Hampshire Water Transfer and Water Recycling Project

Environmental Statement – Appendix 7.4 Geoarchaeological desk-based assessment and landscape characterisation

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Addendum Appendix 7.4 Geoarchaeological desk-based assessment and landscape characterisation

1. The following document forming ES Appendix 7.4 Geoarchaeological desk-based assessment and landscape characterisation, Volume II (Document reference 6.2, DCO Volume 6) provides a baseline of the geoarchaeological potential across the landforms crossed by the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as the Proposed Development). This includes a characterisation of the principal Quarternary geological deposits, the geoarchaeological potential of these deposits, and the extent of superficial deposits with geoarchaeological potential present.
2. This assessment and characterisation report has been used to inform decisions associated with the Project Design, geoarchaeological monitoring and ground investigation conducted to date, the Outline Written Scheme of Investigation (WSI) and Environmental Statement (ES) Chapter 7 Archaeology and cultural heritage, Volume I (Document reference 6.1, DCO Volume 6).
3. This baseline has been included as an appendix to the ES to provide additional supporting detail to the assessment contained in ES Chapter 7 Archaeology and cultural heritage, Volume I (Document reference 6.1, DCO Volume 6) and illustrate the development of geoarchaeological work conducted for the Proposed Development.
4. The baseline is therefore presented as drafted prior to the submission of the PEI Report and serves as a point in time document. As such, this document includes references to terminology and documents in place prior to the submission of the PEI Report. This appendix should therefore be read in conjunction with ES Chapter 7 Archaeology and cultural heritage, Volume I (Document reference 6.1, DCO Volume 6 and the associated appendices.

Hampshire Water for Life Recycling Project

Geoarchaeological Desk-based Assessment
and Landscape Characterisation

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Summary

Wessex Archaeology has been commissioned by Southern Water to produce a Geoarchaeological Desk-based Assessment (GDBA) and Geoarchaeological Landscape Characterisation (GLC) to inform the proposed Hampshire Water Recycling and Water Transfer Project.

This Project requires:

- a new Water Recycling Plant located south of Havant (Budds Farm),
- a new underground pipeline linking the Water Recycling Plant to Havant Thicket Reservoir, and
- a new underground pipeline linking the Water Recycling Plant to Otterbourne Water Supply Works.

Development proposals associated with the Project will cross landforms associated with a range of Quaternary superficial geological deposits of different dates. Such geological deposits have potential to contain archaeology dating from the Palaeolithic period onwards, as well as environmental remains reflective of past human activity, landscapes and environments. Assessments of the archaeological resource associated with Quaternary deposits is therefore 'deposit-led', with the aim to provide lithostratigraphic and chronostratigraphic frameworks and to assess the archaeological and palaeoenvironmental potential of different deposits. A multidisciplinary ‘geoarchaeological’ approach combining archaeological, geological, geophysical and palaeoenvironmental investigative techniques are required.

The GDBA and GLC provide a framework for more precisely determining geoarchaeological potential of Quaternary projects across the Project at a scale which can most effectively inform future decision making, including any requirements for geoarchaeological field evaluation. An ‘Assessment Area’ for the GDBA and GLC was defined. This comprises the Projects agreed Environmental Impact Assessment (EIA) Scoping Area. The Assessment Area runs from Havant in the south, north to Havant Thicket Reservoir and northwest to Otterbourne.

The GBA and GLC identified a range of Quaternary deposits with geoarchaeological potential across the Assessment Area. These included Pleistocene Raised Beach Deposits of the Sussex and Hampshire coastal plain (Brighton-Norton and Pagham beaches); cold stage Pleistocene freshwater deposits in the south of the coastal plain (Budds Farm); Pleistocene River Terrace Deposits of Wallington River and Rivers Meon, Hamble and Itchen; Pleistocene Head-Brickearth overlying some of these terraces; localised capture points for Pleistocene and Holocene sediments in solution features within the chalk on Portsdown Hill and the edge of the South Downs; Pleistocene and Holocene slope deposits on valley margins, and Holocene alluvial sequences that in places contain peats and tufas.

Deposit modelling has divided the Assessment Area to be into 28 Geoarchaeological Character Zones (GCZs) based on variations in Quaternary deposits present. The known archaeological resource associated with these deposits, including evidence indicative of the palaeoenvironmental potential, has been reviewed. The geoarchaeological potential of Quaternary deposits identified in each GCZ has been assessed, and the significance of any such evidence considered in relation to national and regional research themes and priorities.

The GDBA and GLC identified a need, dependant on detailed development proposals, for targeted geoarchaeological field evaluation in 22 GCZs to characterise the geoarchaeological resource in relation to potential development impacts. Recommendations for evaluation, including suggested appropriate methods, are provided.

Hampshire Water for Life Recycling Project

Geoarchaeological Desk-Based Assessment and Landscape Characterisation

1 INTRODUCTION

1.1 Project and planning background

1.1.1 Wessex Archaeology has been commissioned by Southern Water ('the client') to produce a Geoarchaeological Desk-based Assessment (GDBA) and Geoarchaeological Landscape Characterisation (GLC) to inform the proposed Hampshire Water Recycling and Water Transfer Project ('the Project').

1.1.2 The Environment Agency has identified the South East of England as an area of 'serious water stress'. This means that demand for water can outstrip supply, especially during drought conditions. In Hampshire in particular, a growing population, changing climate and sensitive environment means there is not enough water for people and nature. A strategic need to alleviate these current and future problems in Hampshire has therefore been identified.

1.1.3 Southern Water's 'Water for Life – Hampshire' programme sets out a range of measures that are needed to make up this shortfall in water, estimated to be around 192 million litres of water per day during drought conditions. The programme includes measures to manage demand and leakage reduction, however the majority of the deficit would be provided by a strategic new water source – the Hampshire Water Recycling and Water Transfer Project.

1.1.4 This Hampshire Water Recycling and Water Transfer Project introduces a new treatment process to turn treated wastewater into purified recycled water, and then transfer this water to the Havant Thicket Reservoir. This Project requires:

- a new Water Recycling Plant located south of Havant (Budds Farm),
- a new underground pipeline linking the Water Recycling Plant to Havant Thicket Reservoir, and
- a new underground pipeline linking the Water Recycling Plant to Otterbourne Water Supply Works.

1.1.5 The proposed location of the Water Recycling Plant, and the preferred pipeline routes, are illustrated in **Figure 1**.

1.2 Scope of document

1.2.1 Development proposals associated with the Project will cross landforms associated with a range of Quaternary geological deposits of different ages. These are recorded as 'Superficial' deposits in British Geological Survey (BGS) mapping. Such geological deposits have potential to contain archaeology dating from the Palaeolithic period onwards, as well as environmental remains reflective of past human activity, landscapes and environments.

1.2.2 Assessment of the archaeological resource associated with Quaternary deposits is 'deposit-led', with the aim to provide lithostratigraphic and chronostratigraphic frameworks and to

assess the archaeological and palaeoenvironmental potential of different deposits. A multidisciplinary 'geoarchaeological' approach combining archaeological, geological, geophysical and palaeoenvironmental investigative techniques is required.

1.2.3 To help frame geoarchaeological investigations, Wessex Archaeology has developed a four-stage approach, encompassing different levels of investigation appropriate to the results obtained, accompanied by formal reporting of the results at the level achieved. The stages are summarised below (**Table 1**).

1.2.4 This document represents Stage 1 of this process. It provides a Geoarchaeological Desk-base Assessment (GDBA) and Geoarchaeological Landscape Characterisation (GLC) that considers the sub-surface deposits underlying the Project and provides an initial assessment of their archaeological potential. It provides a suitable baseline within which to inform the need for and scope of any subsequent intrusive Stage 2 geoarchaeological evaluation works.

1.2.5 In format and content, the document conforms to current best practice, as well as to the guidance in *Management of Research Projects in the Historic Environment* (MoRPHE, Historic England 2015a) and Historic England's *Deposit modelling and archaeology: guidance for mapping buried deposits* (HE 2020).

Table 1 Staged approach to geoarchaeological investigations

Stage 1: Geoarchaeological Desk-based Assessment (GDBA) and deposit modelling	A geoarchaeological desk-based assessment (GDBA) examines a range of information (published and unpublished ("grey literature"), LiDAR, historic maps) and models existing Ground Investigation (GI) data to inform on the archaeological potential of an Assessment Area. The GDBA may include a Geoarchaeological Landscape Characterisation (GLC) which divides an Assessment Area into different zones (Geoarchaeological Characterization Zones – GCZs) based on variations in deposits and potential. The GDBA establishes the requirements for and scope of Stage 2 archaeological field evaluation. Should Stage 2 evaluation be required, appropriate and proportionate recommendations for each GCZ are provided.
Stage 2: Geoarchaeological evaluation	Field evaluation to establish the archaeological potential of Quaternary deposits within an evaluation area, which informs on the requirements and scope of Stage 3 palaeoenvironmental assessment and/or Stage 4 mitigation. The principal methods of evaluation are through targeted machine-dug test pits and boreholes. An evaluation report is produced, which includes updated deposit modelling and an updated GLC. If required, recommendations for Stage 3 sample assessment and/or Stage 4 mitigation are made.
Stage 3: Sample assessment	Palaeoenvironmental samples and/or sediment samples recovered during Stage 2 are assessed to inform on the archaeological potential of deposits and guide the scope and need for Stage 4 mitigation. Dating of samples taken during Stage 2 may be required to inform on the archaeological l potential of deposits and to guide the scope and need for Stage 4 mitigation. If this is the case, dating will be carried out at this stage. Alternatively dating samples will be retained for Stage 4 mitigation, if required. Recommendations for dating requirements during Stage 3 are made in the Stage 2 report. A sample assessment report is produced outlining the palaeoenvironmental and dating potential of the deposits including targeted and proportionate recommendations for Stage 4 mitigation.

Stage 4: Geoarchaeological mitigation	Based on the results of the Stage 2 and 3 investigations archaeological mitigation may be required to offset development impacts. Mitigation may include targeted geoarchaeological sampling for palaeoenvironmental assessment and scientific dating, potentially alongside archaeological excavation. A final mitigation report is provided on completion of mitigation program.
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 AIMS AND OBJECTIVES

2.1.0 The aims of the GDBA and GLC were to:

- characterise the principal Quaternary geological deposits present within a defined Assessment Area through a review of available Ground Investigation (GI) data, British Geological Survey borehole data (BGS GeoIndex), UK Soil Association (BGS UKSO) data, LiDAR and satellite imagery and the results of previous geoarchaeological investigations;
- assess the geoarchaeological potential of the Quaternary deposits within the Assessment Area;
- identify the extent of superficial deposits with geoarchaeological potential, and
- make suitable recommendations for Stage 2 (see **Table 1**) geoarchaeological field evaluation, if appropriate.

2.1.1 These aims were addressed by achieving the following objectives:

- collation and review of all available Ground Investigation (GI) data, British Geological Survey (BGS) data, LiDAR and satellite imagery, and previous published and unpublished ("grey literature") information relevant to assessing the geoarchaeological resource;
- production of a Geological Landscape Characterisation (GLC) for the Assessment Area, dividing it into Geoarchaeological Character Zones (GCZs);
- production of a Geoarchaeological Desk-Based Assessment GDBA reviewing the known archaeology and evidence indicative of palaeoenvironmental potential for deposits in each GCZ;
- assessment of the likely geoarchaeological potential of the deposits present in each GCZ, and
- the provision of recommendations for Stage 2 (see **Table 1**) geoarchaeological field evaluation, where appropriate.

3 METHODS

3.1 Assessment Area

3.1.1 An 'Assessment Area' for the GDBA and GLC was defined. This comprises the Project's agreed Environmental Impact Assessment (EIA) Scoping Area (**Figures 1**–**2**). The Assessment Area extends from Havant in the south, from where it runs north to Havant Thicket Reservoir, and northwest to Otterbourne.

3.1.2 At Havant, the Assessment Area includes the existing Budds Farm Waste Water Treatment Plant and land bordering Langstone Harbour.

3.1.3 North of the Budds Farm Waste Water Treatment Plant, along the proposed course of the new underground pipeline which will link the Budds Farm plant to Havant Thicket Reservoir, the Assessment Area follows the valleys of the Brockhampton and Hermitage Streams.

3.1.4 Northwest of Havant, along the proposed course of the new underground pipeline linking the Budds Farm plant to Otterbourne Water Supply Works, the Assessment Area initially passes across Portsdown Hill, a chalk ridge trending east-west north of Cosham-Fareham. At the western end of Portsdown the Assessment Area crosses the valley of the Wallington River.

3.1.5 Northwest of Portsdown Hill the Assessment Area crosses the Meon, Hamble and the Itchen Valleys. Within the Meon Valley the Assessment Area includes land north of Knowle, alongside the River Meon, north of the River Meon within the Wickham Park Golf Club and north of the golf course, bordering Titchfield Lane. Within the Hamble Valley, the Assessment Area includes land south of Bishop's Waltham, bordering the River Hamble east of Brokes Copse. Between the Hamble and Itchen Valleys, the Assessment Area crosses the Bow Lake Stream, an east bank tributary of the River Itchen. The northwest end of the Assessment Area is located at southern edge of the South Downs and includes the Itchen Valley. Otterbourne Water Supply Work is situated at the northwest limit of the Assessment Area.

3.2 Geoarchaeological Landscape Characterisation

3.2.1 Deposit modelling has been used to create a Geoarchaeological Landscape Characterisation (GLC) for the Assessment Area. This provides a framework for more precisely determining geoarchaeological potential at a scale which can most effectively inform future decision making, including any requirements for Stage 2 geoarchaeological field evaluation (see **Table 1**).

3.2.2 Deposit modelling maps the lateral extent and depth of deposits across the Assessment Area, providing data for the GLC.

3.2.3 The principal source of data for the deposit modelling was lithostratigraphic information obtained from deposit records within the Assessment Area. Deposit records were obtained from the flowing sources:

- Phase 0 (Budds Farm) Project GI data (11 records);
- Phase 1 Project GI data (34 records);
- Phase 2 Project GI data (42 records);

- BGS borehole records (BGS GeoIndex; 187 records).

3.2.4 Only lithostratigraphic records with sufficiently detailed descriptive terminology and location data (including surface elevation) were included in the model. The deposit modelling was undertaken following the guidelines in Historic England (2020).

3.2.5 All available data points were entered into industry standard geological utilities software (Rockworks™ 23). 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., Bedrock, Alluvium and Made Ground)

3.2.6 Sedimentary units from the boreholes were classified into stratigraphic units. The classified data were then input into a database within the RockWorks 23™ program. Two-dimensional stratigraphic profiles ('transects') of selected interventions within the Assessment Area were generated using RockWorks 23™

3.2.7 Models of surface height and/or thickness were generated using an inverse-distance weighted (IDW) algorithm for the stratigraphic units present within the Assessment Area. Where data points are not uniformly distributed over the area of investigation the reliability of the models is variable. In order to account for this, the modelling algorithm has been adjusted to include a maximum distance cut-off filter, so that only those areas for which sufficient stratigraphic data is present will be included in the model. A maximum distance cut-off filter equivalent to a 200m radius around each data point was applied.

3.2.8 To aide interpretation, the lithostratigraphic data was augmented by UK Soil Association (BGS UKSO) data, and a review of LiDAR and satellite imagery (Google Earth Version 9.193.0.1).

3.2.9 LIDAR data was downloaded from the DEFRA data services platform in ASCII raster format (DEFRA 2023). This comprised a 1 m Digital Terrain Model (DTM), which removes surface objects from using bespoke algorithms and manual editing of the data, to produce a terrain model of the ground surface (DEFRA 2022). As the Project covers a large area, multiple tiles were combined to create single DTM mosaics in ArcGIS, clipped to the entire project area, from which subsequent visualisations were produced. Other data products (including Digital Surface Models (DSM) and Intensity data) are also available (see **Appendix 1**), but the DTM was preferred as this provides a refined bare earth model, with modern vegetation and buildings removed.

3.2.10 LiDAR-derived DTMs can be difficult to interpret in their raw data form and visualisation techniques were used to improve the definition of features of geoarchaeological interest (i.e. geomorphological landforms visible as surface topographic variations). For this analysis, a Simple Local Relief Model (SLRM) was generated using the Relief Visualization Toolbox (RVT) version 2.2.1 (Kokalj et al. 2013). This was calculated using a 20-cell search radius for trend assessment to maximise visibility of a low-relief variations. To illustrate any topographic landforms of archaeological interest or those with a high palaeoenvironmental preservation capacity, a geoarchaeological interpretation of the LiDAR data was undertaken, further details of which are provided in **Appendix 1**.

3.2.11 The combined datasets have been used to provide a GLC for the Assessment Area. The GLC works on the same principles as a Historic Landscape Characterisation (English Heritage 2004) and Landscape Character Assessment (Natural England 2014), but in this case largely considers the buried and outcropping superficial geological elements of the landscape.

3.2.12 The GLC considers variations in the Quaternary geology, sub-dividing the Assessment Area into different Geoarchaeological Characterisation Zones (GCZs). The GLC has been combined with the results of the GDBA to provide an assessment of the archaeological potential of Quaternary deposit in each GCZ, providing a suitable baseline within which to inform the need for and scope of any subsequent Stage 2 (see **Table 1**) field evaluation.

3.3 Geoarchaeological Desk-based Assessment

3.3.1 The GDBA provides a summary of the geoarchaeological resource associated with deposits in each GCZ of the GLC. It includes assessment of any known archaeological findspots that may be associated with deposits and any evidence which enables the potential of deposits to preserve palaeoenvironmental evidence to be considered.

3.3.2 A 1km Study Area around the proposed Water Recycling Plant (Budds Farm), and the proposed pipeline route has been applied to GDBA (**Figure 2**).

3.3.3 The following data sources have been consulted:

- Deposit records included in the GLC;
- Hampshire Historic Environment Record;
- Winchester Historic Environment Record;
- The English Rivers Project (Wessex Archaeology and Wymer 2009);
- Palaeolithic and Mesolithic Lithic Artefact (PaMELA) database (Wessex Archaeology and Jacobi 2014);
- Academic publications;
- Unpublished (“grey literature”) reports.

3.3.4 Additional sources of information relating to equivalent deposits in the wider landscape are included and referenced as appropriate.

3.4 Chronology

3.4.1 Geoarchaeological assessments are typically undertaken with reference to geological periods (e.g. Quaternary), epochs (e.g. Pleistocene) and sub-epochs (e.g. Devensian) that reflect major climate sea-level and/or environmental changes. Here we adopt British nomenclature correlated to the Marine Isotope Stage (MIS) record to distinguish between different climatic periods, with dates given in Kya BP (thousands of years before present).

3.4.2 Marine Isotope Stages are deduced from marine palaeoclimatic records and reflect alternating warm (interglacial and interstadial) and cold (glacial and stadial) periods throughout the Quaternary (**Table 2**).

3.4.3 Where age estimates are available 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). These are linked to the global Marine Isotope Stage (MIS) chronological framework

Table 2 British Quaternary chronostratigraphy

Geological Period	Chronostratigraphy		Age (kya)	MIS
Holocene	Holocene interglacial		11.7 – present	1
Late Pleistocene	Devensian Glaciation	Loch Lomond Stadial	11.7 – 12.9	2 – 5d
		Windermere Interstadial	12.9 – 15	
		Dimlington Stadial	15 – 26	
		Upton Warren Interstadial	40 – 43	
		Early Devensian	60 – 110	
	Ipswichian interglacial		115 – 130	5e
Middle Pleistocene		Unnamed cold stage	130 – 374	6
		Aveley interglacial		7
		Unnamed cold stage		8
		Purfleet interglacial		9
		Unnamed cold stage		10
	Hoxnian interglacial		374 – 424	11
	Anglian glaciation		424 – 478	12
	Cromerian Complex		478 - 780	13 – 19

4 RESULTS

4.1 Solid geology

4.1.1 The solid geology underlying the Assessment Area consists of Cretaceous Chalk, frequently overlain by Palaeogene sands, silts and clays (**Figure 3**).

4.1.2 Along the southern margins of the Assessment Area, from the Budds Farm Waste Water Treatment Plant in the east to the Meon Valley in the west, chalk of the Newhaven Chalk Formation, Spetisbury Chalk Member and Portsdown Chalk Member form the uppermost solid geology. Deposited in marine environments during the late Cretaceous period (84 –72 Mya), these deposits form the Portsdown Anticline, an extensively eroded inlier of chalk, separated from the chalk forming the South Downs to the north by a west to east syncline structure of the Hampshire Basin. The Hampshire Basin is infilled with younger Palaeogene sediments.

4.1.3 North of the Budds Farm Waste Water Treatment Plant, the Assessment Area crosses the Paleogene deposits within the Hampshire Basin. Geological units include the London Clay Formation and Bognor Sand Member, fringed to both the north and south by deposits of the Lambeth Group. Similarly, much of the Assessment Area northwest of the River Meon is underlain by Palaeogene sediments of the Hampshire Basin, including deposits of the London Clay Formation, Whitecliff Sand Member, Wittering Formation, Earnley Sand Formation and Lambeth Group. These Palaeogene sediments were deposited in a shallow marine environment between 59–41 Mya.

4.1.4 The north-west end of the Assessment Area at Otterbourne is situated on the northern margin of the Hampshire Basin and at the southern margin of the South Downs, where late Cretaceous chalk (84 –72 Mya) of the Tarrant Chalk and Culver Chalk Embers outcrop are the upper bedrock sediments.

4.1.5 The solid geology provides the template for Quaternary landscapes and their associated sediments. The east of the Assessment Area contains Middle and Upper Pleistocene sediments of the Sussex and Hampshire coastal plain raised beach sequences, which occur within the western end of a semi-enclosed embayment formed by the chalk of the Portsdown Anticline. Further west the Assessment Area is defined by Pleistocene and Holocene fluvial drainage systems of the Wallington River and Rivers Meon, Hamble and Itchen, which developed within the syncline of the Hampshire Basin.

4.2 Quaternary sediments

4.2.1 The GLC identified a wide range of Quaternary deposits of Pleistocene and Holocene date in the Assessment Area. Summary information relating to these deposits and their broad potential to preserve archaeology (artefacts), including palaeoenvironmental data (ecofacts), is provided below.

4.2.2 It should be noted that this review has demonstrated that BGS mapping of superficial deposits (**Figure 4**) does not accurately reflect sediments present, particularly at the eastern end of the Assessment Area.

Pleistocene Raised Beach Deposits

4.2.3 The eastern end of the Assessment Area is situated at the western limit of the Sussex and Hampshire coastal plain. Pleistocene marine deposits within the coastal plain have been recognised since the 1850s (Prestwich 1859). Initially two sets of marine deposits were identified, one situated at 30m above Ordnance Datum (OD), referred to as the Upper Coastal Plain, and a lower series of sediments at 4.5m OD, forming the Lower Coastal Plain (Palmer and Cooke 1923, Fowler 1932, Calkin 1934). However, it is now recognised that deposits within the Lower Coastal Plain include at least three phases of sea-level high stands as well as low stands (Bates et al. 2000, 2003, 2007, 2010).

4.2.4 The current stratigraphic and local palaeogeographic succession for the Pleistocene raised beach sequence of the Sussex and Hampshire coastal plain are outlined in **Table 3** and summarised below.

Table 3 Stratigraphic and local palaeogeographic succession for the Pleistocene raised beach sequence of the Sussex and Hampshire coastal plain (after Bates et al. 2010)

Geological period	Age (Kya)	Marine Isotope Stage (MIS)	Raised Beach	Local palaeogeography
Holocene	11.7 – present	1		Harboured
Late Pleistocene	26 – 11.7	2		
	57 – 26	3		
	72 – 37	4		

Geological period	Age (Kya)	Marine Isotope Stage (MIS)	Raised Beach	Local palaeogeography
	116 – 72	5d – 5a		
	130 – 116	5e	Pagham Raised Beach	Open coastline
Middle Pleistocene	191 – 130	6		
	243 – 191	7	Brighton/Norton Raised Beach	
			? Aldingbourne Raised Beach	Embayed coastline
	300 – 243	8		
	337 – 300	9	? Aldingbourne Raised Beach	Embayed coastline
	374 – 337	10		
	424 – 374	11	? Aldingbourne Raised Beach	Embayed coastline
	478 – 424	12		
	524 – 478	13	Westbourne/Arundel Raised Beach	Embayed coastline

Westbourne/Arundel Beach

4.2.5 The earliest sediments currently recognised within the Sussex and Hampshire coastal plain belong to the Westbourne/Arundel Raised Beach, which are associated with internationally significant Lower Palaeolithic archaeology. The units forming and overlying the Westbourne/Arundel Raised Beach, and the Palaeolithic archaeology they contain, are summarised in **Table 3**.

4.2.6 The Westbourne/Arundel Beach is mapped east of the Assessment Area from Westbourne Common to Arundel (Bates et al. 2010, Roberts and Pope 2018). However, raised beach deposits which may be broadly contemporary with the Westbourne/Arundel Beach have been recorded at a higher elevation on Portsdown Hill east of the Wallington River and south of the M27 (ApSimon et al. 1977, Bates et al. 2010) to the south of the Assessment Area.

Table 4 Stratigraphy and archaeology associated with the Westbourne/Arundel Raised Beach (data from Robert and Pope 2018, Pope et al. 2020).

Unit	Description and interpretation	Marine Isotope Stage (MIS)	Archaeology
Eartham Upper Gravel	Head gravel		Lower Palaeolithic archaeology reworked from higher ground

Unit	Description and interpretation	Marine Isotope Stage (MIS)	Archaeology
	Calcareous Head gravel		Lower Palaeolithic archaeology reworked from higher ground
Eartham Lower Gravel	Freeze-thaw sorted flint gravel	12	
	Waterlain chalk pellet gravel	12	
	Chalk cliff collapse	late 13 / early 12	Undisturbed Lower Palaeolithic archaeology
	Colluvial and water lain silts.	late 13 / early 12	
Slindon Silt	Mineralised organic deposits	13	
	Soil horizon	13	Undisturbed Lower Palaeolithic archaeology
	Intertidal muds	13	
Slindon Sand	Freshwater channels and scoured landsurfaces	13	
	Near-shore marine sands	13	Lower Palaeolithic archaeology; ?reworked from adjacent terrestrial landscape
Slindon Gravel	Near-shore marine gravel	13	

4.2.7 The earliest units of the Westbourne/Arundel Raised Beach are transgressive storm beach gravels (Slindon Gravel), located at the foot of a degraded chalk cliff. These are post-dated by geographically more extensive marine sands (Slindon Sands). The Slindon Sands are overlain by silts reflecting marine regressions (Slindon Silts). Units within the Slindon Sands and Silts have produced microfauna assemblages (foraminifera, ostracods and molluscs), whilst vertebrate faunal remains (including small and large mammals) have also been recovered from the Slindon Silts (Roberts and Parfitt 1999).

4.2.8 Microfauna assemblages from the Slindon Sands and Silts generally reflect temperate, interglacial conditions, although they also include “non-analogue species” found today in more cool/cold environments (Whittaker in Roberts and Parfitt 1999, Bates et al. 2010). Additionally, species favouring ‘‘marine’’, brackish water and “freshwater” environments have been identified. These combined characteristics have been interpreted as reflecting a temperate, interglacial period, with sediments deposited in an overall embayed environment containing areas of water of much lower salinity (Bates et al. 2010).

4.2.9 The age of the Slindon Gravel, Sands and Silts is now well established within MIS 13 (524 – 474 Kya; Roberts and Parfitt 1999, Roberts and Pope 2009). A laterally extensive landsurface associated with soil development occurs with the top of the Slindon Silts. This landsurface has produced international significant, undisturbed, Lower Palaeolithic archaeology at several locations, most notably at Boxgrove, Amey's Eartham Pit (Roberts and Parfitt, 1999); Slindon Bottom Pit (Pope 2001, Roberts and Pope 2009) and Valdoe Quarry (Pope et al. 2009). This archaeology includes refitting lithic scatters and butchered mammal remains, as well as human remains and palaeoenvironmental datasets.

4.2.10 Lower Palaeolithic archaeology has been recovered from towards the base of the Slindon Sands at Boxgrove, in areas adjacent to the palaeo-cliff line, which indicates an earlier phase of human activity in the adjacent landscape at the peak of high sea levels.

4.2.11 Further Lower Palaeolithic archaeology has been found in sediments post-dating the landsurface associated with Slindon Silts. This includes undisturbed archaeology from within chalk cliff collapse within the Eartham Lower Gravel, which is indicative a later phase of human activity post-dating peak interglacial conditions, either late in MIS 13 or early MIS 12 (478 – 424 Kya). Lower Palaeolithic artefacts have also been recovered from the Eartham Upper Gravel, but this may all be reworked from upslope.

4.2.12 Raised beach deposits potentially equivalent in age to those of the Westbourne/Arundel Beach occur on Portsdown Hill but are not well understood. No Palaeolithic archaeology is known from these, however, a significant Lower Palaeolithic assemblage, including handaxes, was recovered from associated Head deposits in the area at Red Barns, Porchester (Wenban-Smith et al. 2000)

Aldingbourne Beach

4.2.13 The Westbourne/Arundel Beach is post-dated by younger Pleistocene marine sediment assigned to the Aldingbourne Beach. Sediments assigned to Aldingbourne Beach are much more poorly researched that those of the Westbourne/Arundel Beach and it is possible that sediments assigned to this beach include more than one phase of marine transgression and regression. The mapped west to east distribution of the Aldingbourne Beach within the Upper Coastal Plain is similar to that of the Westbourne/Arundel Beach (Bates et al. 2010, Roberts and Pope 2018).

4.2.14 Units of the Aldingbourne Beach occur along the line of the A27 between Chichester and Arundel (Fowler 1932, Calkin 1934, Shephard-Thorn et al. 1982, Bates 1998), but are best characterised within the area to the east of Chichester, where fossiliferous sediments containing pollen, ostracods, foraminifera, molluscs and vertebrate remains have been identified at Norton Farm, Chichester and Pear Tree Knap, Tangmere (Bates et al. 2000, Bates et al. 2010). Units of the Aldingbourne Beach at these locations have been divided into two groups, separated by a major unconformity in the stratigraphy. The lower sediments comprised coarse sands and gravels that fine upwards, whilst the overlying deposits comprised finer grained, bedded sands and silts. Foraminifera, ostracods and molluscs from these sediments are indicative of a declining marine influence up through the sequence and generally temperate, interglacial conditions.

4.2.15 The Aldingbourne Beach has previously been suggested to date to MIS 11 or MIS 9 (424 – 374 Kya / 337 – 300 Kya; Bates et al., 1997). However, Optically Stimulated Luminescence (OSL) dates on sediments from Norton Farm indicate an MIS 7 age (240 – 190 Kya; Bates et al. 2010). Younger marine sediments belonging to the later Brighton/Norton Raised Beach at Portfield Pit, Chichester have also produced MIS 7 age estimates. It has therefore been suggested that units of the Aldingbourne Beach reflect marine transgression and regression early in MIS 7, whilst those of the Brighton/Norton Beach form part of a second transgressive and regressive phase later in MIS 7 (Bates et al. 2010).

4.2.16 Only a few Palaeolithic artefacts can currently be attributed to the Aldingbourne Beach (Bates et al. 2007). However, elsewhere in southern Britain (in particular the Thames Valley) MIS 7 is associated with extensive evidence for early Middle Palaeolithic human occupation (Scott 2011).

Brighton-Norton Beach

4.2.17 Pleistocene raised beach sediments post-dating those attributed to the Aldingbourne Beach are found above 5m OD from Havant (Southleigh Park) in the west to Black Rock, Brighton in the east. These are attributed to the Brighton-Norton Beach.

4.2.18 Recorded sediments of the Brighton-Norton Beach have tended to consist of horizontally bedded, slightly gravelly, marine sands (Bates 1998, Bates et al. 2000). Detailed investigations have demonstrated that close to the palaeo-cliff line, at the northern extent of the sediments, regressive sequences occur. These have comprised marine sands that fined upwards to laminated estuarine sands, buried by low-energy fluvial sediments. A buried soil has been identified at the surface of the estuarine sands (Bates et al. 2010). Further south, the finer grained transgressive sediments are absent, with a major unconformity at the top of the marine sands.

4.2.19 Microfauna from sediments of the Brighton-Norton Beach have been studied from a number of localities (Bates 1998, Bates et al. 2010). These have consistently indicated deposition under cold conditions. OSL age estimates on units of the Brighton-Norton Beach at Norton Farm and Portfield Pit, Chichester suggest a late MIS 7 to MIS 6 date (Bates et al. 2010).

4.2.20 As with the Aldingbourne Beach relatively few Palaeolithic artefacts are currently known from the Brighton-Norton Beach sediments, although some artefacts have been recorded (Bates et al. 2007), and contemporary occupation late in MIS 7 would be consistent with the early Middle Palaeolithic settlement history of southern Britain.

Pagham Beach

4.2.21 The youngest Pleistocene raised beach sediments recognised in the Sussex and Hampshire coastal plain are found at heights below 5m OD and belong to the Pagham Beach. Marine gravels of the Pagham Beach have been identified in modern foreshore cliff sections and in boreholes east of Havant (Reid 1903, Bates et al. 2010). Sediments of the Pagham Raised beach are often clastic, high energy marine flint gravel and chalk debris. Finer grained, lower energy sediments do also occur, however.

4.2.22 Units of the Pagham Beach have produced microfossil assemblages which contain similar cold indicator species to those obtained from the Brighton-Norton Beach (Bates et al. 2010). A key sequence of the Pagham Beach has been identified at Warblington, located 2km east of Budds Farm at the eastern end of the Assessment Area. The deposits of the Pagham Beach at Warblington contained silty sands that preserved a rich microfauna assemblage indicative of sand flats.

4.2.23 The Palaeolithic archaeological potential of deposits of the Pagham Beach is poorly understood. Several handaxes have been reported from findspots that are related to the Pagham Beach, including from overlying chalky gravels, but their condition suggests they are significantly reworked (Bates et al. 2007), and may be derived from earlier deposits.

Lower Coastal Plain Pleistocene Freshwater deposits

4.2.24 Extending from Warblington in the west to Chichester Harbour in the east, bedded chalky sediments have been identified infilling low points in underlying chalk bedrock in the Sussex-Hampshire Lower Coastal Plain. These deposits have undergone limited research and their full distribution is poorly understood. The formation processes associated with these basins are also uncertain. As they occur in areas where the immediately underlying bedrock is chalk, they may be related to dissolution of chalk bedrock.

4.2.25 These chalk-rich Pleistocene sediments have been identified south of, and stratigraphically beneath, the Pagham Beach (Bates et al 2007; 2009; 2010). At Warblington, 2km east of Budds Farm at the eastern end of the Assessment Area, these chalky deposits truncate, and post-date, raised beach sediments and are overlain by the bedded chalky gravels and silts. More than 8m of sediments were recorded, extending to below 0m OD. The chalk deposits comprised periglacial solifluction sediments and finer-grained chalky silts formed in shallow pools/ponds and larger water bodies. Similar sediments have been identified east of Warblington, at Thorney Island, Coniger Point, Lagness, Bersted, Colworth and Felpham (Bates et al 2009). The upper part of this deposit at Warblington has yielded an OSL date of 33.1±2.6 Kya, indicating a late MIS 3 age (Bates et al. 2009).

4.2.26 These chalky silts preserve palaeoenvironmental evidence, including pollen, and extensive foraminifera and ostracod faunas. The ostracod fauna from Warblington is indicative of cold, deep freshwater lakes, and pollen indicative of open grasslands. These deposits indicate that during MIS 3 the area the Lower Coastal Plain west of Chichester contained a large area of impeded drainage, with low-lying marshes and open grasslands, with bodies of water in a tundra-like climate (Bates et al 2009).

4.2.27 The Palaeolithic archaeological potential of these Pleistocene freshwater deposits has not been researched and is uncertain. The MIS 3 dates from Warblington post-date the end of the late Middle Palaeolithic in Britain and broadly date to the period of the earlier Upper Palaeolithic (Leaf-Point Industries/Aurignacian) (Jacobi and Higham 2011).

Pleistocene River Terrace Deposits

4.2.28 The Wallington River and Rivers Meon, Hamble and Itchen in the west of the Assessment Area all possess Pleistocene river terraces. These terraces represent progressively younger former Pleistocene floodplains preserved at decreasing elevations through climatically influenced downcutting and crustal uplift (see Bridgland 2006).

4.2.29 The Rivers Meon, Hamble and Itchen today now all drain into Southampton Water but during the Pleistocene were all east bank tributaries of the River Test, which was itself a major drainage network of the Solent River system.

4.2.30 The modern Solent is a sea channel separating the Isle of Wight from southern England, but for most of its history it was a major river system that drained the Hampshire Basin and the surrounding Chalklands. Its catchment area included large parts of Hampshire, Dorset, south Wiltshire and the Isle of Wight. Following extensive coastal erosion and eustatic Holocene sea-level rise, all that is visible terrestrially today of the Solent River system is the upper reaches of the Solent itself, now the River Frome, and its tributary rivers including the Stour, Avon, Test, Itchen, Meon, Hamble and Medina.

4.2.31 Pleistocene sediments associated with the Solent River drainage are some of the most complete geological records of the last 500,000 years, within which internationally significant Palaeolithic archaeological records are preserved. The current terrace stratigraphies and chronology for the major Solent drainage systems are summarised in **Table 10**.

Table 5 Comparative terrace stratigraphies of the Rivers Stour, Solent and Test and Hampshire-Sussex raised beach sequences

River Stour	Bournemouth Solent	Western Solent	River Test	Luminescence age estimates	Possible MIS correlations
			Lordswood Lane/West end		>13 (?26)
			Toot Hill/Netley Hill		>13 (?22)
			Castle Hill		>13 (?18)
			Midanbury/Rownham's Farm (Terrace 8)		>13 (?16-15)
		Holmsey Ridge	Bitterne (Terrace 7)		>13 (?14)
Terrace 13b	Terrace 13b	Sway	Nursling (Terrace 6)		?13-12
		Beaulieu Heath	Ganger Wood/Mallards Moor (Terrace 5)		?12
Terrace 13a	Terrace 13a	Setley Plain			?12-9
Terrace 12	Terrace 12	Mount Pleasant			?12-9
Terrace 11	Terrace 11	Old Milton	Belbin/Upper Warsash (Terrace 4)		?12-9
		Beckton Farm			?12-9
		Downton/ Tom's Down	Mottisfont/Lower Warsash (Terrace 3)	8	9-8
		Taddiford Farm			9-8
Terrace 10	Terrace 10	Stanwoods Bay	Hamble (Terrace 2) *	7-6	8-6
Terrace 9	Terrace 9	Milford on Sea (Lower)	?Broadlands Farm (Terrace 1)*	4	7-5
		Lepe			6
		Stone Point, Lepe			5e
		Milford on Sea (Upper)	?Broadlands Farm (Terrace 1)*	4	4-3
?Terrace 8		Pennington (Lower)	?Broadlands Farm (Terrace 1)*	4	6
		Pennington Marshes			5e
		Pennington (Upper)	?Broadlands Farm (Terrace 1)*	4	5d-3

** Broadlands Farm terrace has only been traced as far down-stream as Southampton, whilst Hamble Terrace only traced upstream of Southampton. This likely this reflects presence of unmapped terraces beneath the modern Solent.*

4.2.32 Three of the four principal rivers in the Assessment Area, the Itchen, Meon and Hamble, are tributaries of the River Test. Terraces of the River Test have produced thousands of Lower and Middle Palaeolithic artefacts that provide evidence for human occupation of the Solent region during the Lower and Middle Palaeolithic (Roe 1968, Wymer 1999, Ashton and Hosfield 2010, Davis 2013).

4.2.33 The pattern of Lower Palaeolithic activity within the Test river system is documented by occurrences of artefacts within different terraces. The earliest well documented evidence for human presence is from Midanbury/Rownham's Farm (Terrace 8) (Davis et al. 2016; 2021, Hatch et al. 2017). The specific age of these sediments is unknown but may range between MIS 16 to 13 (Westaway et al. 2006). Later terrace deposits across the Solent system contain widespread Lower Palaeolithic artefactual evidence, including large numbers of handaxes.

4.2.34 Evidence for Middle Palaeolithic activity with the Test catchment is marked by the appearance of artefacts produced by the Levallois flaking technique. The timing of the first appearance of this technological strategy is debated (see Westaway et al. 2006, Ashton and Hosfield 2010). Recent reviews (Ashton and Hosfield 2010, Davis 2013, Davies et al. 2021) have concluded that, whilst Levallois material is found amongst collections from Solent system terraces dating to as early as MIS 12 to 10, there is insufficient contextual evidence to be sure that this material is from the terraces themselves, as opposed to being from later, overlying deposits. Consequently, caution is required when considering the earliest appearance of Levallois in the Solent terraces. Based on well contextualised material Davies et al. (2021) have concluded that the earliest secure evidence for Levallois core working is associated with the Belbin terrace of the River Test (?≥MIS 9).

4.2.35 The best documented early Middle Palaeolithic assemblage containing Levallois artefacts in the Test Valley is from Warsash (Burkitt et al. 1939). This site has fresh and slightly rolled Middle Palaeolithic artefacts, including artefacts reflecting Levallois core working. These may originate from the upper units or surface of the Lower Warsash terrace. This archaeology may date to late in MIS 8 or early in MIS 7 (Davis et al. 2016).

4.2.36 The later Middle Palaeolithic in the Test valley is less well understood. Concentrations of chance finds of typo-technologically diagnostic late Middle Palaeolithic (Boute coupé) handaxes from the Southampton area (Cutler 2013) demonstrate human activity during this period. Where chronology is available, such handaxes tend to be dated to early MIS 3 (White and Jacobi 2002). Additionally, recent investigation within the wider Solent catchment at Great Pan Farm, Isle of Wight indicates a human presence both during MIS 4/3 and also earlier in MIS 5d-5a (Wessex Archaeology 2021; forthcoming). The latter is particularly significant as MIS 5d-5a, the early Devensian, is often described as a period lacking evidence for humans in Britain (e.g. Ashton and Lewis 2002). The new Great Pan Farm evidence, supported by extant evidence from elsewhere (Wenban-Smith et al. 2010) suggests that this is not the case. The Great Pan Farm archaeology also demonstrates that the Solent system is a key region for investigating later Middle Palaeolithic activity and settlement history in southern Britain.

4.2.37 Palaeoenvironmental records are rare from terraces in the Solent system and the deposits of the Test are generally unfossiliferous. However, evidence from the wider drainage system demonstrates that where suitable conditions locally occur, significant organic and fossiliferous sediments can be present (Barber and Brown 1987, Allen et al. 1996, Briant et al. 2009, Briant et al. 2013).

4.2.38 In comparison to the Test, the Pleistocene terraces of the Meon, Hamble and Itchen are poorly mapped and lack chronology. Of the three, the terraces of the Itchen are the most consistently recorded with up to five terraces located above the modern floodplain (Edwards and Freshney 1987). Multiple terraces are also identified by the BGS for the Meon and Hamble with terraces numbered up to 7 recorded for both (BGS GeoIndex). However, the number and mapping of these terrace outcrops is inconsistent. No deposits associated with terraces of the Meon, Hamble and Itchen have been dated.

4.2.39 Similarly, the Palaeolithic archaeological records associated with these rivers is poorly understood, having been little researched. Hints at archaeological potential are provided by 19th century finds of Palaeolithic artefacts from the Itchen, which include 65 handaxes and a Levallois flake from a gravel pit quarrying Terrace 3 at Colden Common and ten handaxes from a pit cut into Terrace 4 at Chandlers Ford (Davies 2013). The presence of the Middle Palaeolithic Levallois flake from Colden Common may provide some chronology; based on evidence for the first appearance of Levallois in the wider Solent catchment (see above), it may indicate that Terrace 3 is younger than MIS 9.

4.2.40 The other river with Pleistocene river terraces in the Assessment Area, the Wallington River, drains through Fareham and Portsdown Hill at the western end of the Portsdown Anticline into Portsmouth Harbour. During the Pleistocene the river likely drained directly into the Solent River in the area east of the Isle of Wight. The BGS map up to 7 terraces of the Wallington River (BGS GeoIndex). These terraces have undergone little investigation and their age and archaeological potential is unknown.

Deposits mapped as Clay-with-Flints and sediments infilling solution features

4.2.41 The Assessment Area crosses two areas of chalk upland, Portsdown Hill and the edge of the South Downs at Otterbourne. Chalk forming these landscapes is subject to dissolution through infiltration by weak carbonic acid, which flows through fractures dissolving the wall rock and causing them to widen, creating a range of solution features (dolines/hollows, pipes etc). The process of dissolution is ongoing and stochastic with solution features forming during both the Pleistocene and Holocene periods. These solution features act as capture points for Pleistocene and Holocene sediment that have been protected from subsequent erosion in what are otherwise highly erosive landscapes. Solution features can also have been foci for Palaeolithic and later Prehistoric activity, with deposit within them preserving significant and minimally disturbed archaeology. Deposits within solution features can preserve paleoenvironmental evidence. If calcareous deposits are present, deposits within solution features can contain vertebrates and molluscs. Additionally, they can include buried soils preserving other palaeoenvironmental evidence, such as pollen.

4.2.42 In the Otterbourne area Clay-with-Flints is mapped by the BGS overlying the chalk bedrock. Clay-with-Flints (sensu stricto) is a deposit derived from the in-situ dissolution, decalcification and cryoturbation of chalk and overlying Palaeogene (55-23 Ma) deposits. It is a product of cumulative in situ post-Paleogene weathering. Clay-with-Flints (sensu lato) includes not only this parent material, but sediments incorporating exogenous Pleistocene loessic and/or colluvial material. This can include Pleistocene and Holocene sediments that infill solution features within the underlying chalk. The key archaeological significance of areas of Clay-with-Flints is that they are indicative of parts of chalk landscapes that have been protected from extensive weathering and erosion during the Pleistocene and Holocene and are indicative of areas where capture points such as solution features preserving Quaternary sediments containing archaeology can occur.

Pleistocene Head Deposits

4.2.43 Head deposits are recorded by the BGS across the Assessment Area. The sediments are often found overlying raised beach and river terrace deposits, as well on slopes directly overlying bedrock.

4.2.44 Head is a banner term for a range of sediments deposited through different processes. Where fine-grained units dominate, such deposits are often collectively referred to as ‘Head-Brickearth’ or simply ‘Brickearth’.

4.2.45 Head deposits most often include sediments that have be reworked downslope in periods associated with landscape instability. In Pleistocene contexts this instability is climatically and environmentally driven, with cold periods associated with a lack vegetation cover providing the most suitable conditions for deposition of such slope deposits. Depositional processes within such slope deposits can include colluviation, water run-off and, in periglacial environments, seasonal freeze-thaw processes (e.g. solifluction).

4.2.46 Head sequences can also include Pleistocene wind-blown sediments. Wind-blown sediments (Loess/Coversands) are deposited in periglacial environments with silt (loess) or sand (Coversands) sized particles from exposed unconsolidated parent sources that have been redeposited across landscapes. Sequences of Pleistocene wind-blown sediments often reflect periodic aeolian deposition between which stable landsurfaces, including buried soils, can form.

4.2.47 Particularly when overlying Pleistocene River terraces, sediments recorded as Head can include alluvial sediments, including fine-grained floodplain sediments or sediments deposited within fluvial channel fills.

4.2.48 Deposits recorded as Head are generally considered to date to the Pleistocene, but where chronology is absent (for example in the form of contained archaeology) they often include Holocene colluvium. This reflects the fact that both are often slope deposits deposited through a similar range of processes, although the causal factors resulting in Holocene colluviation include human landscape modification (see below).

4.2.49 The archaeological potential of Head deposits is dependent on their specific depositional context. Slope deposits within Pleistocene Head can contain and bury stable horizons associated with minimally disturbed/in-situ Palaeolithic archaeology. Slope deposits themselves can incorporate material reworked downslope within the sediment body, which may in turn be indicative of focusses of activity further upslope. Similarly aeolian sediments in Head sequences and finer-grained alluvial sediments within Head sequences can contain stable surfaces and buried soils associated with minimally disturbed/in-situ Palaeolithic archaeology.

4.2.50 Decalcified Head sequences have low potential to preserve palaeoenvironmental evidence. Calcareous sequences on chalk bedrock can, however, preserve significant mollusc and vertebrate faunas. Buried soils within Head sequences can preserve significant palaeoenvironmental records.

Holocene Alluvium

4.2.51 Holocene alluvium is present in the Assessment Area within the valleys of the Hermitage Stream, Wallington River and Rivers Meon, Hamble and Itchen, and some of their tributaries. Holocene alluvium is a generalised term covering unconsolidated sediment transported by water in a non-marine environment (e.g. rivers). It has also been used as a banner term including other sediment such as peat, but that often occur as distinct bands or discrete features within alluvium. Alluvium will therefore be encountered within both active rivers and floodplains and the fills of former river channels (termed palaeochannels). Both floodplain alluvium and palaeochannels are key contexts of the preservation of waterlogged archaeology.

4.2.52 Three sets of Holocene alluvial sediments are recognised within Assessment Area:

- Minerogenic sediments

- Peats
- Tufa

4.2.53 Minerogenic alluvial sediments can bury archaeological features and layers, particularly where changes in drainage result in floodplain stabilisation and associated activity, which is subsequently sealed by a reversion to active alluvial deposition. Although it contains palaeoenvironmental remains such as pollen and plant macrofossils, these are often poorly preserved and of uncertain source area, transported fluvially over potentially large areas of the wider catchment. Holocene alluvium also lacks suitable material of secure context for radiocarbon dating.

4.2.54 Peat comprises partially decomposed organic matter preserved within waterlogged anaerobic (oxygen-free) conditions. The archaeological potential of peat deposits is high as they can preserve organic remains not otherwise generally preserved. Peat also contains a range of botanical remains (e.g. pollen and plant macrofossils) preserved in the waterlogged anoxic (oxygen-free) conditions, representing important archives of information on past climate and palaeoenvironmental change and the impact of human communities on the landscape.

4.2.55 Tufa is a secondary deposit of calcium carbonate which accumulates on precipitation from emergent spring waters (Thorpe et al. 1980) and is commonly considered to be associated with formation in warm, wet conditions. Holocene tufas are particularly, though not exclusively, associated with the Mesolithic period. Tufa is often recorded around springs though it may reflect a range of fluvial processes. Due to the highly calcareous nature of tufa, it has a high potential to preserve vertebrate and molluscan remains. Direct dating of tufa can be problematic owing to the lack of suitable organic preservation.

4.2.56 Calcareous tufas only occur at the west end of the Assessment Area at Otterbourne where the River Itchen crosses outcropping chalk, which is the source of the calcium carbonate in the tufas. This is the furthest known southerly extent of tufa deposits within the Holocene alluvium in the Itchen Valley (Edwards and Freshney 1987).

Holocene Colluvium

4.2.57 Holocene colluvium are slope deposits formed in areas of topographical relief where soil instability leads to downslope movement of sediments. Colluvium is particularly prevalent in areas of chalk bedrock through erosion of the thin rendzina soils. Generally this instability is considered to have been brought on by activities such as clearance of woodland, agricultural activity and soil degradation. Environmental factors can also influence the formation of Holocene Colluvium.

4.2.58 Holocene colluvial sediments can contain reworked artefacts of multiple dates. It can also bury archaeological features and layers. As with Pleistocene Head sequences, calcareous Holocene colluvial sequences on chalk can preserve molluscs and vertebrate remains, whilst buried soils within colluvium can contain important pollen records.

4.3 Geoarchaeological Characterisation Zones

4.3.1 Deposit modelling has enabled the Assessment Area to be divided into 28 Geoarchaeological Character Zones (GCZs) based on variations in the type of Quaternary deposits present. These are illustrated on **Figure 5** and summarised in **Table 6.** The deposits present in each GCZ and their archaeological and palaeoenvironmental background are discussed below. All relevant archaeological findspots are listed in **Appendix 2**.

Table 6 Geoarchaeological Character Zones

GCZ	Name	Landscape features	Principal Quaternary deposits
1a	Havant Thicket	Areas of high ground overlooking dry valley system in Thicket Bottom - Stockheath	None
1b	West Leigh		
2	Thicket Bottom - Stockheath	Dry valley system and minor watercourse that forms north bank tributary of Hermitage Stream	Pleistocene Head / Holocene Colluvium
3	Bell's Copse	Valley and minor watercourse that forms north bank tributary of Hermitage Stream	Pleistocene Head / Holocene Colluvium
4a	Hermitage Stream North	Valley of the Hermitage Stream	Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
4b	Hermitage Stream North	Valley of the Hermitage Stream	Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
5a	Havant West	East of valley of Hermitage Stream	Pleistocene Raised Beach Deposits
			Pleistocene Head
5b	Bedhampton East	West of valley of Hermitage Stream	Pleistocene Raised Beach Deposits
			Pleistocene Head
5c	Farrington East	Southern slope of Portsdown Hill	Pleistocene Raised Beach Deposits
			Pleistocene Head
6	Brockhampton – Budds Farm	Confluence of Hermitage Stream and Brockhampton Stream in west of Langstone Harbour	Possible Chalky Silts and Gravels
			Chalky Silts and Gravels
			Gravels
			Gravelly Clays
			Clays
			Alluvium
7	Portsdown Hill Road	Southern slope of Portsdown Hill	? Pleistocene Raised Beach Deposits
			Pleistocene Head
8	Portsdown Hill	Chalk ridge with dry valleys incised through northern slopes which form southern side valleys of main valley of Wallington River	? Pleistocene and/or Holocene deposits within solution features
			Pleistocene Head / Holocene Colluvium
			Holocene Colluvium
9	Wallington River East	Upper valley of the Wallington River	Pleistocene River Terrace Deposits
			Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
10	Staple Cross Copse	Interfluve between north bank dry side valleys of the Walling River Valley	None
11	Priors Hold Farm	Valley and minor watercourse that forms north bank tributary of the Wallington River	Pleistocene Head / Holocene Colluvium
12	Wallington River West	Valley of the Wallington River	Pleistocene River Terrace Deposits
			? Pleistocene and/or Holocene deposits within solution features

GCZ	Name	Landscape features	Principal Quaternary deposits
			Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
13	Wickham Common	Interfluve between Wallington River and River Meon	None
14	Funtley	Interfluve between Wallington River and River Meon	? Pleistocene and/or Holocene deposits within solution features
15	River Meon	Valley of the River Meon	Pleistocene River Terrace Deposits
			Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
16	Redhill Copse	Interfluve between Meon Valley and dry valley belonging to upper catchment of the River Hamble	None
17a	Hilldale Farm	Head of dry valley system which develops into of east bank tributary of the River Hamble	Pleistocene Head / Holocene Colluvium
17b	Cloverfield Farm		?Holocene alluvium
18	Shirrell Heath	Interfluve between valleys of tributaries of River Hamble	None
19	Kitnocks Gully	Upper valley of Kitnocks Gully, an east bank tributary of the River Hamble	Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
20	Clewers Hill	Interfluve between valleys of tributaries of River Hamble and the valley of the River Hamble	None
21	River Hamble	Valley of the River Hamble	Pleistocene River Terrace Deposits
			Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
22a	Winters Hill West	West bank tributary of River Hamble	Holocene Alluvium
22b	Winters Hill East		
23	Park Hill	Interfluve between River Hamble and Bow Lake stream	None
24	Fisher's Pond	Valley of the Bow Lake Stream and valley of Fisher's Pond	Pleistocene Head / Holocene Colluvium
			Holocene Alluvium
25	Nobbs Crook	Interfluve between Bow Lake Stream and River Itchen	? Holocene colluvium
26	Itchen Valley	Valley of the river Itchen	Pleistocene River Terrace Deposits
			Pleistocene Head
			Holocene Alluvium
27	Otterbourne	Southern edge of South Downs	? Pleistocene River Terrace Deposits
			? Pleistocene deposits within solution features
			Pleistocene Head / Holocene Colluvium
28	Otterbourne Hill	High ground west of the Itchen Valley	None

GCZs 1a and 1b

4.3.2 GCZs 1a and 1b are defined through BGS mapping (BGS GeoIndex) and topographic data (mapping and LiDAR). They are elevated areas of Palaeogene bedrock overlooking a network of valleys in GCZ 2 (**Figure 6**).

4.3.3 Sediment records for zones 1a-b are sparse (**Figure 6**) but the available data indicates the presence of Palaeogene bedrock (Bognor Sand Member and London Clay Formation, with Lambeth Group sediments to the north) directly beneath topsoil.

GCZ 2

4.3.4 GCZ 2 (**Figure 6**) is defined by a valley system containing ephemeral streams which coalesce to form a north bank tributary stream of the Hermitage Stream. The zone extends from Thicket Bottom in the north, southwards to where the valley system joins that of the Hermitage stream at Stockheath.

4.3.5 The zone was defined principally through BGS mapping (BGS GeoIndex) and LiDAR data, augmented with BGS deposit records. The Quaternary deposits identified are summarised in **Table 7**.

Table 7 Quaternary deposits in GCZ 2

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
2	?Pleistocene Head / Holocene Colluvium	0.20–0.80	0.20–4.05

4.3.6 Deposit records are available for areas in the north of the zone, within Thicket Bottom. A transect through the deposits is shown in **Figure 7**. This transect demonstrates that up to 4m of Pleistocene Head deposits occur in the valleys.

4.3.7 The recorded deposits comprised silty clays, which were sandy in places. They were generally clast free. The lithology suggests that sediments principally reflect reworking of bedrock sediments (Bognor Sands Member and London Clay Formation) through slope processes. These processes likely include colluviation and water runoff of unconsolidated sediments downslope in environments with limited stabilising vegetation. If Pleistocene, they may also include soliflucted sediments resulting from seasonal freeze-thaw of parent material. No chronology for these deposits is available and their specific age is uncertain; they could reflect repeated phases of slope processes reworking sediments during the Pleistocene and/or Holocene.

4.3.8 Although data points are sparse, the evidence suggests that there are no alluvial sediments associated with the minor watercourses in this zone. This is supported by LiDAR data , which does not record any palaeochannels (**Figure 8**).

4.3.9 There is no archaeology that can be directly associated with these Quaternary deposits identified. However, Mesolithic artefacts are recorded in the wider area from the upper slopes of dry valleys where Head deposits are mapped by the BGS (**Figure 6**). The slope deposits identified in GCZ 2 are not likely to be calcareous and are therefore unlikely to preserve palaeoenvironmental evidence.

GCZ 3

4.3.10 GCZ 3 (**Figure 6**) is defined through BGS mapping (BGS GeoIndex) and LiDAR by a north-south orientated valley containing a minor watercourse that forms a north bank tributary of the Hermitage Stream.

4.3.11 No deposit records are available for this zone. Mapped Quaternary deposits consist of Head (BGS GeoIndex) and deposits present are likely to similar to those in GCZ 2 (see above). No archaeology is known that can be attributed to the Quaternary deposits in this zone.

GCZs 4a and 4b

4.3.12 GCZ 4a and 4b comprise the valley of the Hermitage Stream, defined through BGS geological mapping and BGS deposit records (**Figure 9**). Given the predominantly urban nature of these zones, it is not possible to confidently identify any surface topographic features in LiDAR data associated with geomorphological features in these zones. The Quaternary deposits identified are summarised in **Table 8**.

Table 8 Quaternary deposits in GCZ 4a and 4b

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
4a-4b	?Pleistocene Head / Holocene Colluvium	1.10–1.52	1.10–3.71
	Holocene Alluvium	0.30–0.49	0.30–2.43

4.3.13 **Figure 10** provides a transect through the deposit records in the zones 4a and 5a and demonstrates that the Hermitage Stream has incised through and post-dates the Pleistocene Raised Beach deposits found in GCZ 5a (see below).

4.3.14 The Holocene alluvial sediments of the Hermitage Stream recorded in BGS deposit records comprised sandy gravelly clays. All deposits recorded are minerogenic, with low palaeoenvironmental potential. It is possible that deposits with higher potential, such as peats, could occur locally. No archaeological records can be related to the alluvium of the Hermitage Stream.

4.3.15 Clays are present beneath Holocene Alluvium. The lithological description of these clays in BGS deposits records is limited, and it is unclear whether these are Palaeogene bedrock and/or Pleistocene Head/Holocene Colluvium deposits similar to those in GCZ 2.

GCZs 5a, 5b and 5c

4.3.16 Zones 5a and 5b are east and west of the Hermitage Stream, whilst GCZ 5c is located further to the west, along the lower slopes of Portsdown Hill north of Langstone Harbour (**Figure 9**). Coverage of BGS deposit records for these zones are adequate and a transect illustrating these deposits is provided in **Figure 11**.

4.3.17 The BGS mapping records Pleistocene Head and undifferentiated River Terrace Deposits in these zones. This mapping is erroneous. Deposit records demonstrate that Pleistocene Raised Beach Deposits are present overlying bedrock and beneath Pleistocene Head Deposits.

4.3.18 The Quaternary deposits present in GCZ 5a, 5b and 5c are summarised in **Table 9**.

Table 9 Quaternary deposits in GCZ 5a, 5b and 5c

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
5a	Pleistocene Raised Beach Deposits	0.31–1.50	0.31–4.10
	Pleistocene Head Deposits	0.18–0.31	0.18–1.71
5b	Pleistocene Raised Beach Deposits	0.80 –1.20	1.05–7.85
	Pleistocene Head Deposits	0.10 –0.50	0.10–1.20
5c	Pleistocene Raised Beach Deposits	4.72	4.72–5.90
	Pleistocene Head Deposits	0.10	0.10–4.72

4.3.19 The Pleistocene Raised Beach deposits have basal heights of between c. 10m and 8m OD. This would be consistent with attribution to the western end of the Brighton-Norton Beach of the Sussex-Hampshire Lower Coastal Plain, as mapped by Bates et al. (2010). Further east units of the Brighton-Norton Beach have been dated though Optically Stimulated Luminescence (OSL) dating to late MIS 7 to MIS 6 (Bates et al. 2010; see **Section 4.2**). The Pleistocene Raised Beach deposits in GCZ 5a and 5b have been incised through and are separated by the valley of Hermitage stream (GCZ 4a and 4b).

4.3.20 The data suggests that a palaeo-cliff line incised into Palaeogene bedrock extends along the northern and northwestern boundaries of GCZs 5a, 5b and 5c. Although most records are historic BGS borehole logs with limited lithological information, enough data is available to characterise the raised beach sediments.

4.3.21 In GCZ 5a consistent sequences of raised beach deposits are recorded, comprising lower sandy clay units overlain by sandy gravelly clays and gravels. In GCZ 5b and 5c similar Pleistocene Raised Beach sequences are recorded. The thickest sequence is in project GI borehole BH105 in GCZ 5b. This recorded 7.65m of Raised Beach Deposits above bedrock, comprised of basal sandy silty clays, overlain by alternating units of sands and sandy clays, with more gravelly units at the top.

4.3.22 Generally the sequence of finer to coarser sediments recorded in the raised beach sediments in these zones is inverse to that generally observed for the northern extent of the Brighton-Norton Beach further east in Sussex, where marine sands fining upwards to laminated estuarine sands, buried by low-energy fluvial sediments have commonly been observed (Bates et al. 2010). This suggests the Brighton-Norton Beach deposits in GCZs 5a, 5b and 5c may belong to a different part of the raised beach stratigraphy than that found further east on the Lower Coastal Plain.

4.3.23 Across GCZ 5a, 5b and 5c Raised Beach Deposits are sealed by Pleistocene Head. This Head is recorded as gravelly sandy clays, which likely reflect the downslope reworking of bedrock and Pleistocene Raised Beach sediments from upslope.

4.3.24 No archaeology has been identified which can be attributed to the Pleistocene Raised Beach and/or Head deposits in this zone. However, these deposits have not previously been generally recognised or investigated. The finer-grained units of the Pleistocene Raised Beach sequences have potential to contain paleoenvironmental evidence, specifically microfossils, which may enable depositional regime and environmental context for these deposits to be established. These sandy units are also suitable for luminesce dating. The overlying Head Deposits are likely to be decalcified and are unlikely to contain palaeoenvironmental evidence.

GCZ 6

4.3.25 The zone is located at the confluence of the Hermitage Stream and Brockhampton Stream and at the northwestern side of Langstone Harbour (**Figure 9**). Geologically the zone is marked by a change in bedrock from Palaeogene sediments of the Hampshire Basin to chalk of the eroded Portsdown Anticline. The change in bedrock geology is a major influence on the Quaternary deposits present, with up to c. 20m of Quaternary sediments infilling a basin formed within the chalk bedrock. Formation processes associated with this basin are uncertain but may relate to dissolution of the chalk bedrock creating a solution feature, or a series of solution features that have coalesced, which has acted as depocentre for these deposits.

4.3.26 Although the quality of the data is varied, good coverage of deposit records (combined BGS archive boreholes and project GI) is available for this zone. Thick sequences of Quaternary deposits (potentially up to c. 20m) occur across GCZ 6. The Quaternary stratigraphy present is similar to that recorded c. 5km to the east between Southleigh Park, Warblington and Thorney Island (Bates et al. 2010 Fig. 11). The Quaternary deposits recorded in zone 6 comprised:

- Possible Chalky Silts and Gravels (Pleistocene)
- Chalky Silts and Gravels (Pleistocene)
- Gravels (Pleistocene)
- Gravelly Clays (?Pleistocene)
- Clays (?Holocene)
- Holocene Alluvium (Holocene)
- Made Ground (Recent)

4.3.27 The Quaternary sediments in GCZ 6 are summarised in **Table 10** and discussed below.

Table 10 Quaternary deposits in GCZ 6

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
6	Possible Chalky Silts and Gravels	1.98– 23.00	1.98–23.00
	Chalky Silts and Gravels	2.90–17.00	2.90–22.35
	Gravels	0.79–9.00	2.98–14.80
	Gravelly Clays	0.31–2.25	0.31–4.57
	Clays	0.00–2.18	0.00–3.84
	Alluvium	0.00–0.61	0.00–1.82
	Made Ground	0.00–0.20	0.00–16.50

<u>Chalky Silts and Gravels / Possible Chalky Silts and Gravels</u>

4.3.28 The basal Quaternary deposits recorded in the zone consisted of chalky silts and gravelly chalky silts/chalky gravels that contained sub-rounded to rounded chalk clasts and angular flint clasts. The lithostratigraphies of these deposits suggests that these are Pleistocene Freshwater Deposits, similar to those identified 2km to the east at Warblington (Bates et al. 2009; see **Section 4.3**). These Chalky Silts and Gravels are underlain by chalk bedrock. Distinguishing these Pleistocene sediments from chalk bedrock is dependent on the quality of individual deposit records, consequently Possible Chalky Silts and Gravels have been identified, reflecting where there is uncertainty. The data indicates that up to c. 14m of

Chalky Silts and Gravels may be present beneath GCZ 5. In places these occur beneath, and have been truncated by, up to 16.5m of Made Ground.

4.3.29 **Figures 12**–**14** provide transacts through the Quaternary deposits in GCZ 6, whilst **Figures 15** and **16** provide a digital elevation model for the bedrock surface and thickness plot of the Chalky Silts and Gravels. These combined datasets demonstrate that these Chalky Silts and Gravels are infilling a basin within the chalk that extends from north to south and west to east, with bedrock heights decreasing from c. 5.0m OD to c. -16.0m OD.

4.3.30 As at Warblington (Bates et al. 2009), these chalky deposits are interpreted as Pleistocene periglacial solifluction gravels and finer-grained chalky silts that formed in a body of fresh water. At Warblington the upper part of these deposits has been dated through OSL dating to late MIS 3 (Bates et al. 2009). The age range within the Pleistocene period of the chalky deposits in GCZ 6 is unknown; given their thickness they are likely to cover a significant period of time.

4.3.31 No Palaeolithic archaeology can currently be attributed to the Chalky Silts and Gravels found in GCZ 6, but this may at least partially reflect limited investigation and the depths at which they occur beneath ground levels (see **Table 10**). Investigations at Warblington demonstrate that these chalky deposits have significant palaeoenvironmental potential including for pollen and microfossils (including rich foraminifera and ostracod faunas). The fact that they are chalky, and therefore calcareous, additionally suggest potential for vertebrate remains and molluscs.

Gravels

4.3.32 The Chalky Silts and Gravels are often overlain by flint rich gravels. Interpretation of these gravels is inhibited by the variable quality of lithological description in sediment records. Generally these are described as sandy sub-angular to sub-rounded flint gravels or gravelly sands. Often a gradual increase in chalk content with depth was noted. Some deposit records described the gravels as rounded and sub-rounded, with occasional cobbles; gravel such as this is characteristic of marine deposition. Based on the available data these gravels are interpreted as having been deposited in a coastal environment as part of the Lower Coastal Plain Pleistocene raised beach stratigraphies.

4.3.33 Transects through these deposits (**Figures 12**–**14)** demonstrate that the base of the Gravels occurs from c. 0.0 to -2.0m in the north of GCZ 6, descending to c. -6.0m OD in the south of the zone. These heights may be consistent with those of the Pagham Beach, which is dated to MIS 5e (Bates et al. 2010). Further work is required to investigate this, however. The basal heights are lower than the +1.0m OD basal height recorded for these deposits 2km to the east at Warblington (Bates et al. 2009). Additionally the Gravels in GCZ 6 are often recorded overlying Chalky Silts and Gravels. At Warblington similar chalky deposits are thought to post-date, rather than predate, the Pagham Beach (Bates et al 2010). This could indicate that that the Chalky Silts and Gravels in GCZ 6 may be older than those at Warblington. It is possible that the Chalky Silts in GCZ 6 relate to an earlier cold period than those at Warblington, possibly MIS 6. Dating of deposits would be required to resolve this; sand units within the Gravels would be suitable for luminescence dating.

4.3.34 A thickness plot for the Gravels (**Figure 17**) demonstrates that up to c. 10m of Gravels may be present in GCZ 6. This maximum thickness may be an overestimate, however, as the transition to Gravels with an increased chalk content recorded in some deposit records may reflect a change in lithostratigraphy to the underlying Chalky Silts and Gravels. Commonly up to 6m of flint Gravel is recorded in deposit records. The plot demonstrates the Gravels

occurring in deposit records to the north and south of the zone; the gap between these may reflect removal by erosion prior to deposition of the overlying Gravelly Clays

4.3.35 No archaeology can currently be attributed to these Gravels, or indeed the Pagham Beach in the area, but the deposits have been little researched. Investigations at Warblington have demonstrated that fine grained units with the Pagham Beach sequence can contain important palaeoenvironmental records, particularly microfossil assemblages (Bates et al. 2009; see **Section 4.2**).

Gravelly Clays

4.3.36 The Chalky Silts and Gravels are post-dated by Gravelly Clays. Available lithological descriptions of these Gravelly Clays contain limited lithological detail; they are generally described as silty and sandy clays containing flint gravel clasts. Transects (**Figures 12**–**14)** and a thickness plot (**Figure 18**) demonstrate that the thickest sequences of Gravelly Clays run in a linear orientation from northwest to southeast. These may be within a buried valley form.

4.3.37 The mode of deposition of the Gravelly Clays is uncertain; more detailed lithological descriptions are required to assess this. The clasts may indicate deposition through cold stage slope processes (e.g. solifluction) but they could be alluvial sediments or reflect a combination of multiple depositional processes. Similarly, the palaeoenvironmental potential of these deposits is currently uncertain; any evidence that they did preserve would assist with establishing depositional environment.

4.3.38 The age of the Gravelly Clays is currently unknown. They are assumed to be Pleistocene, but this is not certain. Sandy units within the deposits may be suitable for luminescence dating. No extant archaeology can be firmly attributed to these deposits.

Clays

4.3.39 Deposit records record silty and sandy, generally clast free, Clays overlying Gravelly Clays in GCZ 6. Transects (**Figures 12**–**14**) and a thickness plot (**Figure 19**) demonstrate the Clays occur across the deposit records and were likely once more extensive, having been truncated by recent impacts and replaced with Made Ground. These Clays are interpreted as alluvial sediments, potentially deposited in an estuarine environment within Langstone Harbour. Their age is uncertain but due to their position in the lithostratigraphic framework, they may be of Holocene date.

4.3.40 These are likely the northern edge of a Holocene alluvial sequence which thickens to the south across Langstone Harbour. Further south within Langstone Harbour, borehole data has recorded grey blue silts over peats at -11.90m and -10.75m OD (Wimpey 1962, Mottershead 1976). These peats are within deeply incised channels. These peats are undated but have been suggested to date to the Mesolithic (c. 7000 BP), when the coastline is considered to have been located 40 km to the south of Langstone Harbour (Allen and Gardner 2000).

4.3.41 Sediments overlying these peats have been related to a period of gradual sea-level rise through the 9th–4th millennia BC, resulting in the infilling of these channels by the later Bronze Age (Allen and Gardner 2000). Peats related to submerged ‘forests’ occur within Langstone Harbour at depths from -1.0m to -0.5m OD, which are dated to the later Neolithic (based on radiocarbon dates), demonstrating that terrestrial low-lying landscapes were present within the harbours. Although the development of brackish pools may be suggested by plant macro-fossil evidence by the later Neolithic, these terrestrial and semi-terretrial conditions within the harbour are thought to have persisted through to the middle Bronze

Age (Allen and Gardner 2000). Paleoenvironmental data (principally pollen, plant macro-fossils and molluscs) demonstrates that by the late Iron Age and Romano-British period, Langstone Harbour comprised a shallow muddy harbour, fringed with saltmarsh and stronger brine pools (Allen and Gardner 2000).

4.3.42 A Late upper Palaeolithic shouldered and obliquely truncated flint blade has been identified (**PaMeLa ID 706**) from south of GCZ 6 in Langstone Harbour (**Figure 9**). Its context is uncertain but of the deposits identified in this area, this truncated blade is most likely to be lithostratigraphically associated with these Clays or the underlying Gravelly Clays. Only minerogenic sediments are recorded within the Clays in GCZ 6, with no organic deposits identified.

Alluvium

4.3.43 The Hermitage Stream and several minor parallel water courses flow from north to south across this zone. Deposit records from immediately adjacent to these watercourses (e.g. SU70NW106 and SU70NW106) record alternating silty clay, sandy clay and gravelly units, which are Holocene alluvial sediments belonging to these streams. Most deposits identified in sediment records are minerogenic and have low palaeoenvironmental potential, however, localised peats, with great potential do occur (e g. SU70NW248; see **Figure 9**). The peats are significant in that they may preserve Holocene paleoenvironmental signatures which add to studies of such peats further south in Langstone Harbour (Allen and Gardner 2000; see above).

Made Ground

4.3.44 Significant depths of Made Ground (up to 16.5m thick) are recorded in GCZ 6. A thickness plot (**Figure 20**) demonstrates that Made Ground is concentrated in an area of known landfill around the existing Budds Farm Waste Water Treatment Plan. Transects through the deposits (**Figures 12**–**14**) suggest that, although the upper Quaternary deposits have been truncated and areas of removed material infilled with Made Ground, some of the Made Ground comprises made-up ground built up above the original landsurface. Although at significant depths below ground level, remnants of Quaternary stratigraphy are usually present beneath the Made Ground in these areas.

GCZ 7

4.3.45 GCZ 7 consists of the southern slope of Portsdown Hill (**Figure 21**). No Quaternary deposits above chalk bedrock are recorded in this zone. No deposit records are available. It may be that there are no Quaternary deposits in this zone. However, the topographic position of the zone, the southern edge of Portsdown Hill, is similar to that at the western end of Portsdown Hill where Pleistocene raised beach deposits occur (although are not mapped by the BGS) and where associated Head deposits at Red Barn (similarly not mapped by the BGS) have produced significant Lower Palaeolithic archaeology (Wenban-Smith et al. 2000; see **Section 4.3**). Consequently an absence of Quaternary deposits from GCZ 7 cannot be assumed based on the available evidence.

4.3.46 Two handaxes are recorded provenanced to Portsdown in the TERPS database (**TERPS ID 20964**) with the findspot given being west of GCZ 7. These have broad rather than specific provenance data however and may in fact be from Red Barn.

GCZ 8

4.3.47 GCZ 8 is defined by Portsdown Hill, which comprises an elevated chalk plateau formed from the Portsdown Anticline (**Figure 22**). Broadly northward trending parallel dry valleys occur that dissect the zone. North of GCZ 8, these valleys join the main valley of the

Wallington River. Few deposit records are available for the zone and characterisation is based on a combination of BGS mapping and LiDAR data.

4.3.48 Further south on the southern slopes of Portsdown Hill, and significantly beyond the zone boundary, Pleistocene raised beach sequences and Head deposits, the latter associated with significant Lower Palaeolithic archaeology at Red Barns (Wenban-Smith et al. 2000; see **Section 4.2**), are known to occur. The topography and landscape setting of GCZ 8 indicates that such deposits are unlikely to extend as far north.

4.3.49 LiDAR data has defined the extent of the dry valley systems in GCZ 8 (**Figure 23**). These comprise several broad and sinuous depressions, which correspond closely with dry valley deposits mapped by the BGS. Little information is available regarding the deposits infilling dry valleys in this zone or their archaeological potential. Head is mapped by the BGS and it is likely that material deposited through slope processes during the Pleistocene and/or Holocene have accumulated within these valleys. As the bedrock is chalk, units within these sequences could be calcareous, with the palaeoenvironmental potential to preserve mollusc and vertebrate remains.

4.3.50 LiDAR data shows hollows on highpoints on Portsdown Hill between these valleys and, particularly on the scarp slope of Portsdown Hill to south of the zone and above the valley of Wallington River in the west of the zone (**Figure 23**). These are typically circular and measure between 20-30m in diameter. Whilst some relate to historic chalk pits, many, particularly of the more 'saucer' shaped examples, are likely to be solution features, resulting from dissolution of chalk bedrock (see **Section 4.2**).

4.3.51 Areas of chalk upland where solution features are visible are indicative of locations with wider potential to contain solution features that are fully infilled by sediments and have no visible surface expression. Visible examples are often Holocene, whilst non-visible examples are frequently of Pleistocene date. Solution features are significant, as they can act as potential capture points for Pleistocene and Holocene sediments in chalk landscapes that have been protected from erosion. They may also be focal points for Palaeolithic and later prehistoric activity.

4.3.52 Quaternary deposits that may be present in GCZ 8 are summarised in **Table 11.**

Table 11 Quaternary deposits in GCZ 8

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
8	?Pleistocene deposits within solution features	Unknown	Unknown
	Pleistocene Head / Holocene Colluvium	Unknown	Unknown

4.3.53 Sporadic finds of handaxes from unknown contexts on Portsdown Hill indicate Lower/Middle Palaeolithic activity. Two Palaeolithic handaxes are broadly provenanced to Portsdown Hill (**TERPS ID 20964;** see above for further discussion), whilst a third is recorded from Drift Cottage Drive, Wallington (**Winchester HER ID MPM94**).

4.3.54 A Mesolithic assemblage associated with deposits infilling 'solution pipes' was excavated to the south of GCZ 8 during the construction of the M27 (**Hampshire HER ID 20075 / Winchester HER MPM 91**). Additional evidence for Mesolithic activity on Portsdown Hill in areas around GCZ 8 includes a large Mesolithic lithic assemblage from Walton Heath,

Southwick (**PaMeLa ID 10992**), a lithic assemblage from North Wallington (**Hampshire HER ID 37312**) and Mesolithic artefacts including a late Mesolithic microlith from West of Fort Southwick (**PaMeLa ID 10995 / Winchester HER MPM220**). Notably there are also other Mesolithic findspots from locations on the upper margins of dry valleys **(Figure 22)** where Head is mapped, indicating that such areas were a focus for Mesolithic activity.

GCZ 9

4.3.55 GCZ 9 comprises the upper valley of the Wallington River (**Figure 22**). BGS mapping records Head deposits on the valley margins with Holocene Alluvium confined to a narrow floodplain in the base (BGS GeoIndex). No Pleistocene terrace deposits of the Wallington River are mapped in the upper valley, including within this zone.

4.3.56 Quaternary deposits identified in GCZ 9 are summarised in **Table 12**.

Table 12 Quaternary deposits in GCZ 9

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
9	Pleistocene River Terrace Deposits	0.30–1.80	0.80–3.70
	Pleistocene Head / Holocene Colluvium	0.15–1.60	0.15–3.80
	Holocene Alluvium	0.00–0.50	0.00–1.80

4.3.57 Deposit records available for the zone are limited but do allow further consideration of the Quaternary stratigraphy. **Figure 24** provides a south to north transect across deposits recorded in the valley of the Wallington River at the western end of the zone. This demonstrates that Pleistocene terrace deposits of the Wallington River not mapped by the BGS occur which likely extend into GCZ 9. At least two terraces are present, one with a basal height of c. 17m OD and one between c. 11–10m OD. The latter is overlain by Holocene Alluvium. The terrace deposits recorded consist of sandy gravels. The age of these Pleistocene terraces is unknown. The sandy gravels recorded have low palaeoenvironmental potential but finer grained and/or organic sediments with greater potential could occur elsewhere. No Palaeolithic archaeology attributable to these terrace deposits has been identified.

4.3.58 Slope deposits, as shown in **Figure 24,** are recorded in on the upper slopes of the valley. These are recorded as clays with occasional gravelly units. They likely reflect downslope reworking of the underlying Palaeogene bedrock. They could include Pleistocene Head and/or Holocene colluvium. These sediments are unlikely to be calcareous and therefore preserve paleoenvironmental data. No archaeology related to these Head deposits has been noted.

4.3.59 The Holocene Alluvium recorded in deposit records in this zone consisted of minerogenic silts and clays. Mesolithic flakes and cores have been recovered at a location on the edge of a low river terrace of the Wallington River, just above where the BGS map Holocene Alluvium (**Hampshire HER ID 20202** / **20134**; **Figure 22**). This may be indicative of Mesolithic activity on the surface of a low Pleistocene terrace at the edge of the Holocene floodplain.

GCZ 10

4.3.60 GCZ 10 overlooks the northern edge of the Wallington Valley (**Figure 22**). BGS mapping and deposit records suggest that Quaternary deposits are unlikely to be present in this zone.

GCZ 11

4.3.61 GCZ 11 is the distal end of a side valley which joins the Wallington River Valley in GCZ 9 (**Figure 22**). It is defined through BGS mapping and LiDAR data. The BGS maps Head within this valley. Whilst there are no available deposit records located within the zone itself a BGS borehole record from north of the zone (SU60NW184) records 0.90m of gravelly clay over 0.30m of sandy gravel above bedrock in the valley base. This sequence is indicative of a period of high energy alluvial deposition (sandy gravel) immediately after a phase of erosion that created the current valley form, with overlying slope deposits (gravelly clay) formed through the reworking Palaeogene bedrock from the valley sides. Although no chronology is available, this sequence is suggestive of fluvial discharge post-dating the late Pleistocene Last Glacial Maximum (31–16 Kya), with late Pleistocene and Holocene slope deposits subsequently deposited on the valley sides.

4.3.62 These deposits have low palaeoenvironmental potential. North of GCZ 11 a Mesolithic lithic findspot is recorded from the margin of the dry valley, on the edge of the mapped extent of Head deposits (**Winchester HER ID MWC844**).

GCZ 12

4.3.63 GCZ 12 comprises the continuation of the valley of the Wallington River downstream of GCZ 9 (**Figure 25**). Here the valley is incised through the western end of the chalk forming the Portsdown Anticline. Quaternary deposits present in GCZ 12 are summarised in **Table 13**.

Table 13 Quaternary deposits in GCZ 12

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
12	Pleistocene River Terrace Deposits	0.05–2.00	0.05–5.30
	? Pleistocene and/or Holocene deposits within solution features	Unknown	Unknown
	Pleistocene Head / Holocene Colluvium	0.20–1.50	0.20–3.25
	Holocene Alluvium	0.35–0.40	0.40–2.00

4.3.64 The BGS maps terraces numbered 1, 2, 4, 6 and 7 within GCZ 12.

4.3.65 **Figure 26** utilises available deposit records to provide a west-east transect across GCZ 12 and the Wallington Valley. This data is too sparse to model the terrace sequence present but does support the BGS mapping, with multiple Pleistocene terraces being present. The Palaeolithic archaeological potential of these terraces is currently unknown, with few artefact findspots associated with the terraces of the Wallington River (Wessex Archaeology and Wymer 2009). Two Palaeolithic artefacts are recorded from the Study Area (**Figure 25**). One is a Palaeolithic handaxe from Roche Court (**TERPS ID 20689 / Hampshire HER ID 63878**). Its context is unknown but is likely from Pleistocene River Terrace Deposits of the Wallington River (although none are mapped at this location by the BGS) or Head Deposits. The second is Palaeolithic findspot Furzehall Farm, Wickham Road (**Winchester HER ID MPM103**), where undifferentiated terrace deposits of the Wallington River are mapped by the BGS.

4.3.66 The terrace deposits in these records comprised a basal fluvial chalk and flint gravel over chalk bedrock, with an upper fluvial gravel dominated by flint clasts. Some finer grained units comprising silty clays are recorded.

4.3.67 Along the upper valley margins Pleistocene Head and/or Holocene Colluvium deposits are recorded (**Figure 26**). These comprised sandy clays with occasional flint clasts. They are likely to mostly comprise deposits mobilised down slope. LiDAR data has also recorded many potential solution features at the western end of Ports Down Hill both west and east of the Wallington Valley (**Figure 27**).

4.3.68 The LiDAR data defines the approximate width of the Holocene alluvial corridor and suggests that it may be slightly wider than is recorded by BGS mapping, measuring between 180 and 250 m wide. In addition, a small number of sinuous and linear depressions are also apparent, which are likely indicative of palaeochannels (**Figure 26**). Such features are considered prime contexts for archaeology and deposits with palaeoenvironmental material (see **section 4.2**).

4.3.69 Two deposit records containing Holocene alluvium are available. In both, the Holocene sediments overlay Pleistocene River Terrace deposits. The Holocene deposits were minerogenic with low palaeoenvironmental potential. However, given the small dataset, the Holocene alluvium could contain units with greater potential, particularly in those areas where LiDAR data indicates palaeochannels. There is evidence for Mesolithic activity on the edge of the edge of the Holocene floodplain of the Wallington River (**Hampshire HER ID 20202** / **20134**) (see section on GCZ 9 above).

GCZ 13

4.3.70 GCZ 13 is the interfluve between the valleys of the Wallington River and Meon (**Figure 25**), with bedrock comprising Palaeogene sediments of the Hampshire Basin. The BGS maps no Quaternary deposits in this zone, but no deposit records are available to further assess this. It is likely that Quaternary deposits are absent from much of this zone, although there is a possibility that isolated outcrops of high-level terraces of the Wallington River (in the west) and/or Meon (in the east) locally occur.

GCZ 14

4.3.71 GCZ 14 is the southern continuation of the interfluve between the valleys of the Wallington River and Meon (**Figure 25**). The bedrock in this zone differs to that further north in GCZ 13, being chalk of the Portsdown Anticline, overlain in places by Palaeogene deposits. The available data (principally topographic and BGS mapping, augmented by limited deposit records) suggests that laterally extensive and/or thick sequences of Quaternary deposits are unlikely to be present above bedrock. However, the LiDAR data shows several saucer-shaped depressions occur which are indicative of the presence of solution features (**Figure 27**) that could locally preserve Pleistocene and/or Holocene sediments.

GCZ 15

4.3.72 GCZ 15 comprises the valley of River Meon (**Figure 28**). The valley is incised through Palaeogene bedrock at the western end of the Portsdown Anticline. The Quaternary deposits present in GCZ 15 are summarised in **Table 14**.

Table 14 Quaternary deposits in GCZ 15

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
15	Pleistocene River Terrace Deposits	0.05	0.05–4.50
	Pleistocene Head / Holocene Colluvium	0.25–0.49	0.30–1.70
	Holocene Alluvium	0.25	0.25–3.50

4.3.73 The BGS maps laterally extensive spreads of Pleistocene River Terraces of the River Meon across the zone, with terraces numbered 1, 2, 4, 6 and 7 recorded. This suggests an extensive sequence of Pleistocene river terraces of different dates. Deposit records across these mapped terraces are sparse (**Figure 27**). **Figure 29** provides a transect through selected available data points. Although this does not allow the different Pleistocene terraces to be assessed in detail, it does demonstrate that terraces with basal heights ranging from 39m to 15m OD are present, which supports the suggestion that a significant number of terraces of different at different heights are present. The lack of investigation and information on the Pleistocene River Terrace Deposits is reflected by known archaeological records, with few known Palaeolithic artefact findspots from the Meon Valley (Wessex Archaeology and Wymer 2009) and none from the Study Area.

4.3.74 Deposits records document Pleistocene Head and/or Holocene Colluvium on upper slopes of the Meon Valley in GCZ 15 (**Figure 30)**. On the south side of the valley these comprise gravelly clays containing chalk and flint clasts, whilst to the north they comprise silty clays with some units containing flint gravels. The presence of chalk clasts to the south and lack to the north reflects the change from Cretaceous chalk bedrock of the Portsdown Anticline to Palaeogene deposits of the Hampshire Basin. These are slope deposits which have reworked sediments from the bedrock and earlier terrace deposits. The chalky Head deposits to the south of the Meon may be calcareous and could have potential for preserving palaeoenvironmental evidence, such as molluscs and vertebrates. Those to the north containing reworked Palaeogene deposits are unlikely be calcareous or preserve significant palaeoenvironmental evidence.

4.3.75 BGS mapping and LiDAR data suggests that, as with the Wallington River, Holocene alluvium is restricted to a narrow corridor in the base of the Meon Valley with very few possible palaeochannels (**Figure 31**). However, there are a small number of narrow sinuous linear depressions that may be associated with former course of the River Meon, which may have potential to preserve archaeology and palaeoenvironmental data. There are no archaeological findspots in the Study Area associated with this Holocene Alluvium.

GCZ 16

4.3.76 GCZ 16 is the interfluve which separates the Meon Valley from a dry valley in GCZ 15 (**Figure 32**). Geological mapping (BGS GeoIndex) suggests that Palaeogene bedrock outcrops near the surface and that it is unlikely that significant sequences of Quaternary deposits will be present.

GCZs 17a and 17b

4.3.77 GCZs 17a and 17b comprise the heads of dry valleys which to the west of the zone develop into an east bank tributary of the River Hamble (**Figure 32**). No deposit records are available to characterise the Quaternary deposits infilling these valleys. The BGS maps Head deposits, and these could include Pleistocene slope deposits and/or Holocene colluvium. The bedrock in this zone is Paleogene sands, silts and clays which implies that any slope deposits are unlikely to be calcareous.

4.3.78 LiDAR data records a narrower channel-like feature at the centre of the mapped Head deposits in GCZ 17b, which lead towards a stream draining into the River Hamble to the west (**Figure 33**). This may contain localised Holocene alluvial sediments.

4.3.79 No archaeological material attributable to the Quaternary stratigraphy in these zones have been identified.

GCZ 18

4.3.80 GCZ 18 is the interfluve between tributary valleys of the River Hamble (**Figure 32**). Although the zone lacks deposit records, BGS geological mapping (BGS GeoIndex) and LiDAR data suggests that these highpoints are unlikely to have significant Quaternary sediments above the Palaeogene bedrock.

GCZ 19

4.3.81 GCZ 19 includes the head of two valleys which converge west of the zone to form a valley containing Kitnocks Gully, an east bank tributary of the River Hamble (**Figure 32**). No deposit records are viable for GCZ 19. The BGS (BGS GeoIndex) maps Head, likely to be Pleistocene and/or Holocene slope deposits, and Holocene Alluvium. The latter occurs in narrow corridors in the base of the two valleys, potentially related to narrow depressions visible in the LiDAR data (**Figure 33**).

4.3.82 A large Mesolithic lithic assemblage from Shedfield (**PaMeLa ID 11170; Figure 32**) is located south of GCZ 13 at the head of a side valley leading to Kitnocks Gully. This suggests that the heads of dry valleys, such as those in GCZ 13, are focal points for Mesolithic activity.

GCZ 20

4.3.83 GCZ 20 includes the interfluves between the two spur valleys of Kitnocks Gully and the valley of the River Hamble (**Figure 32**). Based on BGS and topographic mapping, combined with LiDAR data, there is a low likelihood for significant Quaternary deposits to be present above the Palaeogene bedrock in this zone.

GCZ 21

4.3.84 GCZ 21 covers the valley of the River Hamble (**Figure 34**). The zone lacks deposits records. The BGS maps a sequence of Pleistocene River terraces in the zone; due to the lack of deposit records the distribution of these terrace deposits may be more extensive than recorded. Most numbered terrace outcrops in this area are ascribed by the BGS to Terrace 3, with undifferentiated terrace outcrops occurring at higher elevations. Head deposits are mapped at lower elevations in the valley. These overlie River Terrace Deposits.

4.3.85 The data demonstrates that a Pleistocene terrace sequence containing terraces of different ages are likely to be present in the zone but details on these terraces and associated Head Deposits, including their sediments, stratigraphy and age is unknown.

4.3.86 Holocene Alluvium is mapped by the BGS in a narrow corridor along the valley base and in several minor tributary valleys which join the Hamble in this area. As with the Pleistocene deposits no data is available for characterising these alluvial deposits or assessing their palaeoenvironmental potential. Few palaeochannels are visible within the LiDAR data covering this area (**Figure 35**). Residual finds of lithic material from excavations at the Bishop's Place in Bishop's Walton, upstream of GCZ 21 (**Winchester HER ID MWC645**), demonstrate Mesolithic activity on the edge of the Holocene Alluvium.

GCZs 22a and 22b

4.3.87 Zones 22a and 22b contain a minor side valley, which in GCZ 22b joins the upper reaches of the River Hamble (**Figure 34**). No deposit records are available for these zones. The BGS maps Holocene Alluvium in the side valley. No previous archaeological finds likely to be associated with these deposits have been identified.

GCZ 23

4.3.88 GCZ 23 comprises a wide interfluve which separates the valley of the River Hamble from the Bow Lake Stream, an Itchen tributary (**Figure 36**). LiDAR data records few topographic features in the zone, aside from narrow gullies located on the periphery of the high ground (**Figure 37**). Topographic (LiDAR) and geological (BGS GeoIndex) data suggest significant sequences of Quaternary deposits are unlikely to be present. This is supported by limited deposit records, which record topsoil over Palaeogene bedrock.

GCZ 24

4.3.89 GCZ 24 comprises the valley of the Bow Lake Stream (**Figure 36**). BGS mapping records Head and Holocene Alluvium (BGS GeoIndex). Further upstream, east of GCZ 23, BGS mapping includes undifferentiated Pleistocene River Terrace Deposits. Available deposit records for the area indicates that Bow Lake Stream does not possess such terraces. LiDAR data (**Figure 37**) suggests that the Holocene alluvial corridor is likely broader than has been recorded by BGS mapping.

4.3.90 The Quaternary deposits present in GCZ 24 are summarised in **Table 15**.

Table 15 Quaternary deposits in GCZ 24

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
24	Pleistocene Head / Holocene Colluvium	0.30–0.70	0.70–2.40
	Holocene Alluvium	0.20–0.30	0.20–2.75

4.3.91 **Figure 38** provides a transect through deposit records relating to this zone. Slope deposits are present on the upper edges of valley, above bedrock, with Holocene Alluvium above bedrock in the valley base.

4.3.92 The slope deposits comprise sandy clays with occasional angular flint clasts. Given the lack of evidence for other Pleistocene sediments in this valley and the fact that Holocene alluvium overlies bedrock, rather than any Pleistocene Head, there is a strong possibility that these sediments are Holocene Colluvium.

4.3.93 The Holocene Alluvium recorded consists of bedded slightly sandy gravelly clays, sandy clays and clays with silt partings. Reworked organic clays were occasionally noted. These minerogenic alluvial sediments have low palaeoenvironmental potential but sediments with greater potential, such as peat, could locally occur, as potentially indicated by the reworked organic material. In the LiDAR data, several palaeochannels are visible on the southern side of the alluvial corridor (**Figure 37**).

4.3.94 A large lithic assemblage including blades and a Mesolithic tranchet axe is recorded from Holocene Alluvium of the Bow Lake Stream at Stoke Common, Bishopstoke, southwest of GCZ 17 (**PaMeLa ID 10976; Figure 34**).

GCZ 25

4.3.95 GCZ 25 covers the interfluve between the valleys of the Bow Lake Stream and River Itchen (**Figure 34**). There are no deposit records from this zone. BGS geological mapping indicates a lack of Quaternary sediments above Palaeogene bedrock. LiDAR data does however show sinuous linear depressions trending southwards towards Bow Lake Stream, which may indicate shallow dry valleys containing Holocene colluvium (**Figure 37**). A

Palaeolithic findspot is recorded within similar landscape context north of GCZ 25, south of the Woodland Centre (**Winchester HER ID MWC1256**). The nature and context of this discovery is uncertain. Neolithic archaeology was also recovered.

GCZ 26

4.3.96 GCZ 26 is the valley of the River Itchen (**Figure 39**). The underlying bedrock geology is principally Palaeogene sediments, with a transition to the chalk of the South Downs at the northern limit of the zone. Quaternary deposits present in GCZ 26 are summarised in **Table 16**.

Table 16 Quaternary deposits in GCZ 26

GCZ	Quaternary deposits	Depth of surface (m bgl)	Depth range (m bgl)
26	Pleistocene River Terrace Deposits	0.30–2.59	0.40–5.94*
	Pleistocene Head	0.20–0.40	0.20–1.40
	Holocene Alluvium	0.00–0.40	0.14–2.59

*NB SU2SE33/A is excluded – see below

4.3.97 According to BGS mapping, the zone crosses Terrace 1 to 3 of the Itchen. **Figures 40**–**42** provide transects through the available deposit records. These support the BGS mapping, with three terraces at three different basal hights record, 10–12m OD, 15–18m OD and c. 20m OD. This suggest at least three terraces dating to different periods of the Pleistocene are present in this zone. The quality of deposit records and information on the sediments within these terraces is variable, with most records recording sandy gravel. Other units identified comprise gravelly sandy clays and gravelly silty clays.

4.3.98 One anomalously thick sequence comprising 24m of sands and gravels (SU2SE33/A) is recorded with a basal depth of -6.46m OD. Pleistocene fluvial incision to such depths in this area is unlikely and these may not be Pleistocene Terrace Deposits, although the presence of a deeply incised channel cannot be entirely excluded.

4.3.99 The Pleistocene River Terraces in this area have known, if poorly understood, Palaeolithic archaeological potential. A gravel pit quarrying deposits mapped as Terrace 3 of the Itchen has produced at least 65 handaxes and a Middle Palaeolithic Levallois flake (**TERPS ID 20275**) (see **Section 4.2**). This pit was immediately to the northeast of GCZ 23, with the same Terrace deposits extending south into and across the zone (**Figure 39**). A further Palaeolithic findspot from Terrace 3 is a handaxe from Brambridge Farm (**Winchester HER ID MWC107**). Additionally a Palaeolithic handaxe and two Middle Palaeolithic Levallois flakes are recorded from a gravel pit at Highbridge (**TERPS ID 20281**), which quarried deposits recorded as Terrace 1.

4.3.100 Head is recorded overlying the higher terraces. These sediments comprised slightly gravelly sandy clay containing sub-angular to sub-rounded flint clasts. These are similar to Pleistocene Head-Brickearth deposits which overlie the terraces of the River Test further to the west in the Hampshire Basin. These may be slope deposits, but they could include finer alluvial sediments relating to the top of terrace sequences and possibly aeolian material or aeolian sediments reworked through slope processes.

4.3.101 A wide Holocene floodplain containing alluvial deposits is recorded in the centre of the valley. The associated sediments recorded in deposit records are generally minerogenic, but peats are present (e.g. SE42SE34). Additionally, in the north of the zone, tufa within the Holocene alluvium is recorded (e.g. SU2SE74). Tufa will only occur in the north of GCZ 26

where the immediately underlying bedrock is chalk. Evidence for Mesolithic activity within the Holocene floodplain is provided by a findspot recorded in the centre of the floodplain at Rosemary Leet (**Winchester HER ID MWC3878**) north of GCZ 26.

4.3.102 The LiDAR data in GCZ 26 clearly delineates the Holocene alluvial corridor (**Figure 43**). Within this, there are a small number of depressions that may be associated with palaeochannels, but there are likely further examples that are not expressed topographically. This is primarily due to extensive historic water meadow features and contemporary drainage channels, which cover much of the floodplain in this area.

4.3.103 Towards the north of GCZ 26, west of Twyford Moor, there are extensive dendritic positive topographic features visible in the LiDAR data, which may be associated with former channels. The upstanding nature of their topography could indicate that these relate to 'Roddons', dried raised beds of former watercourses typically associated with river or tidal creeks. Given that there is also extensive evidence for modern drainage, it is possible that this has caused the former channels to become positive topographical features, but further investigation would be required to fully understand and establish what these features are, and their potential to preserve palaeoenvironmental evidence.

GCZ 27

4.3.104 GCZ 27 is located at the edge of the South Downs in an elevated position on chalk bedrock above the Itchen Valley (**Figure 39**). No deposit records are available for this zone and assessment of the Quaternary deposits present is reliant on BGS mapping (BGS GeoIndex). This mapping records Clay-with-Flints and Head, with Pleistocene terrace deposits of the Itchen to the south.

4.3.105 Terrace deposits (mapped by the BGS as Terrace 1) could occur in the south of the zone. The Clay-with-Flints suggests uneroded chalk landscapes where capture points for Pleistocene and Holocene sediments (e.g. solution features) could occur (see **Section 4.3**). No information is available on the depositional processes associated with Head mapped in this zone. They are most likely slope deposits but could be Pleistocene and/or Holocene in date.

4.3.106 No relevant archaeological findspots have been identified in this zone.

GCZ 28

4.3.107 GCZ 28 is at the western end of the Project and is defined by high ground west of the Itchen Valley (**Figure 38**). No deposit records are available for the zone, but the BGS mapping indicates Palaeogene bedrock outcropping close to the bedrock. It is unlikely that extensive Quaternary deposits are present in this zone.

5 ASSESSMENT OF GEOARCHAEOLOGICAL POTENTIAL AND SIGNIFICANCE

5.1 Assessment Criteria

5.1.0 A Geoarchaeological Landscape Characterisation (GLC) has revealed a range of Quaternary deposits within the Assessment Area, dividing it into 28 Geoarchaeological Characterisation Zones (GCZs) based on variations in the Quaternary deposits. The known archaeological resource associated with these deposits, including evidence indicative of their palaeoenvironmental potential, has been assessed. The data allows baseline assessment of the geoarchaeological potential of Quaternary deposits identified in each GCZ, and consideration of the significance of any such evidence in relation to national and regional research themes and priorities.

5.1.1 It should be noted that this is a geoarchaeological assessment of potential relating specifically to any archaeological and palaeoenvironmental evidence that may be present *within* Quaternary deposits. It does not consider the potential for archaeology (features, layers etc.) that may occur immediately beneath modern soil sequences cut into or overlying Quaternary sediments or bedrock. This is assessed in a separate Archaeological Desk-based Assessment (ADBA).

5.1.2 An archaeological 'potential' rating and a separate indicator of potential for palaeoenvironmental evidence is assigned to Quaternary deposits in each GCZ, representing a measure of probability. This has been determined via the application of professional judgement, informed by the evidence from the Assessment Area itself and equivalent deposits in the surrounding area. 'Potential' is expressed on a four-point scale, assigned in accordance with the following criteria:

- **High** Situations where evidence is known or strongly suspected to be present within deposits and which are likely to be well preserved.
- **Moderate** Includes cases where there are grounds for believing that evidence may be present, but for which conclusive evidence is not currently available.
- **Low** Circumstances where the available information indicates that evidence is unlikely to be present, or that their state of preservation is liable to be severely compromised.
- **Unknown** Cases where currently available information does not provide sufficient evidence on which to provide an informed assessment with regard to the potential for material to be present.

5.1.3 The relative '*Significance'* of known and potential archaeological evidence associated with the Quaternary deposits has been considered in accordance with the criteria set out in **Table 17.** These criteria are related to national (e.g. EH 2008) and regional (Hey and Hind 2013, SERF) research themes and priorities.

Table 17 Generic schema for classifying the significance of archaeological assets (based on HE 2015)

Significance	Categories
Very High	World Heritage Sites (including nominated sites) Assets of recognised international importance Assets that contribute to international research objectives
High	Scheduled Monuments Non-designated assets of national importance Assets that contribute to national research agendas
Moderate	Assets that contribute to regional research objectives
Low	Assets compromised by poor preservation and/or poor contextual associations Assets with importance to local interest groups
Negligible	Little or no archaeological or geoarchaeological interest
Unknown	The importance of the asset has not been ascertained from available evidence

5.2 GCZs 1a and 1b

5.2.1 Quaternary deposits with archaeological potential are unlikely to be present in GCZs 1a and 1b.

5.3 GCZ 2

5.3.1 Quaternary deposits in this zone consist of slope deposits in a north bank valley of the Hermitage Stream. These deposits reflect the mobilisation and reworking of sediments downslope during unknown periods of the Pleistocene and/or Holocene. No archaeology directly associated with these sediments has been identified. There are indications of Mesolithic activity in valley side locations in the wider area which may be related to these deposits, however, there is currently insufficient evidence to establish archaeological potential.

5.3.2 Both Pleistocene and Holocene slope deposits have archaeological potential. Pleistocene slope deposits can contain archaeology reworked downslope within the sediment load. Such material is indicative of Palaeolithic human presence within the wider landscape and may indicate the presence of less disturbed material in upslope locations. These slope deposits can also contain and bury stable horizons and landsurfaces (including buried soils) containing minimally disturbed/in situ Palaeolithic archaeology. Similarly, Holocene slope deposits (colluvium) can contain reworked archaeology of multiple periods, which may be indicative of archaeological activity within the local landscape. It can also bury surfaces (including buried soils) associated with archaeological layers and/or features.

5.3.3 The significance of archaeology within slope deposits varies in relation to these specific depositional contexts and taphonomic histories, with buried minimally disturbed material being of greater significance than reworked archaeology. Additionally, as Palaeolithic archaeology is rare in comparison to archaeology of later periods, reworked Palaeolithic archaeology in slope deposits is generally of greater significance in terms of regional settlement history.

5.3.4 The Pleistocene Head/Holocene Colluvium in this zone has been assessed as unlikely to be calcareous and is therefore considered have low potential to preserve palaeoenvironmental evidence. Any buried soils within such sequences would have greater potential, however.

5.3.5 The assessed archaeological potential of the Quaternary deposits in GCZ 2 is summarised in **Table 18**.

Table 18 Archaeological potential of Quaternary deposits in GCZ 2

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
2	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate

5.4 GCZ 3

5.4.1 GCZ 3 is a valley containing a minor watercourse that forms a north bank tributary of the Hermitage Stream. No information is available regarding the deposits in this zone or any

associated archaeology, but any deposits present are likely to be similar to those in GCZ 2, enabling a similar assessment of their potential to be provided (**Table 19**).

Table 19 Archaeological potential of Quaternary deposits in GCZ 3

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
3	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate

5.5 GCZ 4a and 4b

5.5.1 The limited number of deposit records for this zone indicate that Holocene Alluvium is present in the base of the valley of the Hermitage Stream, possibly with Pleistocene/Holocene slope deposits on the valley sides. The assessed archaeological potential of these deposits is summarised in **Table 20**.

Table 20 Archaeological potential of Quaternary deposits in GCZ 4a and 4b

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
4a-b	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	Unknown

5.5.2 Any slope deposits present are likely to be similar to that in spur valleys in GCZs 2 and 3. Whilst these may have potential to contain archaeology, there is currently no clear evidence to demonstrate the presence of such deposits or their archaeological potential and an unknown rating has been assigned. As is in zones 2 and 3 palaeoenvironmental potential of any such deposits is likely to be low.

5.5.3 The Holocene Alluvium recorded in these zones is minerogenic. No archaeology is attributable to this alluvium, but the deposits have not undergone significant previous investigation and their potential is considered to be unknown. The minerogenic alluvial sediments recorded have low palaeoenvironmental potential. Whilst there is no evidence of deposits such as peats which would have greater potential, the number of deposit records is not sufficient to establish absence, resulting in an unknown potential rating.

5.6 GCZ 5a, 5b and 5c

5.6.1 The Quaternary deposits in GCZs 5a-c are dominated by Pleistocene Raised Beach Deposits. These are not mapped by the BGS and have been subject to little previous investigation. The elevation of the deposits indicate they belong to the western end of the Brighton-Norton Beach of the Sussex-Hampshire Lower Coastal Plain, dating to late MIS 7.

5.6.2 No archaeology was identified attributable to these deposit, which may at least partly reflect a lack of investigation. Few Palaeolithic artefacts are recorded from the Brighton-Norton Beach across the coastal plain (see **section 4.3**), but they date to late MIS 7, a period when late Middle Palaeolithic archaeology could be expected in the region. A consistent sequence of finer grained sandy clays overlain by gravels are recorded in deposit records of raised beach sediments in GCZs 5a-c. This may reflect marine transgression over time, with a lower set of brackish water estuarine sediments. Such estuarine locations would have been suitable for Palaeolithic occupation. The specific depositional environments represented by these sediments require investigating (detailed lithostratigraphy and assessment for microfossils indicative of environmental conditions).

5.6.3 Based on this assessment the archaeological potential of the Raised Beach deposits has been assessed as moderate and significance as high (**Table 21**). Additionally as finer-grained units with the Raised Beach Deposits in these zones may preserve palaeoenvironmental evidence (e.g. ostracods, foraminifera, and pollen), they have been assigned moderate palaeoenvironmental potential. These finer-grained sandy units would also be suitable for luminescence dating.

5.6.4 The Raised Beach Deposits in these zones are uniformly overlain by Head consisting of sediments that have been reworked downslope over the top of the Raised Beach. These deposits may reflect active processes that deposited material during several, principally cold, periods of the Pleistocene from late MIS 7 onwards.

5.6.5 Although no artefacts likely to relate to these specific Head Deposits have been identified, Head overlying raised beach sequences in the Sussex-Hampshire region can include both minimally disturbed, contemporary and Palaeolithic artefacts (for example at Red Barns and Boxgrove, Amey's Eartham Pit; see **section 4.3**) and are therefore considered to have moderate archaeological potential (**Table 22**). Significance ratings ranging from moderate to high have been assigned, dependent on whether the material is reworked or contemporary. The lithological descriptions of the Head Deposits in deposit records indicates that they are likely to be decalcified and have low palaeoenvironmental potential.

Table 21 Archaeological potential of Quaternary deposits in GCZ 5a, 5b and 5c

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
5a-c	Pleistocene Raised Beach Deposits	Moderate	High	Moderate
	Pleistocene Head Deposits	Moderate	Moderate	Low
	Stable surfaces within/beneath Head Deposits	Moderate	High	Low

5.7 GCZ 6

5.7.1 GCZ 6 contains a thick sequence of previously unrecognised Quaternary sediments. The basal units (Chalky Silts and Gravels) are with a basin formed in chalk bedrock of the eroded Portsdown Anticline. The upper units of this stratigraphy have been impacted on by previous development impacts in places. The assessed archaeological potential of the range of Quaternary deposits identified is summarised in **Table 22** and discussed below.

Table 22 Archaeological potential of Quaternary deposits in GCZ 6

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
6	Chalky Silts and Gravels / Possible Chalky Silts and Gravel	Unknown	Unknown	High
	Gravels	Unknown	?Low	?Low
	Gravelly Clays	Unknown	Moderate-High	Uncertain
	Clays	Moderate	Moderate-High	Moderate
	Alluvium	Unknown	Unknown	Low (minerogenic sediments) High (localised peats)

Chalky Silts and Gravels / Possible Chalky Silts and Gravels

5.7.2 The earliest deposits above bedrock comprise chalky silts and gravels. Similar deposits have been identified to the east of the Assessment Area from Warblington to Chichester Harbour but are not well known or extensively studied. The sediments have been previously interpreted as Pleistocene cold stage freshwater deposits (Bates et al. 2009; 2010) associated with an area of impeded drainage. The deposits in GCZ 6 demonstrate that such deposits occur west of Warblington, at least as far as Havant.

5.7.3 These deposits have only been investigated in any detail at Warblington (Bates et al. 2009; 2010) where the upper units have been dated to MIS 3. The Warblington sediments contained well preserved and numerous microfossils. This is demonstrative of the high palaeoenvironmental potential of the Chalky Silts and Gravels in GCZ 6.

5.7.4 At Warblington the Pleistocene cold stage freshwater deposits overlie the Pagham Raised Beach. In contrast the deposits in GCZ 6 occur beneath a gravel that may belong to the Pagham Raised Beach. This may indicate that the GCZ 6 sediments date to earlier in the Pleistocene than MIS 3, with an MIS 6 cold stage date a possibility. No MIS 6 deposits of this date have previously been identified in the region but could be expected to occur. No archaeology is currently known from these deposits in GCZ 6, but this likely at least partially reflects investigation solely through boreholes. The archaeological potential of these sediments is therefore unknown, whilst significance would depend on the taphonomic histories of any contained archaeology, and their degree of contemporaneity with the sediments.

Gravels

5.7.5 Flint rich gravels and gravelly sands overlie the Chalky Silts and Gravels. Based on limited lithological descriptions, these are tentatively interpreted as marine gravels, whilst their heights may be consistent with belonging to the Pagham Raised Beach of the Sussex-Hampshire Lower Coastal Plain (although their basal heights are lower than the Pagham beach to the east at Warblington).

5.7.6 No archaeology is known from the Gravels, but they have not previously been identified or investigated. Consequently their archaeological potential is assessed as unknown. The lithological descriptions in deposit records are consistently indicative of a high energy environment (coarse sands and gravels). Any archaeology within such deposits would likely, therefore, be extensively reworked, possibly over large distances and/or from earlier deposits, which would limit significance. Similarly, such high energy marine gravels have low potential for palaeoenvironmental data. Finer-grained sediments within the Gravels would have greater potential to contain contemporary, less disturbed and more significant archaeology and palaeoenvironmental evidence. Although no such finer-grained deposits were noted in deposit records, their presence cannot be entirely excluded. This uncertainty is reflected in **Table 22**.

Gravelly Clays

5.7.7 Sediments comprising minerogenic gravelly clays post-date the Gravels. The available information is insufficient to assess mode of deposition and their age is similarly uncertain. They may be Pleistocene Head Deposits. The archaeological potential of these deposits is unknown, although a late Upper Palaeolithic shouldered point from the south of the zone could be associated with their upper units or the overlying Clays (see below). Their palaeoenvironmental potential is similarly uncertain.

Clays

5.7.8 The youngest Quaternary deposit widely distributed across the zone comprise silty and sandy clays interpreted as Holocene alluvial sediments formed in Langstone Harbour. Evidence indicates that these have archaeological potential.

5.7.9 A Late Upper Palaeolithic shouldered and obliquely truncated flint blade is recorded from the south of GCZ 6, indicative of late Pleistocene activity. Although the specific context of this artefact is unknown, it is most likely to be broadly associated with these Clays or the top of the underlying Gravelly Clays. Holocene alluvial deposits further south in Langstone Harbor have been shown to reflect sea-level rise through the 9th–4th millennia BC (Allen and Gardner 2000). This indicates potential for terrestrial landscapes associated with prehistoric archaeology from the Mesolithic through to later Bronze Age periods.

5.7.10 Previous investigations have demonstrated that Holocene Peats with significant palaeoenvironmental potential occur within Langstone Harbour. No organic deposits associated with the Clays have been identified, although localised occurrences cannot be ruled out, whilst they may contain microfossils (diatoms, ostracods and foraminifera) indictive of changing freshwater, brackish water and marine environments during the Holocene.

5.7.11 The archaeological potential of Clays has been assessed as moderate, with the possibility of moderately to highly significant archaeology. Palaeoenvironmental potential has been defined as moderate.

Alluvium

5.7.12 Localised occurrences of Holocene Alluvium of the Hermitage Stream and several minor parallel watercourses occur within this zone. The lithological and archaeological evidence is insufficient to assess the archaeological potential of these deposits, but such alluvial sediments could seal archaeological layers and features. Localised peats have been identified in deposit records. These have potential contain palaeoenvironmental and dating evidence relatable to previous studies of the Holocene landscape history of Langstone

Harbour (Allen and Garner 2000). The paleoenvironmental potential ratings have been assessed as low for the minerogenic component and high for peats.

5.8 GCZ 7

There is insufficient evidence with which to establish whether Quaternary deposits are present in this zone and, consequently, no assessment of archaeological potential is provided. It may be that no Quaternary deposits are present. However, it is possible that Raised Beach Deposits and Head with significant Lower Palaeolithic archaeological potential could occur.

5.9 GCZ 8

5.9.1 Two topographic features associated with Quaternary features have been identified in GCZ 8, solution features within the chalk bedrock on Portsdown Hill and dry valleys draining the Hill to the Wallington River to the north. The archaeological potential of Quaternary deposits within these contexts is summarised in **Table 23**.

Table 23 Archaeological potential of Quaternary deposits in GCZ 8

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
8	Pleistocene / Holocene sediments within solution features	Moderate	Moderate-High	Moderate
	Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Moderate
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate-High	Moderate

5.9.2 Solutions features with topographic expression have been identified in LiDAR data. It is likely that other solution features without visible surface expression also occur in these areas of active chalk dissolution. Solution features can contain Pleistocene and Holocene sediments, along with associated archaeology. Potential for archaeology within solution features on Portsdown Hill is documented by Mesolithic material excavated during the construction of the M27 (**Hampshire HER ID 20075 / Winchester HER MPM 91**), whilst sporadic Palaeolithic handaxe finds from Portsdown Hill could indicate Lower/Middle Palaeolithic activity associated with these features.

5.9.3 Archaeological potential and has therefore been assessed as moderate and, as such material is unlikely to be extensively reworked, with significance as moderate-high. The palaeoenvironmental potential of the deposits within solution features is dependent on their specific mode of deposition. Colluvial deposits in these chalk landscapes within solution features can be calcareous and preserve molluscs and vertebrates, whilst buried soils within these capture points can preserve pollen. A moderate palaeoenvironmental potential has therefore been assigned.

5.9.4 The dry valleys are mapped by the BGS as containing Head. These deposits likely comprise slope deposits of Pleistocene and/or Holocene date. Some indication of archaeological

potential is indicated by occurrences of Mesolithic finds, including large lithic assemblages, on the upper valley margins. These are likely associated with slope deposits on the valley margins. These deposits may be associated with stable land surfaces or deflated land surfaces reflecting Mesolithic activity at the findspot, as well as reworking material from upslope. Moderate archaeological potential is therefore implied, with significance dependent on context (i.e. reworked or minimally disturbed). These slope deposits may also be calcareous and therefore palaeoenvironmental potential has been assessed as moderate.

5.10 GCZ 9

5.10.1 This zone contains Pleistocene River Terrace Deposits and Holocene Alluvium of the Wallington River, with Pleistocene Head on the valley sides. The assessed archaeological potential of these deposits is outlined in **Table 24**.

Table 24 Archaeological potential of Quaternary deposits in GCZ 9

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
9	Pleistocene River Terrace Deposits	Moderate	Moderate-High	Unknown
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	?Low

5.10.2 The Pleistocene Terraces of the Wallington River have had little investigation. The available data indicates that at least two terraces of different Pleistocene dates are present in this zone, although their specific age is unknown. Little is known about the Palaeolithic archaeological potential of these deposits, but Pleistocene terraces in the region are known to be an important resource for Lower and Middle Palaeolithic archaeology (see **section 4.3**). They have therefore been assessed as having moderate potential. The significance of any such archaeology would vary dependent on context and taphonomy from moderate (fluvially reworked) to high (minimally disturbed). There is insufficient information to establish palaeoenvironmental potential and this has been designated unknown.

5.10.3 Slope deposits of unknown age are present on the valley edges in this zone. These are reworking Palaeogene bedrock and Pleistocene Terrace Deposits downslope; there is little available information with which to assess their archaeological potential, but they could contain Palaeolithic artefacts. These sediments are unlikely to be calcareous and therefore, unless buried soils were to be identified, are considered to have low paleoenvironmental potential.

5.10.4 The Holocene Alluvium recorded in deposits records consisted of minerogenic silts and clays with low paleoenvironmental potential. Data coverage is sparse, however, and organic units, including peats, could be present in the Holocene alluvial sequences in the zone. Evidence of Mesolithic activity on the surface of a low Pleistocene terrace at the edge of

the Holocene floodplain is indicative of general archaeological potential associated with the alluvium, but detailed information of specific potential of the alluvial sequences is lacking.

5.11 GCZ 10

5.11.1 Quaternary deposits are considered unlikely to be present in this zone.

5.12 GCZ 11

5.12.1 GCZ 11 contains Quaternary deposits associated with a dry valley located north of the Wallingford River. Head is mapped by the BGS. No information on the specific Quaternary deposits in the zone is available, but a borehole located further north in the base of the same valley records a gravel indicative of high energy water flow and slope deposits on the valley margins.

5.12.2 Although no dates are available, it is suggested that this sequence could indicate late Pleistocene and Holocene ages for the sediments.

5.12.3 The archaeological and geoarchaeological potential of these dry valley deposits is summarised in **Table 25**. As in dry valleys south of the Wallingford River (see **section 5.9**), there is evidence of Mesolithic activity which may be associated with slope deposits. Consequently these have been assessed as having moderate archaeological potential. As they are likely principally reworking Palaeogene bedrock sediments, the Quaternary deposits in GCZ 11 may be decalcified which, unless buried soils were to be present, implies low palaeoenvironmental potential.

Table 25 Archaeological potential of Quaternary deposits in GCZ 11

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
11	Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate-High	Moderate

5.13 GCZ 12

5.13.1 GCZ 12 contains Quaternary deposits within the Wallington Valley downstream of those in GCZ 9. The assessed archaeological potential of Quaternary deposits in GCZ 12 is summarised in **Table 26**.

Table 26 Archaeological potential of Quaternary deposits in GCZ 12

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
12	Pleistocene River Terrace Deposits	Moderate	Moderate-High	Moderate

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
	Pleistocene / Holocene sediments within solution features	Unknown	Moderate-High	Moderate
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Moderate
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	Unknown

5.13.2 The BGS maps up to seven numbered Pleistocene terraces of the Wallington River in this zone, but this interpretation is based on very few deposit records and requires further investigation. Nevertheless the data implies the presence of multiple terraces of different Pleistocene dates. Palaeolithic archaeological potential associated with these terraces is indicated by chance surface finds of Palaeolithic handaxes; a moderate potential rating has therefore been assigned.

5.13.3 The terrace deposits in deposit records for the zone include chalky calcareous units and finer grained sediments within coarser sands and gravels. The finer grained sediments have palaeoenvironmental potential to preserve microfossils, whilst the presence of chalk suggests that deposits within these terraces are calcareous and could therefore preserve vertebrate remains and molluscs. A moderate palaeoenvironmental rating is assigned.

5.13.4 Pleistocene Head / Holocene Colluvium has been identified on the valley edges, likely representing slope deposits. No evidence with which to assess archaeological potential is available. These deposits are on chalk bedrock and could be calcareous, preserving molluscs and/or vertebrate remains.

5.13.5 Possible solution features have been identified in LiDAR data on the upper slopes of the Wallington Valley in GCZ 12. No specific information relating to these is available. They have been assigned an unknown archaeological potential, with other ratings in line with similar features to the east on Portsdown Hill in GCZ 8 (see **section 5.9**).

5.13.6 Holocene alluvium is present in the base of the valley. Data is insufficient to consider the archaeological potential of these deposits, but the presence of Mesolithic finds on the floodplain margin may be indicative.

5.13.7 Alluvial deposits recorded in the small number of deposit records in this zone were minerogenic sediments with low palaeoenvironmental potential but, given the small dataset, the Holocene Alluvium could contain units with greater potential (e.g. peats). Additionally, palaeochannels have been identified in the LiDAR data in the alluvial floodplain in this zone. These have potential to be filled or capped with peat in a floodplain dominated by minerogenic alluvium. In the absence of specific information, the palaeoenvironmental potential of the Holocene Alluvium is considered unknown.

5.14 GCZ 13

5.14.1 Available data suggests that Quaternary deposits are unlikely to be present in this zone, although the presence of high-level Pleistocene River Terraces of the Wallington River could occur. If such deposits were present, they would have the same generalised archaeological potential ratings as those in GCZ 12 (see **section 5.13**), although being on Palaeogene rather than Cretaceous chalk bedrock reduces their potential to preserve palaeoenvironmental data.

5.15 GCZ 14

5.15.1 Data indicates that Quaternary deposits in this zone are likely to be localised in solution features, several of which are indicated by LiDAR data. These are further examples of such features identified immediate to the east in GCZ 13; they have been assigned congruent archaeological potential and significance ratings (**Table 27**).

Table 27 Archaeological potential of Quaternary deposits in GCZ 14

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
14	Pleistocene / Holocene sediments within solution features	Unknown	Moderate-High	Moderate

5.16 GCZ 15

5.16.1 The valley of the River Meon in GCZ 15 contains Pleistocene River Terrace Deposits, Pleistocene Head/Holocene Colluvium and Holocene Alluvium. The assessed archaeological potential of these is summarised in **Table 28**.

Table 28 Archaeological potential of Quaternary deposits in GCZ 15

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
15	Pleistocene River Terrace Deposits	Moderate	Moderate-High	Unknown
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Moderate (South) Low (North)
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	Unknown

5.16.2 Although the available data is limited, the evidence demonstrates that a range of Pleistocene River terraces at different heights and of different ages are present; up to seven different terraces could occur in the zone. The Palaeolithic archaeological potential of these terrace deposits is poorly understood with no previous investigations and no known chance finds. However, it is likely that such an extensive range of terraces will contain Palaeolithic archaeology and potential has been assessed as moderate.

5.16.3 The River Meon flows across the Hampshire Basin and forms part of the Solent River system. Only very occasional localised organic sediments occur within river terraces in the Hampshire Basin and deposits tend to be unfossiliferous, reflecting a lack of calcareous deposits due to the dominant underlying bedrock being Palaeogene clays, silts and sands. The Meon terraces in the south of this zone abut the chalk at the western end of the Portsdown Anticline, however, with associated possibility for calcareous deposits resulting in a moderate palaeoenvironmental potential rating. Investigations would be required to refine this assessment.

5.16.4 Slope deposits which may include Pleistocene and/or Holocene sediments are present in the upper slopes of the Meon Valley in GCZ 15. As with the terraces there is little evidence with which to gauge the archaeological potential. In the south of the zone these slope deposits contain chalk and may therefore be calcareous and have some paleoenvironmental potential. Paleoenvironmental potential of the slope deposits in the south of the zone is assessed as moderate. In the north of the zone these deposits overlie and rework Palaeogene bedrock of the Hampshire bedrock. These sediments are likely decalcified and have been assigned a low palaeoenvironmental potential score.

5.16.5 Information with which to assess the archaeological potential of the Holocene Alluvium is lacking. There is a similar lack of deposit records with which to assess the palaeoenvironmental potential of sediments, although the review of LiDAR data has highlighted possible paleochannels that could be associated with organic sediments. Based on available data, the archaeological and palaeoenvironmental potential of the Holocene Alluvium in GCZ 15 is determined as unknown.

5.17 GCZ 16

5.17.1 Quaternary deposits with archaeological potential are unlikely to occur in this zone.

5.18 GCZ 17a and 17b

5.18.1 There is limited available detail on the Quaternary deposits in this zone but Pleistocene and/or Holocene slope deposits, and Holocene Alluvium, could be present. The archaeological potential of both sets of deposits is unknown (**Table 29**). The slope deposits are unlikely to be calcareous and are assigned low palaeoenvironmental potential. The possible presence of alluvium is based on interpretation of LiDAR which records a possible channel. The nature of any sediments associated with this possible channel are unknown, as is their palaeoenvironmental potential.

Table 29 Archaeological potential of Quaternary deposits in GCZ 17a and 17b

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
17a-b	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	Unknown

5.19 GCZ 18

5.19.1 The data indicates that Quaternary deposits with archaeological potential are unlikely to be present in GCZ 18.

5.20 GCZ 19

5.20.1 The zone contains Pleistocene/Holocene slope deposits and Holocene Alluvium within Kitnocks Gully. The assessed archaeological potential of these deposits is summarised in **Table 30**.

Table 30 Archaeological potential of Quaternary deposits in GCZ 19

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
19	Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	Unknown

5.20.2 There is a significant Mesolithic lithic assemblage from Shedfield (**PaMeLa ID 11170**) south of GCZ 19 situated where Head is mapped by the BGS in a minor spur valley linked to Kitnocks Gully. This suggests that slope deposits on the margins of Kintocks Gully could be associated with similar archaeology, providing an indication of moderate potential. The slope deposits in these valleys are unlikely to preserve significant palaeoenvironmental evidence.

5.20.3 The lithostratigraphy and archaeological potential of the alluvial sequences in the zone is unknown. Their palaeoenvironmental is dependent on the sediments present (e.g. peats), which are also unknown.

5.21 GCZ 20

5.21.1 No Quaternary deposits with archaeology are considered likely to be present in this zone.

5.22 GCZ 21

5.22.1 Information on the Quaternary deposits present in GCZ 21 and their archaeological potential is sparse. BGS mapping records Pleistocene Terrace Deposits of the River Hamble, Head deposits and Holocene Alluvium. The assessed archaeology potential of these deposits is summarised in **Table 31**.

Table 31 Archaeological potential of Quaternary deposits in GCZ 21

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
21	Pleistocene River Terrace Deposits	Moderate	Moderate-High	?Low

	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Unknown
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate
	Holocene Alluvium	Unknown	Unknown	Unknown

5.22.2 The number of Hamble terraces in the zone is unknown although multiple terraces of different dates will be present. No known Palaeolithic archaeology associated with these terraces has been identified but moderate archaeological potential can be assumed given the extensive amounts of material from the River Test, which the Hamble is a tributary of. Based on the underlying Palaeogene bedrock and broadly equivalent deposits investigated in the Test Valley, palaeoenvironmental potential is most likely to be low, but possible isolated occurrences of organic deposits could occur. This uncertainty is reflected in the potential rating in **Table 32**.

5.22.3 Head deposits are mapped by the BGS. No deposit records associated with these deposits are available. They are likely slope deposits reworking sediments from bedrock and terraces but could also include finer grained Pleistocene Head-Brickearth, which could reflect alluvial and aeolian deposition, which themselves could be reworked downslope. If purely slope deposits of sediments from local sources, they are unlikely to have significant paleoenvironmental potential. However, given the lack of deposit records with which to consider the deposits, their palaeoenvironmental potential has been assessed as unknown.

5.22.4 No information is available on the sediments comprising the Holocene Alluvium. Residual Mesolithic material from excavations upstream at the Bishop's Place in Bishop's Walton, (**Winchester HER ID MWC645**) provides evidence of Mesolithic activity on the edge of the Holocene Alluvium. However, the relationship between any such archaeology and Holocene Alluvium, or colluvium on the valley edges, is unknown. Both the archaeological and palaeoenvironmental potential has been assessed as unknown.

5.23 GCZ 22a and 22b

5.23.1 The BGS maps Holocene Alluvium in a minor side valley of the Hamble in this zone. No deposit records are available and there is no information to assist assessment of archaeological and palaeoenvironmental potential. These are therefore considered unknown (**Table 32**).

Table 32 Archaeological potential of Quaternary deposits in GCZ 22a and 22b

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
22a-b	Holocene Alluvium	Unknown	Unknown	Unknown

5.24 GCZ 23

5.24.1 Extensive Quaternary deposits are considered unlikely to be present in GCZ 23. A narrow gully is located on LiDAR data within the zone. If Quaternary deposits are present in this gully they are most likely to comprise Holocene Colluvium. If impacted on, work would be required to assess what this feature is and what deposits it contains.

5.25 GCZ 24

5.25.1 The deposits in this zone likely comprise late Pleistocene to Holocene slope deposits and Holocene alluvium of the Bow Lake Stream. Evidence of archaeological potential is provided by significant Mesolithic archaeology from the same alluvial floodplain southwest of the zone at Stoke Common, Bishopstoke (**PaMeLa ID 10976**). This study has demonstrated that such assemblages are also associated with slope deposits on valley sides in the wider area. The archaeological potential of the combined Quaternary stratigraphy in this zone is assessed as moderate (**Table 33**).

Table 33 Archaeological potential of Quaternary deposits in GCZ 24

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
	Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Low
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Moderate	Moderate-High	Moderate
	Holocene Alluvium	Moderate	Moderate-High	Moderate

5.25.2 Slope deposits in this zone are unlikely to have significant palaeoenvironment potential. Deposit records record the alluvium comprising minerogenic sediments with reworked organic clasts. Although these deposits themselves have limited palaeoenvironmental potential, the reworked organic clasts could indicate that in situ organic deposits occur locally. These would have higher palaeoenvironmental potential. The Holocene alluvium has consequently been assigned an overall moderate palaeoenvironmental potential rating (**Table 33**).

5.26 GCZ 25

5.26.1 There is generally low potential for Quaternary deposits in this zone. Evidence of possible localised shallow dry valleys connected to the Bow Lake Stream were identified. Such features are most likely to contain Holocene colluvium. The archaeological potential of any such deposits is unknown but being on Palaeogene bedrock, unless buried soils are present, they are unlikely to have significant palaeoenvironmental potential (**Table 34**).

Table 34 Archaeological potential of Quaternary deposits in GCZ 25

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
	? Holocene Colluvium	Unknown	Low-Moderate	Low
	? Stable surfaces within/beneath Holocene Colluvium	Unknown	Moderate-High	Moderate

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5.27 GCZ 26

5.27.1 GCZ 26 encompasses the valley of the River Itchen GCZ 26. Quaternary deposits recorded comprise Pleistocene River Terrace Deposits overlain by Pleistocene Head-Brickearth, with

Holocene alluvium across the current floodplain. The assessed archaeological potential of these is summarised in **Table 35**.

Table 35 Archaeological potential of Quaternary deposits in GCZ 26

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
26	Pleistocene River Terrace Deposits	Moderate-High	Moderate-High	Unknown
	Pleistocene Head-Brickearth Deposits	Moderate	Moderate	?Low
	Stable surfaces within/beneath Pleistocene Head Deposits	Moderate	Moderate-High	Moderate
	Holocene Alluvium (Minerogenic)	Unknown	Unknown	Low
	Holocene Alluvium (Peat)	Unknown	Unknown	High
	Holocene Alluvium (Tufa)	Unknown	Unknown	High

5.27.2 Of the river systems with Pleistocene terraces traversed by the Project, those of the Itchen are best characterised. Nevertheless the age ranges of different terraces is uncertain. The data studied indicates three terraces of the Itchen are present in GCZ 26, Terraces 1–3. The lack of previous studies targeted on these terraces and their lack of chronology prohibits assessment of the archaeological potential of deposits forming individual terraces, but archaeological finds from 19th century gravel pits in the Assessment Area and wider Study Area allow their general potential to be characterised.

5.27.3 Palaeolithic artefacts have been recovered from Terrace 3 and Terrace 1, which in both cases include handaxes and Middle Palaeolithic Levallois artefacts. This may indicate potential for contemporary and reworked Middle Palaeolithic archaeology and reworked Lower Palaeolithic archaeology. However, taphonomic studies of similar historic artefact collections from the Test Valley, most notably Warsash (Davis et al. 2016), suggest the lithostratigraphy of these terraces and the context of historic finds of Palaeolithic archaeology may be more complex with Middle Palaeolithic artefacts possibly being from fluvial deposits in the top of terraces, or from later Head-Brickearth deposits overlying and sealing the terrace. There is insufficient data with which to assess whether this could be the case for the archaeology from GCZ 26, but it should be noted that such Head-Brickearth deposits do occur (see below).

5.27.4 Based on the available evidence, the archaeological potential of the Pleistocene River Terrace Deposits in GCZ 26 has been assessed as moderate (reflecting lack of investigation of individual outcrops) to high (reflecting the known presence of archaeology in Terraces 1 and 3).

5.27.5 The palaeoenvironmental potential of the Itchen terraces is poorly understood. The available deposit records generally record coarse sands and gravels, which have low palaeoenvironmental potential. However, the distribution of data points is wide and localised finer-grained or organic deposits with great potential could be present. In the south of the zone the terraces cross Palaeogene bedrock. In such circumstances elsewhere in the wider Solent catchment palaeoenvironmental potential is generally low. However in the north of

GCZ 26 the bedrock is chalk and, if suitable finer-grain sediments were present, could preserve material including vertebrates and molluscs. Given the limited data and lack of specific information, the palaeoenvironmental potential of the terraces in GCZ 26 is classed as unknown.

5.27.6 The Head-Brickearth deposits that overlie terrace outcrops are likely principally Pleistocene, although the upper most units could have been colluvially reworked in the later Pleistocene and/or Holocene periods. Their mode of deposition is uncertain but could include alluvial, slope and/or aeolian processes. No archaeology can be clearly attributed to these deposits, but they are a possible context for some of the Palaeolithic material recovered historically from gravel pits in the Assessment and Study Areas (see above). On this basis their archaeological potential is determined as moderate. Given the geological context of where Head has been recorded (mostly Palaeogene bedrock), these deposits may generally be decalcified and have low palaeoenvironmental potential, but further work on the deposits and their mode of deposition would be required to confirm this.

5.27.7 GCZ 26 contains a laterally extensive Holocene floodplain with potential paleochannels and 'Roddons' evident in LiDAR data. These features are possibly indicative of locations preserving deposits with palaeoenvironmental potential. Deposit records generally record minerogenic alluvium that has low palaeoenvironmental potential in the contemporary floodplain, but peats and tufa with high potential are locally present. The specific archaeological potential of the Holocene alluvial deposits in the zone is poorly characterised, which is reflected in unknown potential ratings. General archaeological potential is indicated by a Mesolithic findspot from the centre of the floodplain (**Winchester HER ID MWC3878**) north of the zone.

5.28 GCZ 27

5.28.1 The specific Quaternary sediments present in this zone is uncertain. Deposits which may possibly be present are Pleistocene Terrace Deposits of the River Itchen, and localised capture of Pleistocene and/or Holocene sediments in solution features and slope deposits (Pleistocene Head and/or Holocene colluvium). Any terrace deposits are the continuation of those furth south in GCZ 26, and the same archaeological potential rating has been assigned (**Table 36**). No information is available to guide assessment of archaeological potential of other Quaternary sediments possibly present.

Table 36 Archaeological potential of Quaternary deposits in GCZ 27

GCZ	Quaternary deposits	Archaeological potential of deposits	Archaeological Significance	Palaeoenvironmental potential of deposits
27	Pleistocene River Terrace Deposits	Pleistocene River Terrace Deposits	Moderate-High	Moderate-High
	Pleistocene / Holocene sediments within solution features	Unknown	Moderate-High	Moderate
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate (Pleistocene Head) Low (Holocene Colluvium)	Moderate
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Moderate-High	Moderate

5.28.2 No specific information is available on the palaeoenvironmental potential of deposits in this zone. The underlying bedrock being chalk indicates potential for calcareous sediments and they may therefore be of the same broad potential. The lack of deposit records with which to consider the sedimentary sequences prevents the provision of any specific assessment ratings.

5.29 GCZ 28

5.29.1 The study suggests that significant occurrences of Quaternary sediments are unlikely in this zone.

6 RECOMMENDATIONS

6.1 Introduction

6.1.1 The GDBA, supported by deposit modelling and a GLC, has demonstrated the presence of Quaternary deposits with varying archaeological potential in 28 GCZs located across the Project. Based on the available information, targeted Stage 2 (see **Table 1**) geoarchaeological evaluation of the Quaternary deposits is recommended to characterise the geoarchaeological resource in relation to potential development impacts. Stage 2 evaluation should be targeted on areas where Quaternary deposits with archaeological and palaeoenvironmental potential have been identified, and in areas where data is insufficient to establish the presence or absence of such sediments.

6.1.2 No final development proposals for the Project are available. Should such information become available, these recommendations for evaluation should be reviewed and used to further target evaluation requirements on areas of possible development impacts.

6.1.3 Appropriate methods for Stage 2 evaluation of the geoarchaeological potential of Quaternary deposits in each GCZ are provided. Recommendations are in line with best practice as outlined in in Historic England (2015b) and Historic England (2023).

6.1.4 Phase 3 Project GI works and associated geoarchaeological monitoring are being carried out across the Assessment Area. It is recommended that the results of these investigations are utilised to update this document and to further target requirements for Stage 2 evaluation.

6.1.5 These recommendations for geoarchaeological evaluation relate specifically to assessing the archaeological and palaeoenvironmental potential of Quaternary deposits. It does not include recommendations for evaluation of archaeological features and layers which may occur immediately beneath modern soil sequences, and which may be cut into or overlie Quaternary or bedrock deposits. These are included in a separate ADBA. Standard approaches to evaluating for such archaeology is through evaluation trenches. The following recommendations for geoarchaeological evaluation of Quaternary deposits can be carried out alongside any such investigations.

6.1.6 For all deposits the key aims of evaluation should be to (1) establish the depositional processes associated with these deposits, (2) their potential to contain archaeology, including stable land surfaces (including buried soils) that could be associated with minimally disturbed archaeology, and (3) the palaeoenvironmental potential of sediments and dating options to provide chronology.

6.2 GCZ 1a and 1b

6.2.1 This assessment indicates that Quaternary deposits with archaeological potential are unlikely to be present in these zones and no geoarchaeological evaluation is recommended.

6.3 GCZ 2

6.3.1 Slope deposits which may be of Pleistocene and/or Holocene date are present in this zone, which extend up to c. 4.0m bgl. Machine dug test pits are the most appropriate method for evaluating these deposits (**Table 37**). Sampling for artefacts including, where appropriate, sieving should be carried out. These test pits could be carried out alongside any required archaeological evaluation trenches.

Table 37 Recommendations for evaluation of Quaternary deposits in GCZ 2

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
2	?Pleistocene Head / Holocene Colluvium	0.20–4.05	Test Pits, alongside evaluation trenches

6.4 GCZ 3

6.4.1 Quaternary deposits in GCZ 3 are likely to be similar to those in GCZ 2 and a comparable approach to archaeological evaluation would be appropriate (**Table 38**).

Table 38 Recommendations for evaluation of Quaternary deposits in GCZ 3

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
3	?Pleistocene Head / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches

6.5 GCZ 4a and 4b

6.5.1 Slope deposits similar to those occurring in GCZ 2 are present in these zones, alongside Holocene alluvium. Test pitting would be the most effective method of evaluating the slope deposits. Evaluation for archaeology within the Holocene alluvium could be carried out as part of any archaeological trial trenching, with additional boreholes carried out across the alluvial floodplain aimed at recovering samples suitable for Stage 3 palaeoenvironmental assessment (see **Table 1**) and dating from the alluvial sequence, should deposits with significant potential to be present.

Table 39 Recommendations for evaluation of Quaternary deposits in GCZ 4a and 4b

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
4a-b	?Pleistocene Head / Holocene Colluvium	1.10–3.71	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.30–2.43	Boreholes, alongside evaluation trenches

6.6 GCZ 5a, 5b and 5c

6.6.1 Quaternary deposits in GCZs 5a, 5b and 5c comprise Pleistocene Raised Beach Deposits overlain by Head. Recommendations for geoarchaeological evaluation are summarised in **Table 40**.

6.6.2 These sequences extend to 7.85m bgl. Machine dug test pits would be the most appropriate method of evaluating the geoarchaeological potential of these deposits. Targeted boreholes should be carried out to recover samples throughout the raised beach sequence suitable for palaeoenvironmental assessment (ostracods, foraminifera and pollen) and material suitable for luminescence dating to provide chronology. It is recommended that a limited number of boreholes are carried out, targeted on sequences with greatest potential identified from GI data and deposit modelling (**section 4.9**).

Table 40 Recommendations for evaluation of Quaternary deposits in GCZ 5a, 5b and 5c

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
5a	Pleistocene Raised Beach Deposits	0.31–1.50	Test Pits and boreholes
	Pleistocene Head Deposits	0.18–0.31	Test Pits and boreholes
5b	Pleistocene Raised Beach Deposits	0.80 –1.20	Test Pits and boreholes
	Pleistocene Head Deposits	0.10 –0.50	Test Pits and boreholes
5c	Pleistocene Raised Beach Deposits	4.72	Test Pits and boreholes
	Pleistocene Head Deposits	0.10	Test Pits and boreholes

6.7 GCZ 6

6.7.1 Quaternary deposits with significant palaeoenvironmental potential are present, possibly to depths greater than 15m, in this zone. Boreholes targeted based on GI data and results of deposit modelling (**section 5.7**) are recommended, with the aim to record the lithostratigraphy in detail and to recover samples suitable for palaeoenvironmental assessment and dating. These should be aimed in particularly to recover sequences through the Pleistocene chalky silts and gravels. In addition, shallower boreholes should be considered across areas where Holocene Alluvium containing peats may be present.

6.7.2 Previous development impacts have removed Quaternary deposits across areas of this zone to depths beyond which archaeological evaluation is appropriate. In areas that have not previously been significantly impacted on, test pits with associated artefact sampling and sieving are recommended alongside any required evaluation trenches.

6.7.3 Recommended approaches to evaluation in GCZ 6 are summarised in **Table 41**.

Table 41 Recommendations for evaluation of Quaternary deposits in GCZ 6

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
6	Possible Chalky Silts and Gravels	1.98–23.00	Boreholes
	Chalky Silts and Gravels	2.90–22.35	Boreholes
	Gravels	2.98–14.80	Boreholes
	Gravelly Clays	0.31–4.57	Boreholes. Test Pits alongside evaluation trenches
	Clays	0.00–3.84	Boreholes. Test Pits alongside evaluation trenches

	Alluvium	0.00–1.82	Boreholes. Evaluation trenches
	Made Ground	0.00–16.50	None

6.8 GCZ 7

6.8.1 There is uncertainty regarding whether Quaternary deposits with archaeological potential are present. To establish whether any such deposits do occur machine dug test pits with artefact sampling and sieving are recommended, to be carried out alongside any evaluation trenches (**Table 42**).

Table 42 Recommendations for evaluation of Quaternary deposits in GCZ 7

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
7	Unknown	Unknown	Test Pits, alongside evaluation trenches

6.9 GCZ 8

6.9.1 LiDAR data from GCZ 8 indicates the presence of visible solution features. Visible solution features are indicative of active dissolution of the chalk bedrock and are often indicative of areas where solution features with no surface expression occur. To establish the presence of solution features and the depths of deposits in-filling them, Electrical Resistivity Tomography (ERT) geophysical survey is recommended. Such surveys such be targeted on areas where solution features are visible in LiDAR data, but include additionally surrounding areas to assess for additional, non-visible, Quaternary sedimentary capture points. The results of the ERT survey should be ground truthed and the potential for any deposits to contain archaeology assessed through machine dug test pits, with artefact sampling and sieving.

6.9.2 Pleistocene and/or Holocene slope deposits with archaeological potential have been identified in dry valleys in this zone. Evaluation through machine dug test pits carried out alongside any evaluation trenches is recommended.

6.9.3 Recommendations for archaeological evaluation in GCZ 8 are summarised in **Table 43**.

Table 43 Recommendations for evaluation of Quaternary deposits in GCZ 8

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
8	Pleistocene / Holocene sediments within solution features	Unknown	ERT geophysical survey and test pits
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches

6.10 GCZ 9

6.10.1 Pleistocene River Terrace Deposits and Holocene Alluvium occur in the Wallington Valley in this zone, with Pleistocene and/or Holocene slope deposits on the valley edges. Recommendations for geoarchaeological evaluation are summarised in **Table 44**.

Table 44 Recommendations for evaluation of Quaternary deposits in GCZ 9

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
9	Pleistocene River Terrace Deposits	0.80–3.70	Test Pits
	Pleistocene Head / Holocene Colluvium	0.15–3.80	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.00–1.80	Boreholes. Evaluation trenches

6.10.2 Terrace deposits occur to depths of c. 4.0m bgl in this zone. These should be evaluated through machine dug test pits (with artefact sampling and sieving) to assess the archaeological, palaeoenvironmental and dating potential of the sediments. Test pits through the slope deposits are also recommended. A borehole survey across the Holocene floodplain is recommended to assess for deposits with palaeoenvironmental and dating potential and to recover samples suitable for assessment. A requirement to assess for archaeological features/layers within the alluvium should be included in any archaeological trial trenching program.

6.11 GCZ 10

6.11.1 No significant Quaternary deposits are considered likely to be present in this zone and no geoarchaeological evaluation is recommended.

6.12 GCZ 11

6.12.1 Pleistocene/Holocene slope deposits are present in this zone. Evaluation though machine dug test pits alongside any required evaluation trenches is recommended (**Table 45**).

Table 45 Recommendations for evaluation of Quaternary deposits in GCZ 11

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
11	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches

6.13 GCZ 12

6.13.1 The Wallington Valley in this zone contains Pleistocene River Terraces, Holocene Alluvium and Pleistocene/Holocene slope deposits. Evaluation through test pits with associated artefact sampling and sieving is recommended to assess the archaeological potential of the terrace and slope deposits. Assessment for archaeological features/layers within the alluvium should be included in any trial trenching evaluation. A borehole survey of the Holocene alluvial floodplain is recommended to assess palaeoenvironmental potential and to recover samples suitable for assessment and dating. This should be targeted on possible palaeochannels identified in LiDAR data, as these are indicative of locations in the floodplain with greatest palaeoenvironmental potential.

6.13.2 These recommendations are summarised in **Table 46**.

Table 46 Recommendations for evaluation of Quaternary deposits in GCZ 12

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
12	Pleistocene River Terrace Deposits	0.05–5.30	Test Pits
	Pleistocene Head / Holocene Colluvium	0.20–3.25	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.40–2.00	Boreholes. Evaluation trenches

6.14 GCZ 13

6.14.1 The likelihood of significant Quaternary deposits in this zone is generally low, although high level terraces of the Wallington River could occur. No specific geoarchaeological evaluation at this stage is recommended, although the results of any further GI and/or archaeological evaluation trenching should be reviewed to assess for the presence of any localised terrace outcrops, with additional test pitting if terrace deposits are identified.

6.15 GCZ 14

6.15.1 The presence of solution features in this zone is indicated by LiDAR data. ERT geophysical survey, followed by machine dug test pits are recommended to evaluate any associated Quaternary deposits (**Table 47**). ERT survey should be located on visible solution features but include wider surrounding areas to assess for others.

Table 47 Recommendations for evaluation of Quaternary deposits in GCZ 14

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
14	Pleistocene / Holocene sediments within solution features	Unknown	ERT geophysics and test pits

6.16 GCZ 15

6.16.1 Pleistocene river terraces and Holocene alluvium of the River Meon have been identified in this zone, along with Pleistocene/Holocene slope deposits. Recommendations for evaluation are summarised in **Table 48**.

Table 48 Recommendations for evaluation of Quaternary deposits in GCZ 15

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
15	Pleistocene River Terrace Deposits	0.05–4.50	Test Pits
	Pleistocene Head / Holocene Colluvium	0.30–1.70	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.25–3.50	Boreholes. Evaluation trenches

6.16.2 Evaluation of these deposits through machine dug test pits with artefact sieving of the terrace and slope deposits is recommended. Evaluation for archaeology within the Holocene Alluvium should be included as part of any archaeological trial trenching, with additional test pits to investigate deeper sequences as required. A borehole survey in the

Holocene floodplain is recommended. This should be spaced across the narrow floodplain but include possible palaeochannels tentatively identified from LiDAR data.

6.17 GCZ 16

6.17.1 Significant Quaternary deposits are considered unlikely to present in GCZ 16 and no geoarchaeological evaluation is recommended.

6.18 GCZ 17a and 17b

6.18.1 Pleistocene/Holocene slope deposits and Holocene Alluvium have been identified in these zones. Machine dug test pits carried out alongside any evaluation trenches are recommend for evaluating the former, whilst the latter can be assessed as part of the trenching, augmented with an additional geoarchaeological borehole survey (**Table 49**).

Table 49 Recommendations for evaluation of Quaternary deposits in GCZs 17a and 17b

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
17a-b	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches

6.19 GCZ 18

6.19.1 The potential for significant Quaternary deposits to be present in this zone is low and no geoarchaeological evaluation is recommended.

6.20 GCZ 19

6.20.1 Pleistocene/Holocene slope deposits and Holocene Alluvium have been identified in this zone, the geoarchaeological potential of which could be evaluated through test pits and as part of any archaeological trial trenching, with the addition of boreholes to assess the palaeoenvironmental potential of the Alluvium (**Table 50**).

Table 50 Recommendations for evaluation of Quaternary deposits in GCZ 19

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
19	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches

6.21 GCZ 20

6.21.1 Quaternary deposits are unlikely to be present in GCZ 20 and no geoarchaeological evaluation is deemed necessary.

6.22 GCZ 21

6.22.1 GCZ 21 crosses the valley of the River Hamble and contains Pleistocene River Terrace deposits, slope deposits and Holocene Alluvium.

6.22.2 Proposed methods of evaluation are summarised in **Table 51**.

Table 51 Recommendations for evaluation of Quaternary deposits in GCZ 21

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
21	Pleistocene River Terrace Deposits	Unknown	Test Pits
	Pleistocene Head / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches

6.22.3 The most appropriate method for evaluating geoarchaeological potential of the terrace and slope deposits is through machine dug test pits with associated sampling for artefacts. The presence of archaeology within the alluvium can be assessed as part of any trial trenching program, with the addition of boreholes to assess the full stratigraphy and recover samples suitable for palaeoenvironmental assessment and dating.

6.23 GCZ 22a and 22b

6.23.1 Holocene Alluvium is recorded in this zone. Any archaeological trial trenching program should include evaluation for archaeological features and layers within these sediments, with additional boreholes to assess the palaeoenvironmental and dating potential and recover appropriate samples (**Table 52**).

Table 52 Recommendations for evaluation of Quaternary deposits in GCZ 22a and 22b

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
22a-b	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches

6.24 GCZ 23

6.24.1 Extensive Quaternary deposits are considered unlikely to be present in this zone. Review of LiDAR data identified a gully which may contain Quaternary sediments, most likely to be Holocene Colluvium. Any archaeological evaluation trenching program carried out in the area of the gully should investigate this feature, to assess how it formed, what sediments it contains and their geoarchaeological potential.

6.25 GCZ 24

6.25.1 GCZ 24 contains Holocene Alluvium of Bow Lake Stream with slope deposits, most likely of Holocene date. Recommendations for methods of archaeological evaluation are summarised in **Table 53**.

6.25.2 The Quaternary deposits are generally relatively shallow (<2.75m) and could mostly be investigated as part of archaeological evaluation trenching, although additional test pits may be required to investigate the deepest deposits. A borehole survey is recommended to assess for deposits with palaeoenvironmental and dating potential in the Holocene Alluvium and to recover samples from suitable sediments for assessment and dating. This should be

targeted on the southern side of the alluvial corridor where possible palaeochannels are apparent in LiDAR data.

Table 53 Recommendations for evaluation of Quaternary deposits in GCZ 24

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
24	Pleistocene Head / Holocene Colluvium	0.70–2.40	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.20–2.75	Boreholes. Evaluation trenches.

6.26 GCZ 25

6.26.1 The likely lack of significant Quaternary deposits means that geoarchaeological evaluation is not necessary in this zone. Review of LiDAR data identified localised features which may be shallow dry valley forms. These and any Quaternary deposits they contain could be investigated as part of archaeological trial trenching evaluation.

6.27 GCZ 26

6.27.1 The Itchen Valley in this zone contains Pleistocene terrace deposits overlain in places by Head-Brickearth, with Holocene Alluvium, including localised peats and tufa within a wide alluvial floodplain.

6.27.2 A summary of recommendations for evaluation is provided in **Table 54**.

Table 54 Recommendations for evaluation of Quaternary deposits in GCZ 26

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
26	Pleistocene River Terrace Deposits	0.40–5.94	Test Pits
	Pleistocene Head-Brickearth	0.20–1.40	Test Pits
	Holocene Alluvium	0.14–2.59	Boreholes. Evaluation trenches

6.27.3 Machine dug test pits with artefact sampling and sieving are the most appropriate method of assessing geoarchaeological potential of the terraces and overlying Head-Brickearth. Where necessary, this should allow scope for stepping test pits for direct section cleaning and sampling of Head-Brickearth to assess stratigraphy and mode of deposition.

6.27.4 Any trial trenching program within the alluvial floodplain should include scope for assessing the archaeological potential of the alluvium, with additional test pits as require to investigate deeper sequences. Targeted boreholes should be carried out to investigate and obtain palaeoenvironmental and dating samples from locations in the floodplain with greatest potential. This includes areas where peats and tufas are recorded, and locations where possible palaeochannels have been identified in LiDAR data.

6.28 GCZ 27

6.28.1 Pleistocene terraces of the River Itchen may extend into the south of this zone. It is recommended that targeted machine dug test pits are carried out in this area to establish presence/absence of such deposits and evaluate the geoarchaeological potential if present.

6.28.2 A potential for solution features in areas mapped as Clay-with-Flints by the BGS has been identified. ERT geophysical survey to assess for the presence of solution features, followed by test pits to evaluate any deposits within such features, is recommended.

6.28.3 Pleistocene/Holocene slope deposits have also been identified in GCZ 27. Evaluation through machine dug test pits alongside any evaluation trenches is recommended to assess the archaeological potential of these deposits.

6.28.4 Recommendations for the evaluation of Quaternary deposits in GCZ 27 are summarised in **Table 55**.

Table 55 Recommendations for evaluation of Quaternary deposits in GCZ 27

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
27	Pleistocene River Terrace Deposits	Unknown	Test Pits
	Pleistocene / Holocene sediments within solution features	Unknown	ERT geophysics and test pits
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches

6.29 GCZ 28

Quaternary deposits are considered unlikely to be present in this zone and no geoarchaeological evaluation is recommended.

6.30 Summary

6.30.1 Recommendations for Stage 2 geoarchaeological evaluation of Quaternary deposits present across the Assessment Area are summarised in **Table 56.**

Table 56 Summary of recommendations for Stage 2 geoarchaeological evaluation

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
1a-b	None	n/a	None
2	?Pleistocene Head / Holocene Colluvium	0.20–4.05	Test Pits, alongside evaluation trenches
3	?Pleistocene Head / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
4a-b	?Pleistocene Head / Holocene Colluvium	1.10–3.71	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.30–2.43	Boreholes, alongside evaluation trenches
5a	Pleistocene Raised Beach Deposits	0.31–1.50	Test Pits and boreholes
	Pleistocene Head Deposits	0.18–0.31	Test Pits and boreholes
5b	Pleistocene Raised Beach Deposits	0.80 –1.20	Test Pits and boreholes
	Pleistocene Head Deposits	0.10 –0.50	Test Pits and boreholes

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
5c	Pleistocene Raised Beach Deposits	4.72	Test Pits and boreholes
	Pleistocene Head Deposits	0.10	Test Pits and boreholes
6	Possible Chalky Silts and Gravels	1.98–23.00	Boreholes
	Chalky Silts and Gravels	2.90–22.35	Boreholes
	Gravels	2.98–14.80	Boreholes
	Gravelly Clays	0.31–4.57	Boreholes. Test Pits alongside evaluation trenches
	Clays	0.00–3.84	Boreholes. Test Pits alongside evaluation trenches
	Alluvium	0.00–1.82	Boreholes. Evaluation trenches
	Made Ground	0.00–16.50	None
7	Unknown	Unknown	Test Pits, alongside evaluation trenches
8	Pleistocene / Holocene sediments within solution features	Unknown	ERT geophysics and test pits
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
9	Pleistocene River Terrace Deposits	0.80–3.70	Test Pits
	Pleistocene Head / Holocene Colluvium	0.15–3.80	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.00–1.80	Boreholes, alongside evaluation trenches
10	None	n/a	None
11	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
12	Pleistocene River Terrace Deposits	0.05–5.30	Test Pits
	Pleistocene Head / Holocene Colluvium	0.20–3.25	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.40–2.00	Boreholes. Evaluation trenches
13	Unknown	Unknown	Review additional GI and/or trial trenching results
14	Pleistocene / Holocene sediments within solution features	Unknown	ERT geophysics and test pits
15	Pleistocene River Terrace Deposits	0.05–4.50	Test Pits
	Pleistocene Head / Holocene Colluvium	0.30–1.70	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.25–3.50	Boreholes. Evaluation trenches
16	None	n/a	None
17a-b	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches
18	None	n/a	None

GCZ	Quaternary deposits	Depth of deposits (m bgl)	Recommended method of evaluation
19	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Stable surfaces within/beneath Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches
20	None	n/a	None
21	Pleistocene River Terrace Deposits	Unknown	Test Pits
	Pleistocene Head / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches
22a-b	Holocene Alluvium	Unknown	Boreholes. Evaluation trenches
23	?Holocene Colluvium	unknown	Evaluation trenches
24	Pleistocene Head / Holocene Colluvium	0.70–2.40	Test Pits, alongside evaluation trenches
	Holocene Alluvium	0.20–2.75	Boreholes. Evaluation trenches.
25	?Holocene Colluvium	unknown	Evaluation trenches
26	Pleistocene River Terrace Deposits	0.40–5.94	Test Pits
	Pleistocene Head / Holocene Colluvium	0.20–1.40	Test Pits
	Holocene Alluvium	0.14–2.59	Boreholes. Evaluation trenches
27	Pleistocene River Terrace Deposits	Unknown	Test Pits
	Pleistocene / Holocene sediments within solution features	Unknown	ERT geophysics and test pits
	Pleistocene Head Deposits / Holocene Colluvium	Unknown	Test Pits, alongside evaluation trenches
28	None	n/a	None

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APPENDICES

Appendix 1: LiDAR data

LiDAR (Light Detection and Ranging) is an active form of remote sensing that uses pulses of laser light to measure distances to the earth's surface. Most terrestrial LiDAR systems operate using narrow beams of laser (NIR) light (typically 1064 nm) and are operated from airborne platforms or UAV-mounted (drone) sensors. LiDAR data is typically acquired as discrete return or full-waveform data, which are then converted to a point cloud.

Discrete return data only records targets that yield strong returns over a pre-defined threshold, whereas full-waveform data digitises the vertical profile of the LiDAR pulse over time. Discrete return datasets are the most used and are generally sufficient for most archaeological applications, but full-waveform data can be useful in densely vegetated areas, where it can increase the number of data points derived from the ground surface.

In England, Open Government licence (airborne) LiDAR data is nearly nationally available at high spatial resolutions (e.g., 0.5m – 2 m). Most of these datasets were collected during winter periods to reduce the influence of surface vegetation and maximise the collection of data points upon the ground's surface. The elevation values are recorded in metres above Ordnance Datum Newlyn (aOD) with a vertical accuracy of ±0.15 m.

Data products

The primary dataset for LiDAR is a (.las) point cloud. This comprises information regarding the X, Y and Z coordinates of the returns as well as additional attribute information. These points can be classified into different object types such as ground, low, medium, and high vegetation classes using an automated or manual process. Manual filtering can improve upon automated classification routines to produce a most likely ground surface model but is very time consuming and, therefore, rarely undertaken, but occasionally this data will be re-classified using the ASPRS standard codes. This data can then be used in the creation of Digital Elevation Models (DEMs) and through the 'gridding' of the first and last returns, Digital Surface Models (DSMs) and Digital Terrain Models (DTMs).

DSMs are created from the LiDAR pulses returned to the sensor relating to all ground surface objects, whereas DTMs are created from the last return classified as 'ground' by filtering out surface objects, such as modern buildings and vegetation. DTMs are most extensively used as they provide a a refined bare earth (ground) model, but surface objects within DSMs may be useful to help orientate data in the landscape, particularly for UAV datasets. In addition to elevation, the intensity of the LiDAR return can also be used to provide a measure of the amount of laser light from each laser pulse reflecting from an object (Challis, et al., 2011). This reflectivity is a function of the near-infrared wavelength used, and the material it is incident upon, but also the angle of incidence and flight altitude. It can be used as a proxy to analyse the reflectivity of the surface which can aid interpretation, particularly relating to the location of organic and waterlogged deposits.

Data visualisation

LiDAR data can be processed and visualised through standard GIS software. However, a wide range of advanced visualisation options can also be provided through dedicated toolboxes or GIS-plugins, such as the Relief Visualisation Toolbox (RVT; Kokalj et al., 2013). LiDAR visualisation methods vary in complexity and applicability across a different landscape settings, but can improve the definition of features of interest or transform the data into other physical quantities such as degree of slope (Kokalj and Hesse 2017). The most appropriate method(s) have been selected for the specific site and potential features in question.

Geoarchaeological interpretation

An interpretation of geomorphological landforms of archaeological interest or those with a high palaeoenvironmental preservation capacity, were digitised as a series of polygons (.shp files) in ArcGIS. A consistent set of interpretation categories were used across the project area, and a summary of these categories is provided below.

- **Palaeochannel** – Negative surface topographic expressions pertaining to former channels, typically within alluvial floodplains. Palaeochannels can comprise sediments pertaining to an extensive date range, including well-preserved (Holocene) organic-rich deposits in lower-lying and wetter areas that facilitate anoxic conditions. They, therefore, have a high palaeoenvironmental preservation capacity but are unlikely to contain any specific archaeological deposits of features.
- **Dry Valley** – Negative surface topographic expressions associated with potentially deep colluvial sediment sequences. Dry valleys are formed by water erosion but have no permanent surface channels and typically form on areas of permeable rock, such as limestone or chalk. They can extensive molluscan remains, but pollen or plant macrofossils rarely occur in the bases of dry valleys, as they typically lie above the water table.
- **Roddon** – Positive surface topographic features associated with the dried raised bed of a former watercourse. They are typically associated with river or tidal-creeks, especially in The Fens in eastern England. Their raised nature is often linked to anthropogenic change (e.g. drainage and agriculture) that causes the former channels to become positive topographical features. Roddon deposits can contain rich palaeoenvironmental assemblages.
- **Hollow** – Negative saucer shaped depressions relating to solution features, resulting from dissolution of underlying bedrock. They are particularly common in areas of chalk upland but can occur in a variety of different conditions. Solution features are potential capture points for Pleistocene and Holocene sediments in chalk landscapes that have been protected from erosion and can acts as focal points for Palaeolithic and later prehistoric activity.
- **Gully** – Negative surface topographic features, associated with gully erosion, primarily occurring on steep slopes. Gullies are often the result of intense storm events and can lead to the development of extensive rill and gully systems such as those on the South Downs, which may be linked to past agricultural intensification or landscape change. They can comprise or be overlain by Holocene colluvial deposits.

Contribution to deposit model

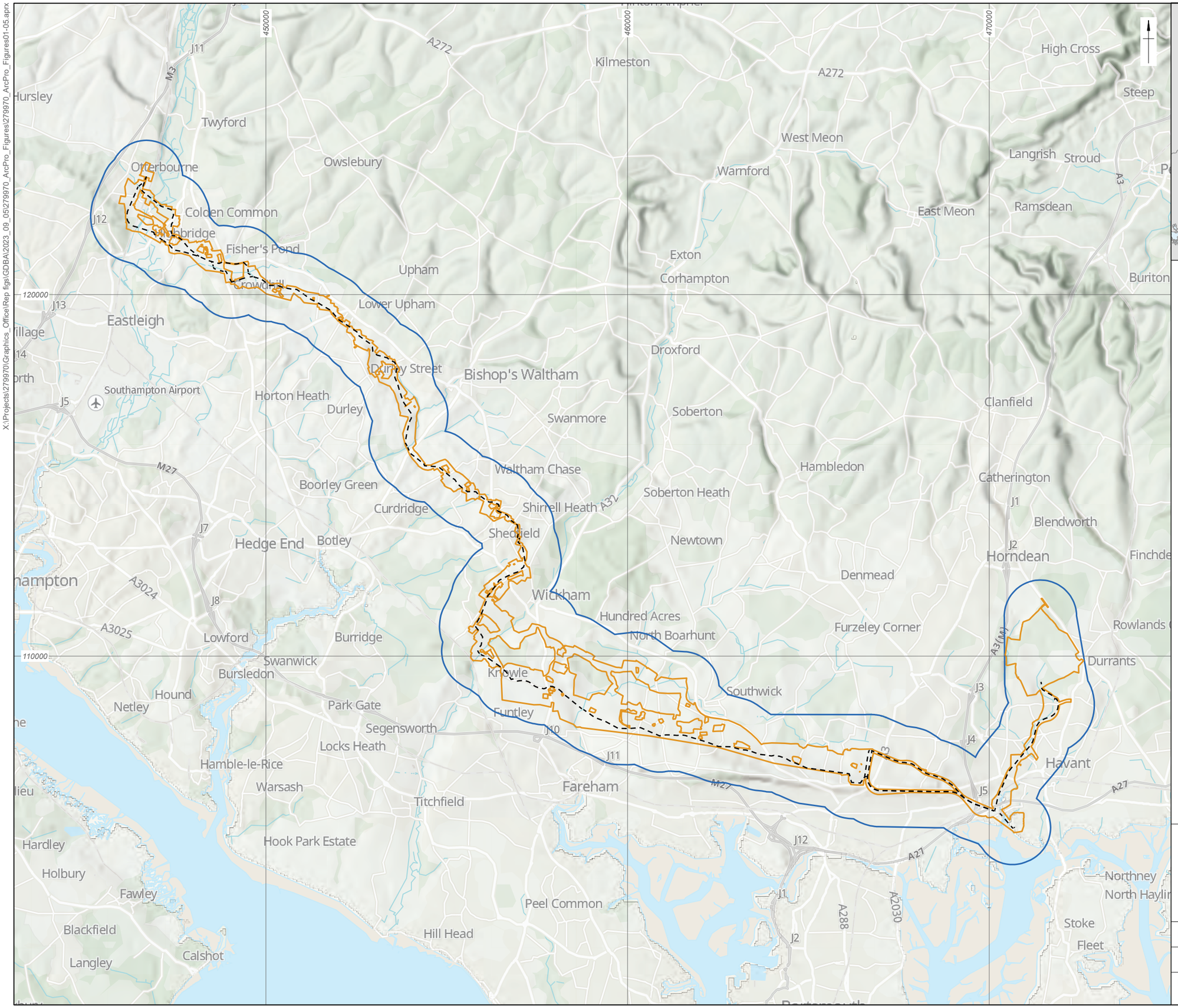
Although deposit models are inherently grounded in conventional archaeological approaches (primarily stratigraphy), they can incorporate data LiDAR data to provide an enhanced understanding of the distribution of archaeological resources within complex depositional environments. This provides a valuable definition of surface topography and landforms, which in turn, help to inform the Geoarchaeological Landscape Characterisation (GLC) of a site or landscape.

Appendix 2: Archaeological gazetteer

HER ID	TERPS ID	PaMELA ID	Name	Description	Period	Easting	Northing
	20275		Golden or Golding Pit, Colden Common	65 handaxes, 1 Levallois flake, 3 retouched flakes, 5 flakes and 1 miscellaneous piece	Lower/Middle Palaeolithic	447800	122000
	20281		High Bridge Pit	1 handaxe and 2 Levallois flakes. Found by Rev. S.J. Percival in 1920s or 1930s	Lower/Middle Palaeolithic	446700	121300
	20284		Gravel pit	1 handaxe	Lower/Middle Palaeolithic	445400	122500
63878	20689		Roche Court	1 handaxe	Lower/Middle Palaeolithic	457900	108200
	20963		Timber Lane	1 handaxe. Found in garden on surface in 1984	Lower/Middle Palaeolithic	467900	107500
	20964		Portsdown	2 handaxes from Portsdown Hill	Lower/Middle Palaeolithic	464500	106500
MWC1207			Brambridge Farm	Handaxes	Lower/Middle Palaeolithic	447500	121500
MPM94			Drift Cottage Drive, Wallington	1 handaxe	Lower/Middle Palaeolithic	459650	106850
MPM103			Furzehall Farm, Wickham Road		Palaeolithic	457950	107550
MWC1256			South of the Woodlands Centre		Palaeolithic	448600	121400
MWC5404			Bakery site, Station Road, Wickham	Possible palaeochannel	Palaeolithic	457291	111608
		706	Langstone Harbour	Shouldered Point	Late Upper Palaeolithic	470500	104500
		10861	Boarhunt Mill	Mesolithic lithic assemblage	Mesolithic	460500	108500
MPM220		10974	Southwick	Mesolithic microlith and flint artefacts	Mesolithic	462210	107150
		10976	Stoke Common, Bishopstoke	Lithic assemblage including two Mesolithic tranchet axes	Mesolithic	447300	120500
		10992	Walton Heath, Southwick	Large Mesolithic lithic assemblage including microliths, microburins, two tranchet axes and an axe resharpening flake	Mesolithic	462210	107150
		10995	West of Fort South Wick, Portsdown	Mesolithic microlith	Mesolithic	468400	106600
MPM247		11012		Lithic assemblage including likely Mesolithic blade	Mesolithic	464600	107300

		11152	Purbrook	Lithic assemblage including Mesolithic tranchet axe	Mesolithic	468800	107100
		11170	Shedfield	Large Mesolithic lithic assemblage including microliths, microburins, a tranchet axe and axe resharpening flakes	Mesolithic	455400	113700
20108				Two probable Mesolithic flakes from unknown context	Mesolithic	458400	107400
20202				Mesolithic flakes and cores	Mesolithic	459500	109000
20066			Field to west of Hellyers Farm farmhouse	Mesolithic flints	Mesolithic	457200	107900
20075 / MPM91				Flint assemblage including axes, microliths. scrapers and blades recovered during salvage excavation during construction of M27. Artefacts from fill of solution pipes.	Mesolithic	459570	106940
37312			North Wallington	Mesolithic blades, a few microliths and waste flakes recorded during fieldwork associated with construction of M27	Mesolithic	459200	107200
57575			8 Queen Anne's Drive	Mesolithic burin found in garden	Mesolithic	470160	106810
20134			North Wallington	Mixed assemblage containing Mesolithic, Iron Age and Roman material	Mesolithic	459500	109000
33705			Camp Hill, Crook	Unretouched flint blade recovered during archaeological evaluation	Mesolithic	469170	106780
MWC4255			Offwell Farm		Mesolithic	462000	107800
MWC883			Boarhurst Road	Flint flakes	Mesolithic	460202	107901
MWC844				Flint	Mesolithic	460800	110483
MWC59			North Boarhurst	Flints from edge of Sand Pit	Mesolithic	460215	111495
MWC5381			Wickham Common		Mesolithic	459000	110900
MWC5383			Wickham Common		Mesolithic	458900	110490
MWC684			The Dean	Flints	Mesolithic	456000	117000
MWC645			Bishop's Palace Stables, Site 5		Mesolithic	455230	117470
MWC1234			Ash Close	Finds	Mesolithic	448000	122000
MWC3878			Rosemary Leet		Mesolithic	447200	122700

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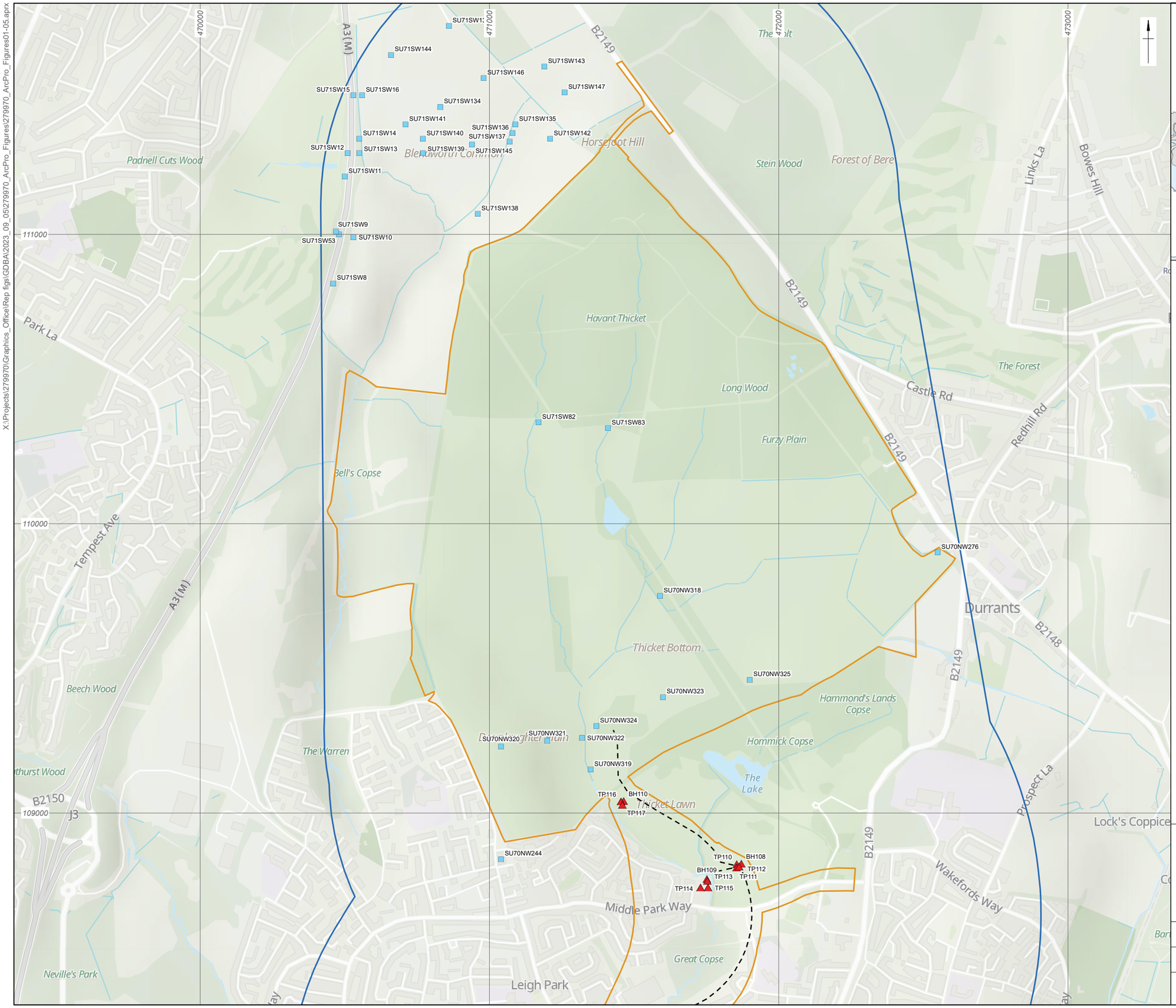
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Figure 1: Project location

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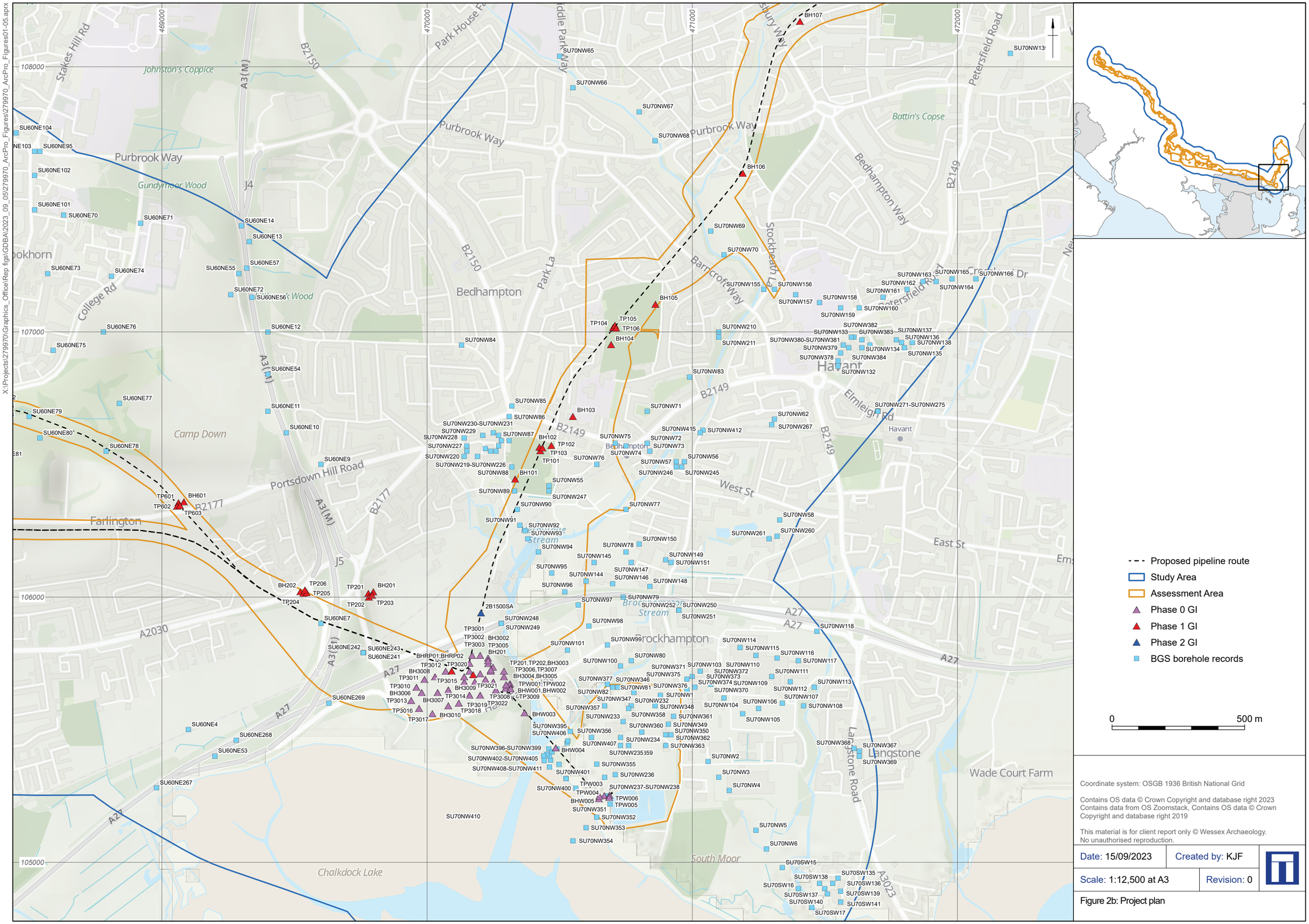
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Figure 2a: Project plan

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Coordinate system: OSGB 1936 British National Grid

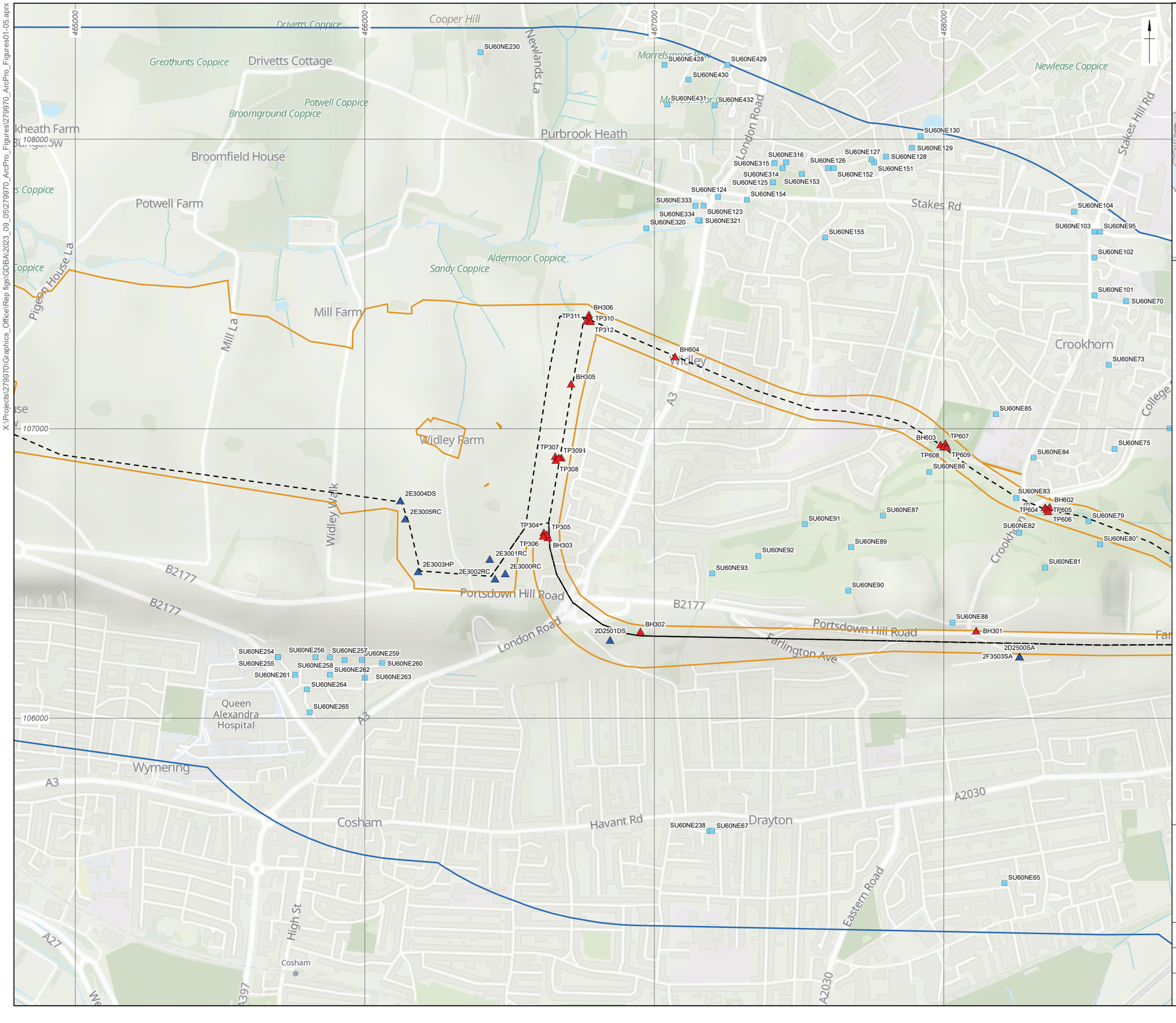
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Figure 2b: Project plan

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Figure 2c: Project plan

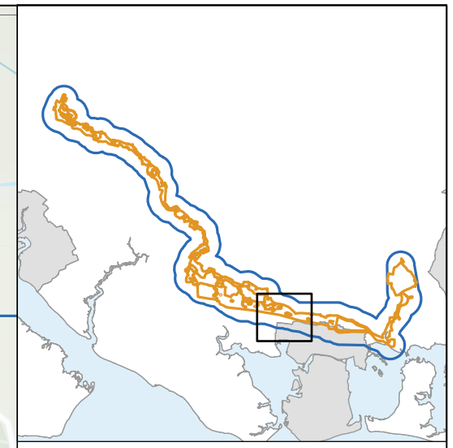
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461000 462000 463000 464000

108000 107000 106000

Ham Coppice
Hobern Coppice
Southwick
Ham Rd
Ham Farm
Back La
West St
High St
The Wilderness
Dairy Clump
Comphouse Moor Coppice
eydown Coppice
Keepers Cottage
Collier Row
Perrige's Coppice
Stroud Coppice
Southwick Park Lake
Comphouse Farm
Sawyer's Wood
B2177
Offwell Farm
Monument La
Portchester La
Crooked Walk La
Pitymoor Coppice
Tree Coppice Plantation
Tree Coppice
Pinsley Plantation
Bushy Coppice
Pinsley Lodge
New Barns Farm
Mountemoor's Coppice
Pigeon House Bungalow
Portsdown Hill Rd
Nelson La
Skew Rd
James Callaghan Dr
Hill Rd
Portsview Ave
Jubilee Ave
Allaway Ave
Paulsgrove
M27
A27
Portchester

SU60NW105 SU60NW154 SU60NW106 SU60NW153 SU60NW152 SU60NW107 SU60NW84:SU60NW91 SU60NW95-SU60NW99 SU60NW108 SU60NW109 SU60NW110 SU60NW111 SU60NW112 SU60NW155 SU60NW150 2E3008TP SU60NW151 SU60NW140 SU60NW83 SU60NW5 2E3007TP 2E3006TP SU60NW137 SU60NW138 SU60NW139 SU60NW198 SU60NW190 SU60NW82/A-H SU60NW30 SU60NW33 SU60NW34 SU60NW36 SU60NW204 SU60NW214 SU60NW37 SU60NW38 SU60NW39 SU60NW191 SU60NW79 SU60NW76



Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

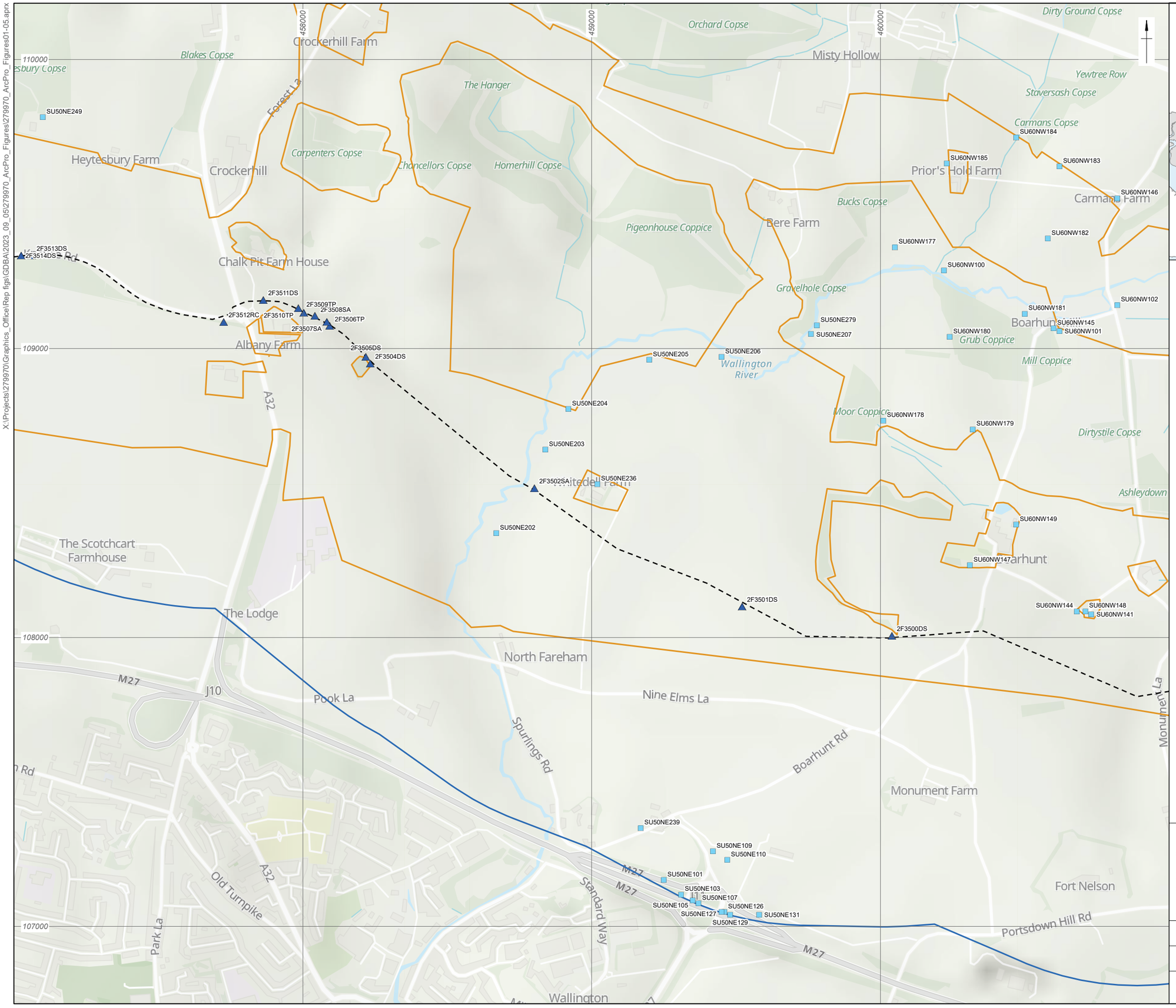
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Figure 2d: Project plan

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Coordinate system: OSGB 1936 British National Grid

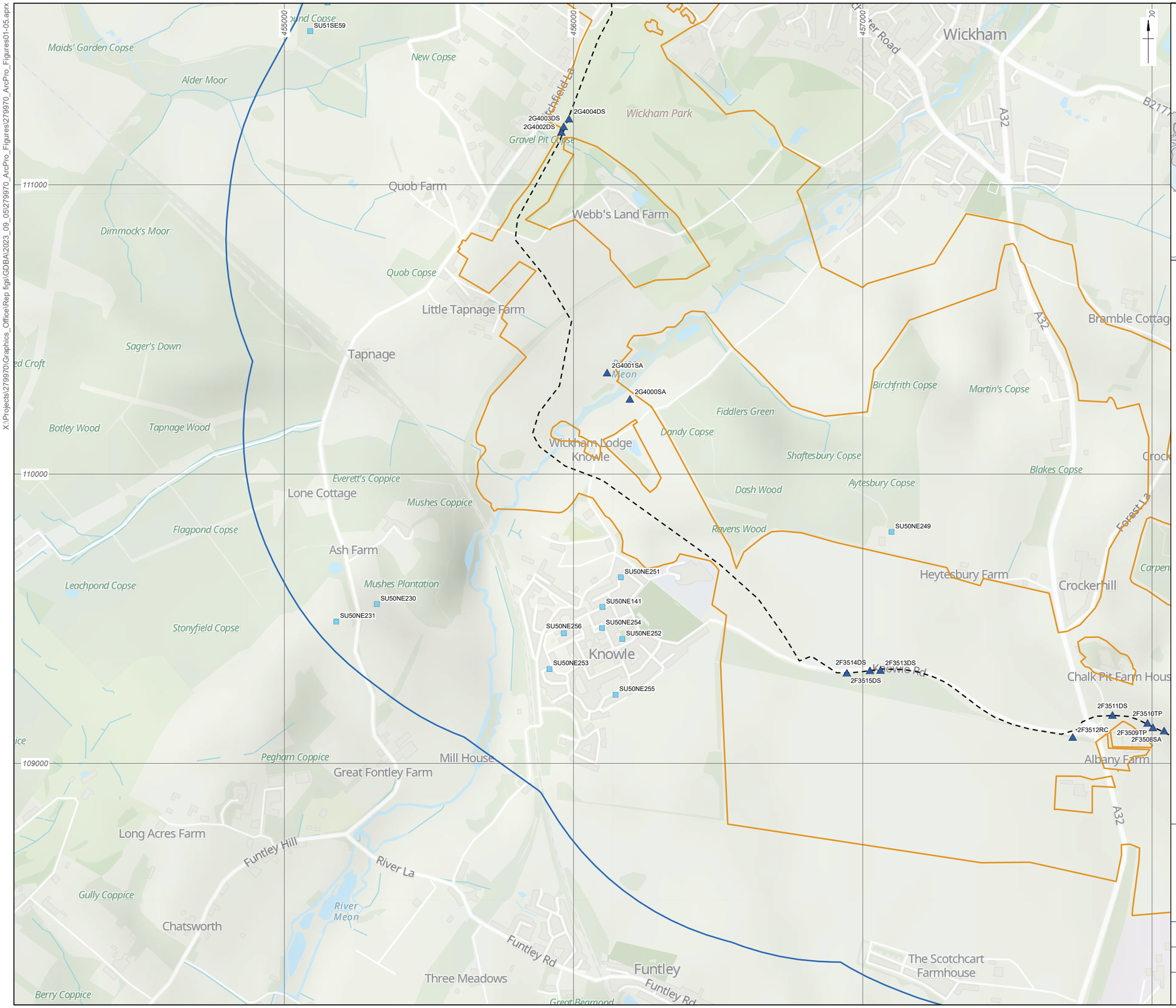
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Figure 2e: Project plan

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Coordinate system: OSGB 1936 British National Grid

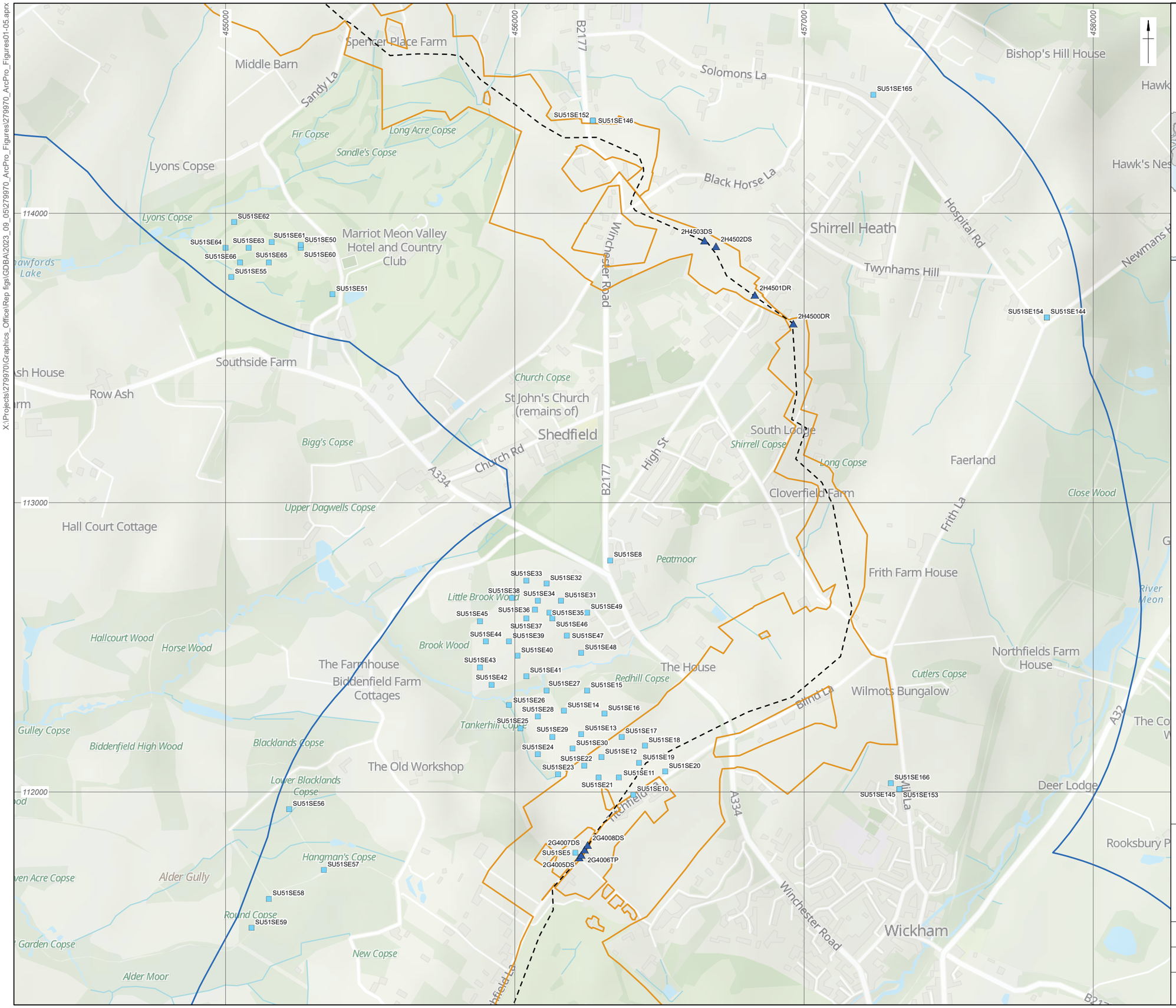
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Figure 2f: Project plan

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Coordinate system: OSGB 1936 British National Grid

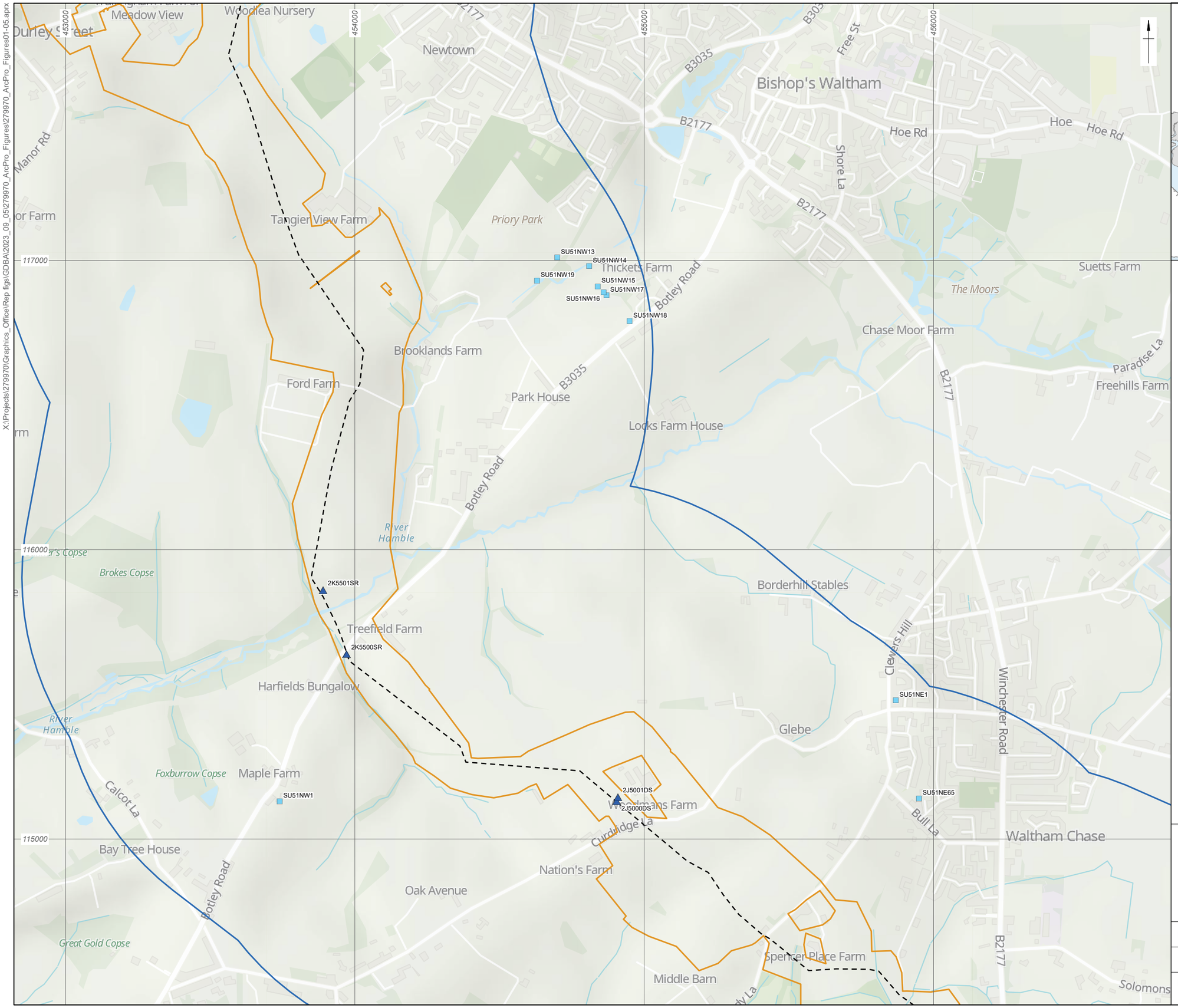
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Figure 2g: Project plan

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Figure 2h: Project plan

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451000 452000 453000 454000

120000 119000 118000

B2177 B3037

Rowlay Farm
White Hill
Sweet Briar Cottage
Upham
Deeps Bushes Copse
Deeps Copse
Thistle Ridge Farm
SU52SW24
Upham Copse
Cawtes Copse
SU52SW15
Dell House
Bushy Copse
Newdeeps Farm
The Beeches
Upham St
Popes Farm
SU51NW5
SU51NW32
Slappinrail Copse
Stroudwood La
Tylers Copse
Stakes La
Peak La
Peak Copse
Blackmans Copse
Lower Upham
Footpath Copse
Stakes Farm
Hawthorns Farm
Winchester Road
Redlands Copse
Mount Pleasant Farm
2K5503DS
2K5502DS
SU51NW29
King George Farm
Cross La
Alma La
Compton Cottage Farm
SU51NW24
SU51NW33
Woodstreet Farm
SU51NW21
SU51NW35
Cross Lanes Farm
SU51NW25
SU51NW26
SU51NW3
Winchester Road
Herons Foot Barn
Moplands Copse
Kmbers Copse
Winter's Hill
Coach House
SU51NW2
Durley House
SU51NW31
SU51NW30
Giles Farm
Broke Close Farm
SU51NW34
Scivier's La
Trullingham Farm or Meadow View
Woodlea Nursery
Durley Street
Longlands Copse
Noyces Copse
Parker's Copse
Greenwood Manor
Newtown

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

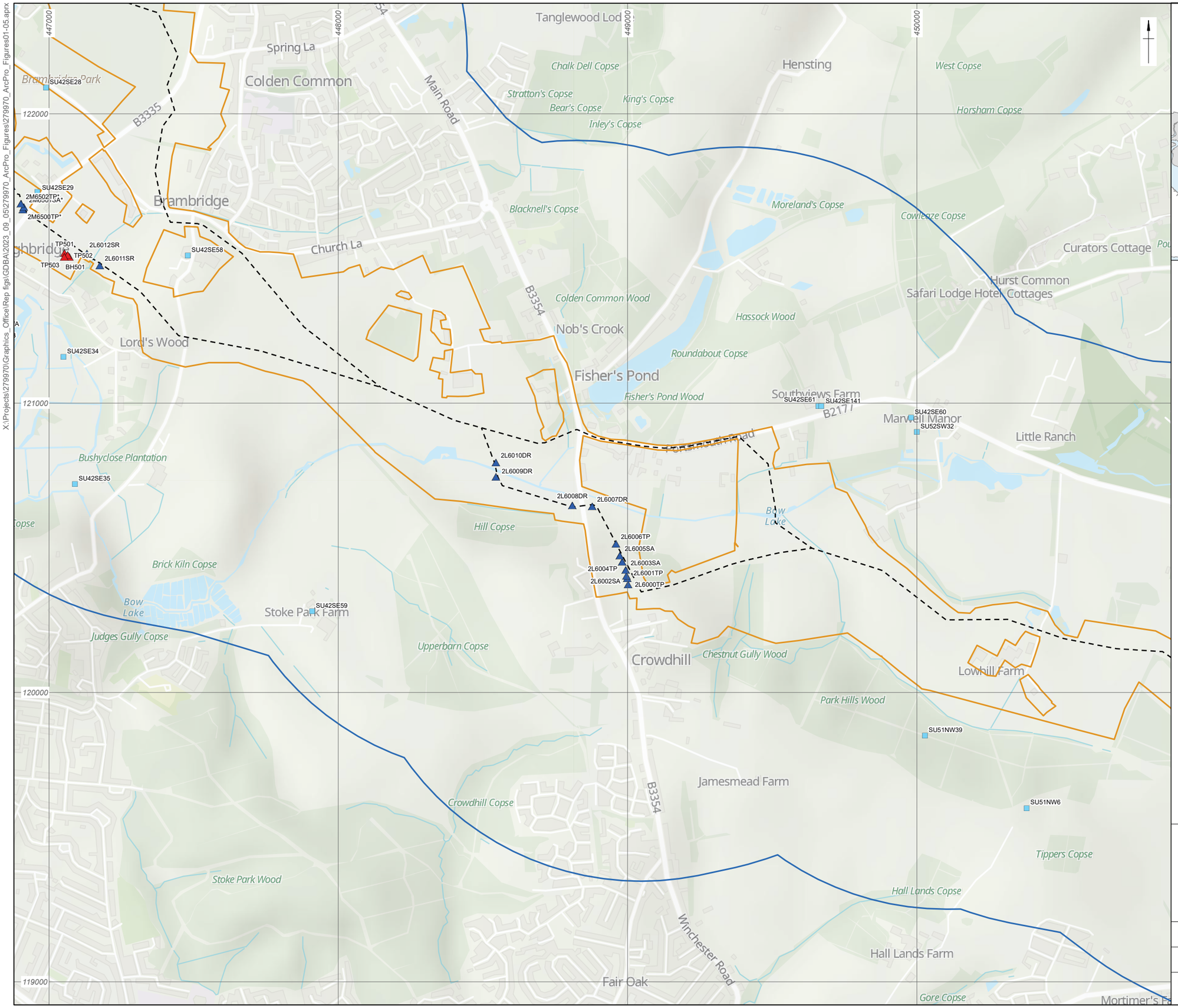
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Figure 2i: Project plan

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Coordinate system: OSGB 1936 British National Grid

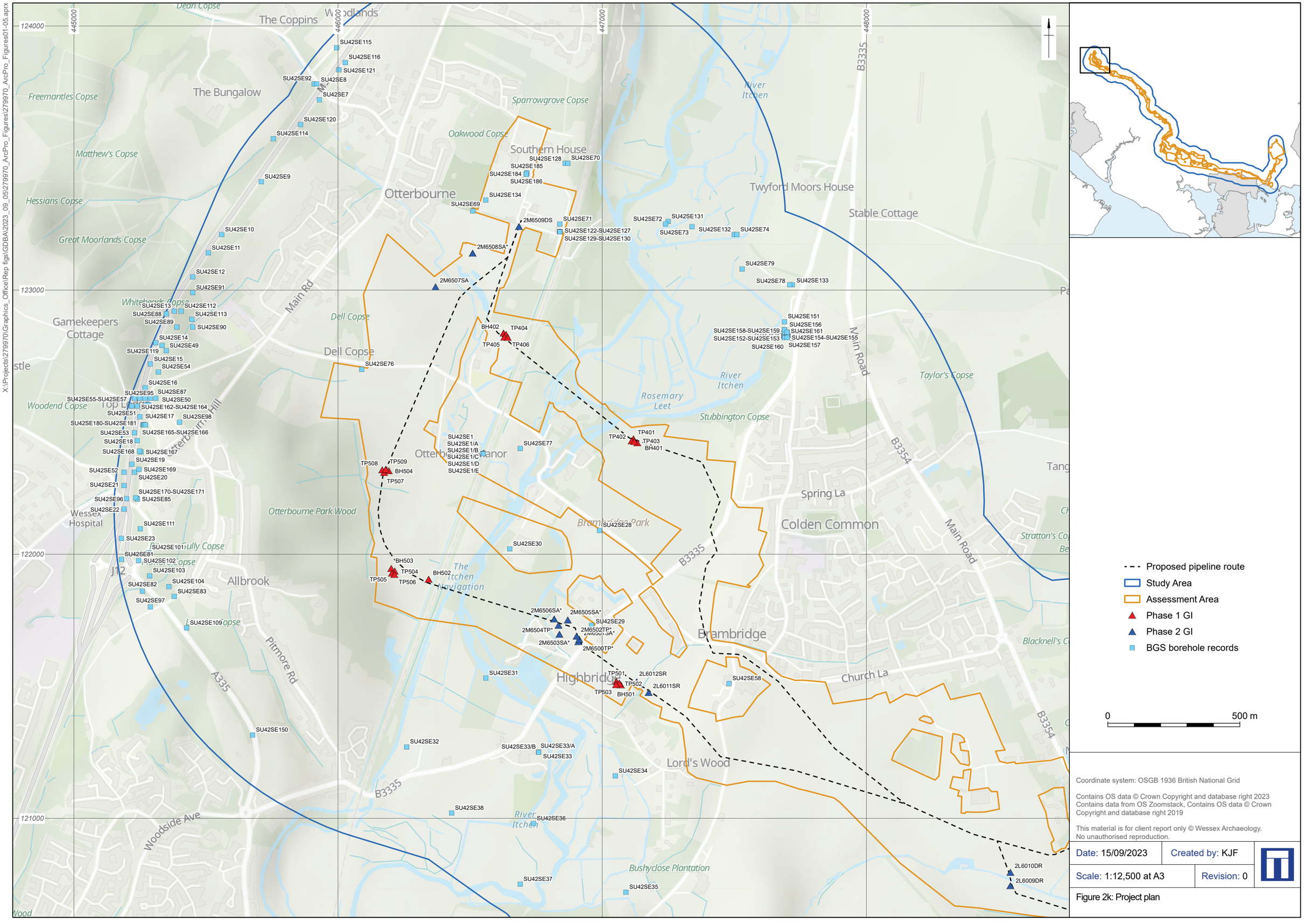
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Figure 2j: Project plan

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Figure 2k: Project plan

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470000 471000 472000 473000

111000 110000 109000

LAMBETH GROUP - CLAY, SILT AND SAND

LONDON CLAY FORMATION - SAND

BOGNOR SAND MEMBER - SAND

SU71SW13 SU71SW144 SU71SW143 SU71SW146 SU71SW147 SU71SW15 SU71SW16 SU71SW134 SU71SW141 SU71SW135 SU71SW136 SU71SW14 SU71SW140 SU71SW137 SU71SW142 SU71SW12 SU71SW13 SU71SW139 SU71SW145 SU71SW11 SU71SW138 SU71SW9 SU71SW53 SU71SW10 SU71SW8 SU71SW82 SU71SW83 SU70NW276 SU70NW318 SU70NW325 SU70NW323 SU70NW324 SU70NW321 SU70NW320 SU70NW322 SU70NW319 TP116 BH110 TP117 SU70NW244 TP110 BH108 BH109 TP112 TP113 TP111 TP114 TP115

A3(M) B2149 B2148 B2150 J3

Padnell Cuts Wood Horse Lot Hill Stein Wood Forest of Bere Links La Bowes Hill Park La Havant Thicket Long Wood The Forest Castle Rd Redhill Rd Furzy Plain Bell's Copse Tempest Ave Durrants Thicket Bottom Beech Wood Hammond's Lands Copse The Warren Hommick Copse The Lake Lock's Coppice Wakefords Way Middle Park Way Great Copse Leigh Park Neville's Park

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3a: Solid geology

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LONDON CLAY FORMATION - CLAY, SILT AND SAND

LONDON CLAY FORMATION - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

LAMBETH GROUP - CLAY, SILT AND SAND

PORTSDOWN CHALK FORMATION - CHALK

SPETISBURY CHALK MEMBER - CHALK

TARRANT CHALK MEMBER - CHALK

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 0 GI
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3b: Solid geology

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WITTERING FORMATION - SAND

WITTERING FORMATION - SAND, SILT AND CLAY

WHITECLIFF SAND MEMBER - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

LAMBETH GROUP - CLAY, SILT AND SAND

PORTSDOWN CHALK FORMATION - CHALK

TARRANT CHALK MEMBER - CHALK

SPETISBURY CHALK MEMBER - CHALK

NEWHAVEN CHALK FORMATION - CHALK

LEWES NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION, NEWHAVEN CHALK FORMATION, CULVER CHALK FORMATION AND PORTSDOWN CHALK FORMATION (UNDIFFERENTIATED) - CHALK

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3c: Solid geology

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461000 462000 463000 464000

108000 107000 106000

LONDON CLAY FORMATION - CLAY, SILT AND SAND

WITTERING FORMATION - SAND, SILT AND CLAY

WHITECLIFF SAND MEMBER - SAND

LAMBETH GROUP - CLAY, SILT AND SAND

PORTSDOWN CHALK FORMATION - CHALK

SPETISBURY CHALK MEMBER - CHALK

TARRANT CHALK MEMBER - CHALK

NEWHAVEN CHALK FORMATION - CHALK

LEWES NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION, NEWHAVEN CHALK FORMATION, CULVER CHALK FORMATION AND PORTSDOWN CHALK FORMATION (UNDIFFERENTIATED) - CHALK

SU60NW105 SU60NW154 SU60NW106 SU60NW153 SU60NW152 SU60NW107 SU60NW108 SU60NW109 SU60NW110 SU60NW111 SU60NW112 SU60NW84-SU60NW91 SU60NW95-SU60NW99 SU60NW155 SU60NW150 SU60NW83 SU60NW151 SU60NW140 SU60NW5 SU60NW137 SU60NW138 SU60NW139 SU60NW198 SU60NW190 SU60NW82/A-H SU60NW30 SU60NW33 SU60NW34 SU60NW36 SU60NW204 SU60NW214 SU60NW37 SU60NW38 SU60NW39 SU60NW191 SU60NW79 SU60NW76

2E3008TP 2E3007TP 2E3006TP

Southwick Ham Coppice Ham Farm Back La West St High St Ham Rd Keepers Cottage Coller Row Perridge's Coppice Stroud Coppice B2177 The Wilderness Dairy Clump Southwick Park Lake Compthouse Moor Coppice Compthouse Farm Sawyer's Wood Hookhea Bunga Pitymoor Cop Coppice Plantation Venables Copp Tree Coppice Pinsley Plantation Bushy Coppice Pinsley Lodge New Barns Farm Crooked La Otterwell Farm Barn Easter La Monumental La Mountemoor's Coppice Pigeon House Bungalow James Callaghan Dr Skew Rd Nelson La Hill Rd Portsdown Hill Rd Portsview Ave Jubilee Ave Allaway Ave Portchester A27

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3d: Solid geology

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458000
459000
460000
110000
109000
108000
107000

WITTERING FORMATION - SAND, SILT AND CLAY

LONDON CLAY FORMATION - CLAY, SILT AND SAND

WHITECLIFF SAND MEMBER - SAND

LAMBETH GROUP - CLAY, SILT AND SAND

PORTSDOWN CHALK FORMATION - CHALK

SPETISBURY CHALK MEMBER - CHALK

LAMBETH GROUP - CLAY, SILT AND SAND

Orchard Copse
Dirty Ground Copse
Crockerhill Farm
Blakes Copse
Misty Hollow
Yewtree Row
Staversash Copse
The Hanger
Carmans Copse
Heytesbury Farm
Crockerhill
Carpenters Copse
Chancellors Copse
Homerhill Copse
Prior's Hold Farm
Bucks Copse
Carman Farm
Pigeonhouse Coppice
Dere Farm
Chalk Pit Farm House
Gravelhole Copse
Boarhunt
Grub Coppice
Albany Farm
Wallington River
Mill Coppice
Moor Coppice
Dirtystile Copse
Ashleydown
The Scotchcart Farmhouse
The Lodge
North Fareham
Nine Elms La
Pook La
Spurlings Rd
Boarhunt Rd
Monument Farm
Fort Nelson
Portsdown Hill Rd
Old Turnpike
Park La
Standard Way
Wallington
M27
J10
A32

SU50NE249
SU60NW184
SU60NW185
SU60NW183
SU60NW146
SU60NW182
SU60NW177
SU60NW100
SU60NW102
SU60NW181
SU50NE279
SU50NE207
SU60NW180
SU60NW145
SU60NW101
SU50NE205
SU50NE206
SU50NE204
SU60NW178
SU60NW179
SU50NE203
SU50NE236
SU60NW149
SU60NW147
SU50NE202
SU60NW144
SU60NW148
SU60NW141

2F3513DS
2F3514DS
2F3511DS
2F3509TP
2F3508SA
2F3512RC
2F3510TP
2F3506TP
2F3507SA
2F3506DS
2F3504DS
2F3502SA
2F3501DS
2F3500DS

SU50NE239
SU50NE109
SU50NE110
SU50NE101
SU50NE103
SU50NE107
SU50NE105
SU50NE126
SU50NE127
SU50NE131
SU50NE129

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0
500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3e: Solid geology

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455000
456000
457000
111000
110000
109000

WITTERING FORMATION - SAND, SILT AND CLAY
WITTERING FORMATION - SAND
WITTERING FORMATION - SAND, SILT AND CLAY
WHITECLIFF SAND MEMBER - SAND
LONDON CLAY FORMATION - CLAY, SILT AND SAND
SPETISBURY CHALK MEMBER - CHALK
LAMBETH GROUP - CLAY, SILT AND SAND
PORTSDOWN CHALK FORMATION - CHALK

SU51SE59
2G4004DS
2G4003DS
2G4002DS
2G4001SA
2G4000SA
SU50NE249
SU50NE251
SU50NE141
SU50NE254
SU50NE252
SU50NE256
SU50NE253
SU50NE255
SU50NE230
SU50NE231
2F3514DS
2F3513DS
2F3515DS
2F3511DS
2F3510TP
2F3512RC
2F3509TP
2F3508SA

Maids' Garden Copse
Alder Moor
New Copse
Wickham
Wickham Park
Gravel Pit Copse
Quob Farm
Webb's Land Farm
Dimmock's Moor
Quob Copse
Little Tapnage Farm
Sager's Down
Botley Wood
Tapnage Wood
Wickham Lodge
Knowle
Everett's Coppice
Lone Cottage
Mushes Coppice
Flagpond Copse
Ash Farm
Dash Wood
Ravens Wood
Heytesbury Farm
Crockerhill
Leachpond Copse
Mushes Plantation
Stonyfield Copse
Knowle
Chalk Pit Farm House
Peghorn Coppice
Mill House
Great Fontley Farm
Albany Farm
Long Acres Farm
Funtley Hill
River La
Gully Coppice
Chatsworth
River Meon
Funtley Rd
Three Meadows
Funtley
The Scotchcart Farmhouse
Berry Coppice
Great Beamond
Fiddlers Green
Dandy Copse
Birchfrith Copse
Martin's Copse
Shaftesbury Copse
Aytesbury Copse
Blakes Copse
Bramble Cottag
A32
B2177

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3f: Solid geology

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455000 456000 457000 458000

114000 113000 112000

EARNLEY SAND FORMATION - SAND, SILT AND CLAY

WITTERING FORMATION - SAND, SILT AND CLAY

WHITECLIFF SAND MEMBER - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

SU51SE62 SU51SE64 SU51SE63 SU51SE61 SU51SE50 SU51SE66 SU51SE65 SU51SE60 SU51SE55 SU51SE51 SU51SE56 SU51SE57 SU51SE58 SU51SE59

SU51SE152 SU51SE146 SU51SE165 SU51SE154 SU51SE144 SU51SE166 SU51SE145 SU51SE153

SU51SE8 SU51SE33 SU51SE32 SU51SE38 SU51SE34 SU51SE31 SU51SE49 SU51SE45 SU51SE36 SU51SE35 SU51SE46 SU51SE37 SU51SE44 SU51SE39 SU51SE47 SU51SE48 SU51SE40 SU51SE43 SU51SE41 SU51SE42 SU51SE27 SU51SE15 SU51SE26 SU51SE14 SU51SE16 SU51SE28 SU51SE25 SU51SE29 SU51SE13 SU51SE17 SU51SE18 SU51SE24 SU51SE30 SU51SE12 SU51SE22 SU51SE19 SU51SE23 SU51SE20 SU51SE11 SU51SE21 SU51SE10

2H4503DS 2H4502DS 2H4501DR 2H4500DR

2G4007DS 2G4008DS SU51SE5 2G4006TP 2G4005DS

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3g: Solid geology

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453000
454000
455000
456000
117000
116000
115000

CULVER CHALK FORMATION - CHALK

LAMBETH GROUP - SAND

LAMBETH GROUP - CLAY, SILT AND SAND

BOGNOR SAND MEMBER - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

EARNLEY SAND FORMATION - SAND, SILT AND CLAY

WHITECLIFF SAND MEMBER - SAND

WITTERING FORMATION - SAND, SILT AND CLAY

SU51NW13
SU51NW14
SU51NW19
SU51NW15
SU51NW17
SU51NW16
SU51NW18
2K5501SR
2K5500SR
SU51NW1
2J5001DS
2J5000DS
SU51NE1
SU51NE65

Bishop's Waltham
Newtown
Priory Park
Thickets Farm
Suetts Farm
The Moors
Chase Moor Farm
Freehills Farm
Brooklands Farm
Ford Farm
Park House
Lodks Farm House
Borderhill Stables
Treefield Farm
Harfields Bungalow
Glebe
Bay Tree House
Nation's Farm
Oak Avenue
Middle Barn
Spencer Place Farm
Waltham Chase
Meadow View
Woodlea Nursery
Tangier View Farm
Brokes Copse
Great Gold Copse

Manor Rd
Botley Road
Shore La
Hoe Rd
Hoe
Free St
Curridge La
Bull La
Paradise La
Clewers Hill
Winchester Road
River Hamble
B2177
B3035

- - - Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3h: Solid geology

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451000
452000
453000
454000
120000
119000
118000

LAMBETH GROUP - CLAY, SILT AND SAND

CULVER CHALK FORMATION - CHALK

LAMBETH GROUP - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

SU52SW24
SU52SW15
SU51NW5
SU51NW32
2K5503DS
2K5502DS
SU51NW29
SU51NW24
SU51NW33
SU51NW21
SU51NW35
SU51NW25
SU51NW26
SU51NW3
SU51NW2
SU51NW31
SU51NW30
SU51NW34

B2177
B3037
Rowley Farm
White Hill
Sweet Briar Cottage
Upham
Deeps Bushes Copse
Deeps Copse
Thistle Ridge Farm
Cawtes Copse
Upham Copse
Dell House
Bushy Copse
The Beeches
Upham Ct
Popes Farm
Stakes La
Peak La
Peak Copse
Clappinrail Copse
Tylers Copse
Blackmans Copse
Footpath Copse
Stakes Farm
Lower Upham
Hawthorns Farm
Mount Pleasant Farm
Winchester Road
Redlands Copse
King George Farm
Cross La
Alma La
Compton Cottage Farm
Cross Lanes Farm
Kimbers Copse
Durley House
Herons Foot Barn
Coach House Cottage
Giles Farm
Brute Close Farm
Horton Farm
Scivier's La
Trullingham Farm or Meadow View
Woodlea Nursery
Durley Street
Newtown
Greenwood Manor
Longlands Copse
Noyces Copse
Parker's Copse

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3i: Solid geology

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LAMBETH GROUP - CLAY, SILT AND SAND

LAMBETH GROUP - SAND

CULVER CHALK FORMATION - CHALK

WHITECLIFF SAND MEMBER - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

WITTERING FORMATION - SAND, SILT AND CLAY

447000 448000 449000 450000

122000 121000 120000 119000

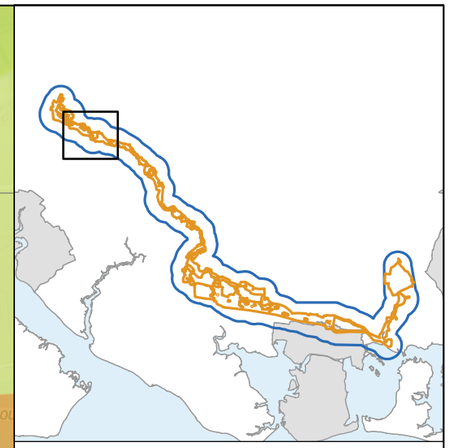
SU42SE28 SU42SE29 SU42SE58 SU42SE34 SU42SE35 SU42SE59 SU42SE61 SU42SE141 SU42SE60 SU52SW32 SU51NW39 SU51NW6

2M6502TP* 2M6500TP* 2M6503SA*

TP501 TP502 TP503 BH501 2L6012SR 2L6011SR

2L6010DR 2L6009DR 2L6008DR 2L6007DR 2L6006TP 2L6005SA 2L6003SA 2L6004TP 2L6001TP 2L6002SA 2L6000TP

Spring La Colden Common Tanglewood Lodge Chalk Dell Copse Stratton's Copse Bear's Copse King's Copse Inley's Copse Hensting West Copse Horsham Copse Main Road B3335 Brambridge Park Brambridge Church La Blacknell's Copse Moreland's Copse Covenanze Copse Curators Cottage Hurst Common Safari Lodge Hotel Cottages B3354 Colden Common Wood Hassock Wood Nob's Crook Lord's Wood Roundabout Copse Fisher's Pond Fisher's Pond Wood Southviews Farm B2177 Marwell Manor Little Ranch Bushyclose Plantation Hill Copse Brick Kiln Copse Bow Lake Stoke Park Farm Judges Gully Copse Upperbarn Copse Crowdhill Cheesefoot Head Lowhill Farm Park Hills Wood Jamesmead Farm Crowdhill Copse Stoke Park Wood Tippers Copse Hall Lands Copse Hall Lands Farm Winchester Road Fair Oak Gore Copse Mortimer's Hill



- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3j: Solid geology

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CULVER CHALK FORMATION - CHALK

NEWHAVEN CHALK FORMATION - CHALK

WHITECLIFF SAND MEMBER - SAND AND GRAVEL

WHITECLIFF SAND MEMBER - SAND

LONDON CLAY FORMATION - CLAY, SILT AND SAND

LAMBETH GROUP - CLAY, SILT AND SAND

LAMBETH GROUP - SAND

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 3k: Solid geology

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HEAD - CLAY, SILT, SAND AND GRAVEL

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4a: Superficial geology

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HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

BEACH AND TIDAL FLAT DEPOSITS - CLAY, SILT, SAND AND GRAVEL

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 0 GI
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4b: Superficial geology

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ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4c: Superficial geology

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461000
462000
463000
464000
108000
107000
106000

SU60NW105
SU60NW154
SU60NW106
SU60NW153
SU60NW152
SU60NW107
SU60NW108
SU60NW109
SU60NW110
SU60NW111
SU60NW112
SU60NW84-SU60NW91
SU60NW95-SU60NW99
SU60NW155
SU60NW150
SU60NW83
SU60NW151
SU60NW140
SU60NW5
2E3008TP
2E3007TP
2E3006TP
SU60NW137
SU60NW138
SU60NW139
SU60NW198
SU60NW190
SU60NW82/A-H
SU60NW30
SU60NW33
SU60NW34
SU60NW36
SU60NW204
SU60NW214
SU60NW37
SU60NW38
SU60NW39
SU60NW191
SU60NW79
SU60NW76

Southwick
Ham Coppice
Ham Road
Ham Farm
Back La
West St
High St
The Wilderness
Dairy Clump
Compthouse Moor Coppice
Keydown Coppice
Keepers Cottage
Collier Row
Hark Rd
B2177
Perrige's Coppice
Stroud Coppice
Compthouse Farm
Sawyer's Wood
Hookheath Bungalow
Pitymoor Coppice
Tree Coppice Plantation
Tree Coppice
Venables Coppice
Pinsley Plantation
Pinsley Lodge
Monument La
Portchester La
Crookwell Farm
Crooked Walk La
New Barns Farm
Mountemoor's Coppice
Pigeon House Bungalow
Portsdown Hill Rd
Nelson La
Skew Rd
James Callaghan Dr
Hill Rd
Portsview Ave
Jubilee Ave
Allaway Ave
Paulsgrove
M27
A27
Portchester

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4d: Superficial geology

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HEAD - CLAY, SILT, SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND AND GRAVEL

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4e: Superficial geology

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ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4f: Superficial geology

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ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND AND GRAVEL

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4g: Superficial geology

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CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

SU51NW13
SU51NW14
SU51NW19
SU51NW15
SU51NW17
SU51NW16
SU51NW18
2K5501SR
2K5500SR
SU51NW1
2J5001DS
2J5000DS
SU51NE1
SU51NE65

Proposed pipeline route
Study Area
Assessment Area
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4h: Superficial geology

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RIVER TERRACE DEPOSITS - SAND AND GRAVEL

CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4i: Superficial geology

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RIVER TERRACE DEPOSITS - SAND AND GRAVEL

CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

TUFA - TUFA, CALCAREOUS

Proposed pipeline route
Study Area
Assessment Area
Phase 1 GI
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4j: Superficial geology

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HEAD - CLAY, SILT, SAND AND GRAVEL

TUFA - TUFA, CALCAREOUS

HEAD - CLAY, SILT, SAND AND GRAVEL

CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND AND GRAVEL

TUFA - TUFA, CALCAREOUS

- Proposed pipeline route
- Study Area
- Assessment Area
- Phase 1 GI
- Phase 2 GI
- BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 4k: Superficial geology

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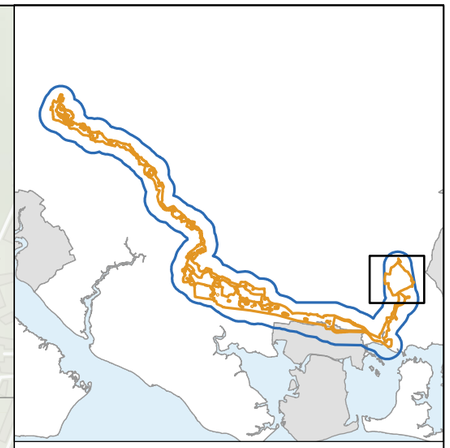
470000
471000
472000
473000
111000
110000
109000

A3(M)
B2149
B2148
B2150
J3

Padnell Cuts Wood
Blendworth Common
Horsecroft Hill
Stein Wood
Forest of Bere
Links La
Bowes Hill
Park La
Havant Thicket
Long Wood
The Forest
Castle Rd
Redhill Rd
Furzy Plain
Bell's Copse
Tempest Ave
Beech Wood
The Warren
Thicket Bottom
Durrants
Hammond's Lands Copse
Hommick Copse
The Lake
Thicket Lawn
Prospect La
Lock's Coppice
Wakefords Way
Middle Park Way
Great Copse
Leigh Park
Neville's Park

SU71SW144
SU71SW143
SU71SW146
SU71SW147
SU71SW15
SU71SW16
SU71SW134
SU71SW141
SU71SW135
SU71SW136
SU71SW137
SU71SW14
SU71SW140
SU71SW142
SU71SW12
SU71SW13
SU71SW139
SU71SW145
SU71SW11
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SU71SW53
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SU70NW325
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SU70NW324
SU70NW321
SU70NW320
SU70NW322
SU70NW319
TP116
BH110
TP117
SU70NW244
TP110
BH108
TP112
BH109
TP113
TP111
TP114
TP115

GCZ 1a
GCZ 1b
GCZ 2
GCZ 3



Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 1 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

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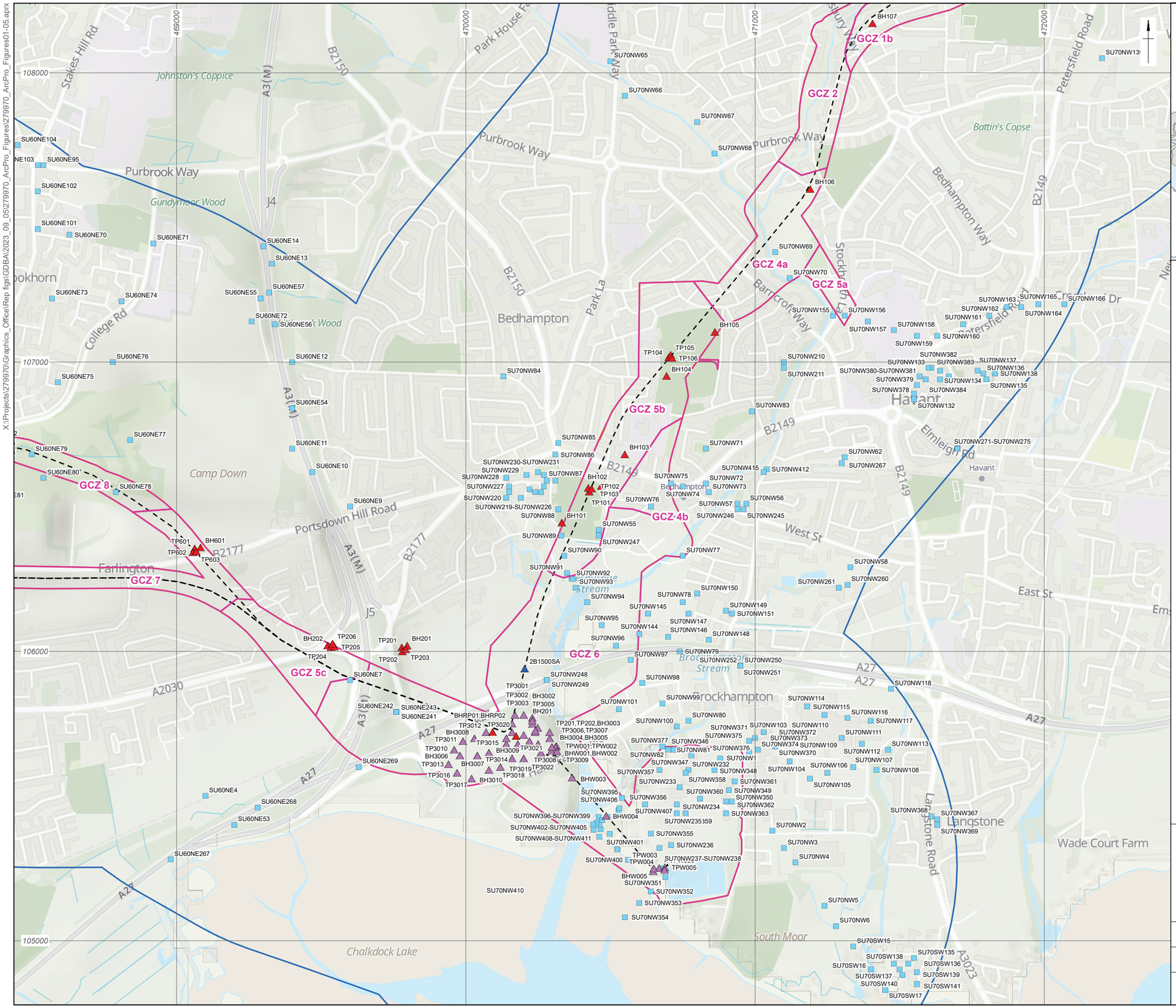
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Figure 5a: Geoarchaeological Character Zones

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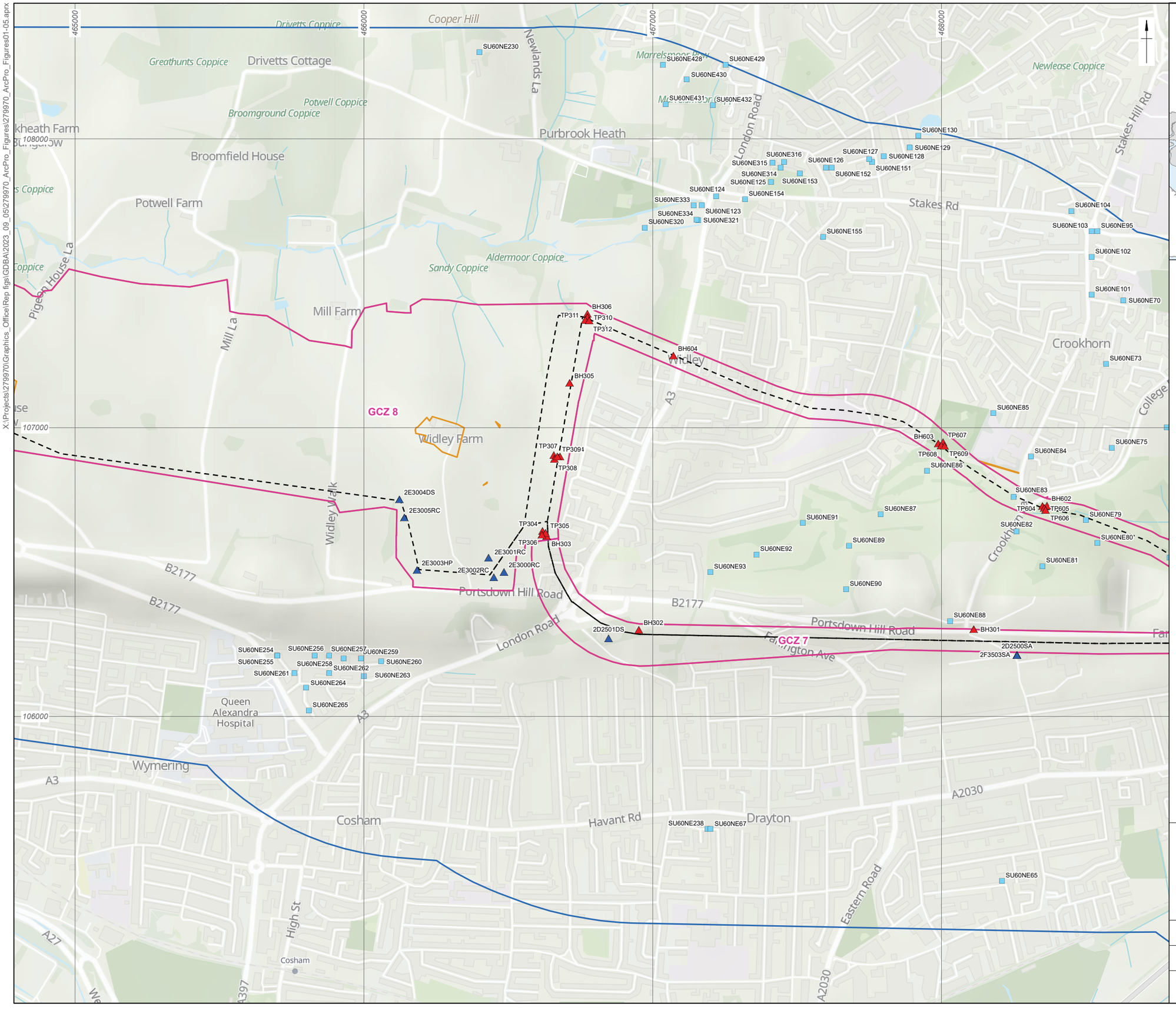
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Figure 5b: Geoarchaeological Character Zones

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Figure 5c: Geoarchaeological Character Zones

X:\Projects\279970\Graphics_Office\Rep figs\GDBA\2023_09_05\279970_ArcPro_Figures\279970_ArcPro_Figures01-05.aprx

461000 462000 463000 464000

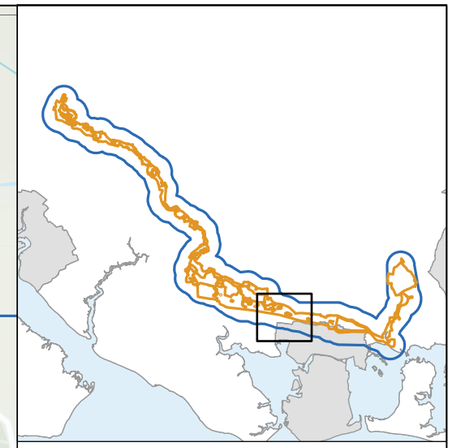
108000 107000 106000

Ham Coppice
Hobern Coppice
Southwick
Ham Rd
Ham Farm
Back La
West St
High St
Keepers Cottage
Collier Row
Stroud Coppice
Perrige's Coppice
The Wilderness
Dairy Clump
Southwick Park Lake
Comphouse Moor Coppice
Comphouse Farm
Sawyer's Wood
Offwell Farm
Monument La
Portchester La
Crooked Walk La
New Barns Farm
Pinsley Lodge
Pitymoor Coppice
Tree Coppice Plantation
Tree Coppice
Pinsley Plantation
Bushy Coppice
Mountemoor's Coppice
Portsdown Hill Rd
Nelson La
Skew Rd
Hill Rd
James Callaghan Dr
Portsview Ave
Jubilee Ave
Allaway Ave
Paulsgrove
Portchester
A27
M27
B2177
Pigeon House Bungalow

GCZ 9
GCZ 8

SU60NW105 SU60NW154 SU60NW106 SU60NW153 SU60NW152 SU60NW107 SU60NW84 SU60NW91 SU60NW95-SU60NW99 SU60NW108 SU60NW109 SU60NW110 SU60NW111 SU60NW112 SU60NW155 SU60NW150 SU60NW83 SU60NW151 SU60NW140 SU60NW5 SU60NW137 SU60NW138 SU60NW139 SU60NW198 SU60NW190 SU60NW82/A-H SU60NW30 SU60NW33 SU60NW34 SU60NW36 SU60NW204 SU60NW214 SU60NW37 SU60NW38 SU60NW39 SU60NW191 SU60NW79 SU60NW76

2E3008TP 2E3007TP 2E3006TP



- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Phase 2 GI
- BGS borehole records

0 500 m

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Figure 5d: Geoarchaeological Character Zones

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458000
459000
460000
110000
109000
108000
107000

Dirty Ground Copse
Orchard Copse
Blakes Copse
Misty Hollow
Yewtree Row
Staversash Copse
Carmans Copse
The Hanger
Forest La
Crockerhill Farm
Heytesbury Farm
Crockerhill
Carpenters Copse
Chancellors Copse
Homerhill Copse
Prior's Hold
Carman's Farm
Bucks Copse
Bere Farm
Pigeonhouse Coppice
Chalk Pit Farm House
Gravelhole Copse
Boarhunt
Grub Coppice
Mill Coppice
Albany Farm
Wallington River
Moor Coppice
Dirtystile Copse
Ashleydown
Hunt
The Scotchcart Farmhouse
The Lodge
North Fareham
Pook La
Nine Elms La
Spurlings Rd
Boarhunt Rd
Monument La
Monument Farm
Fort Nelson
Portsdown Hill Rd
Standard Way
Old Turnpike
A32
Park La
M27
J10
Wallington

GCZ 13
GCZ 11
GCZ 10
GCZ 9
GCZ 14
GCZ 12
GCZ 8

SU50NE249
SU60NW184
SU60NW185
SU60NW183
SU60NW146
SU60NW177
SU60NW182
SU60NW100
SU60NW102
SU60NW181
SU60NW145
SU60NW101
SU60NW180
SU50NE279
SU50NE207
SU50NE205
SU50NE206
SU50NE204
SU50NE203
SU50NE202
SU50NE236
SU60NW178
SU60NW179
SU60NW149
SU60NW147
SU60NW144
SU60NW148
SU60NW141
SU50NE239
SU50NE109
SU50NE110
SU50NE101
SU50NE103
SU50NE107
SU50NE105
SU50NE126
SU50NE127
SU50NE131
SU50NE129

2F3513DS
2F3514DS
2F3511DS
2F3509TP
2F3508SA
2F3512RC
2F3510TP
2F3506TP
2F3507SA
2F3506DS
2F3504DS
2F3502SA
2F3501DS
2F3500DS

Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 2 GI
BGS borehole records

0 500 m

Coordinate system: OSGB 1936 British National Grid

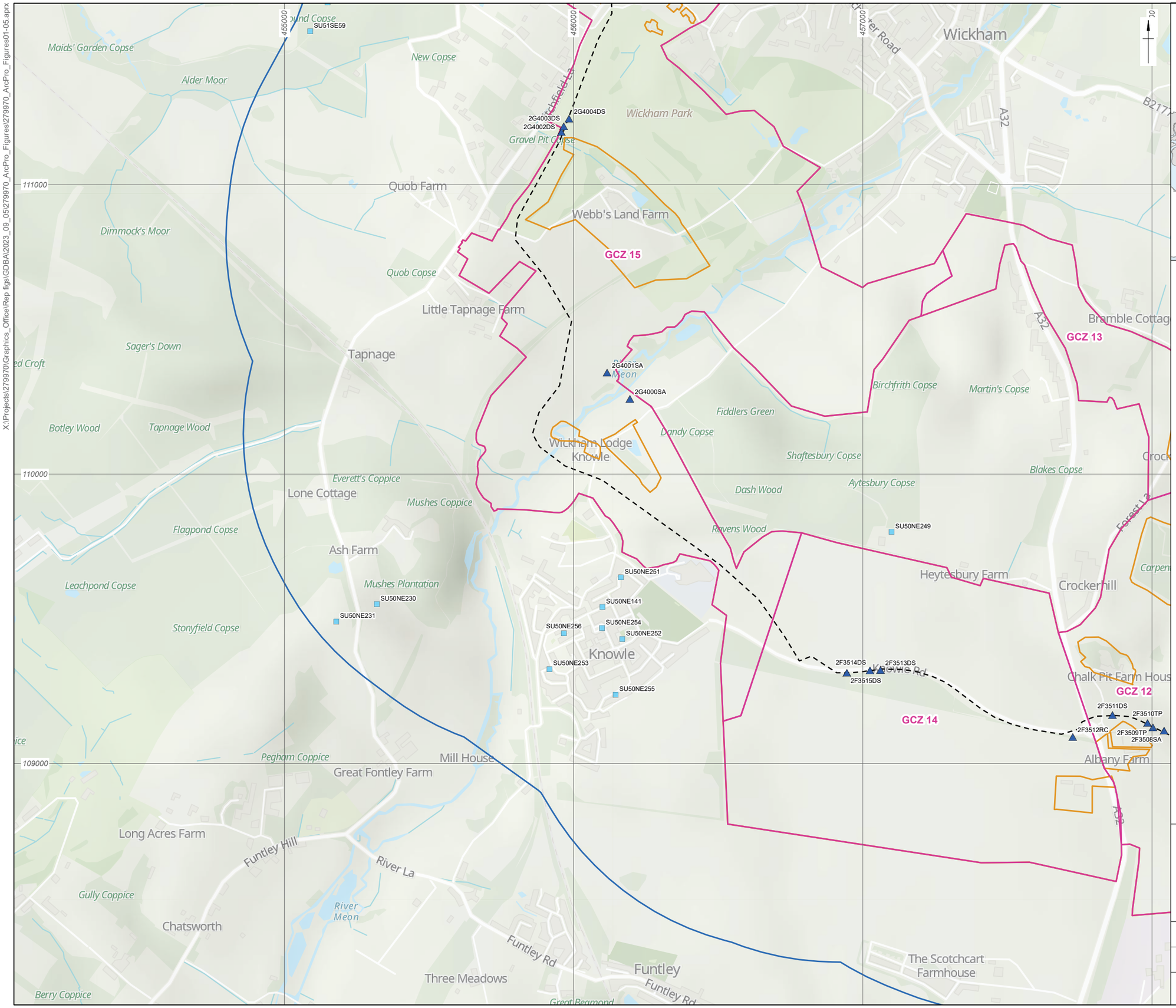
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Figure 5e: Geoarchaeological Character Zones

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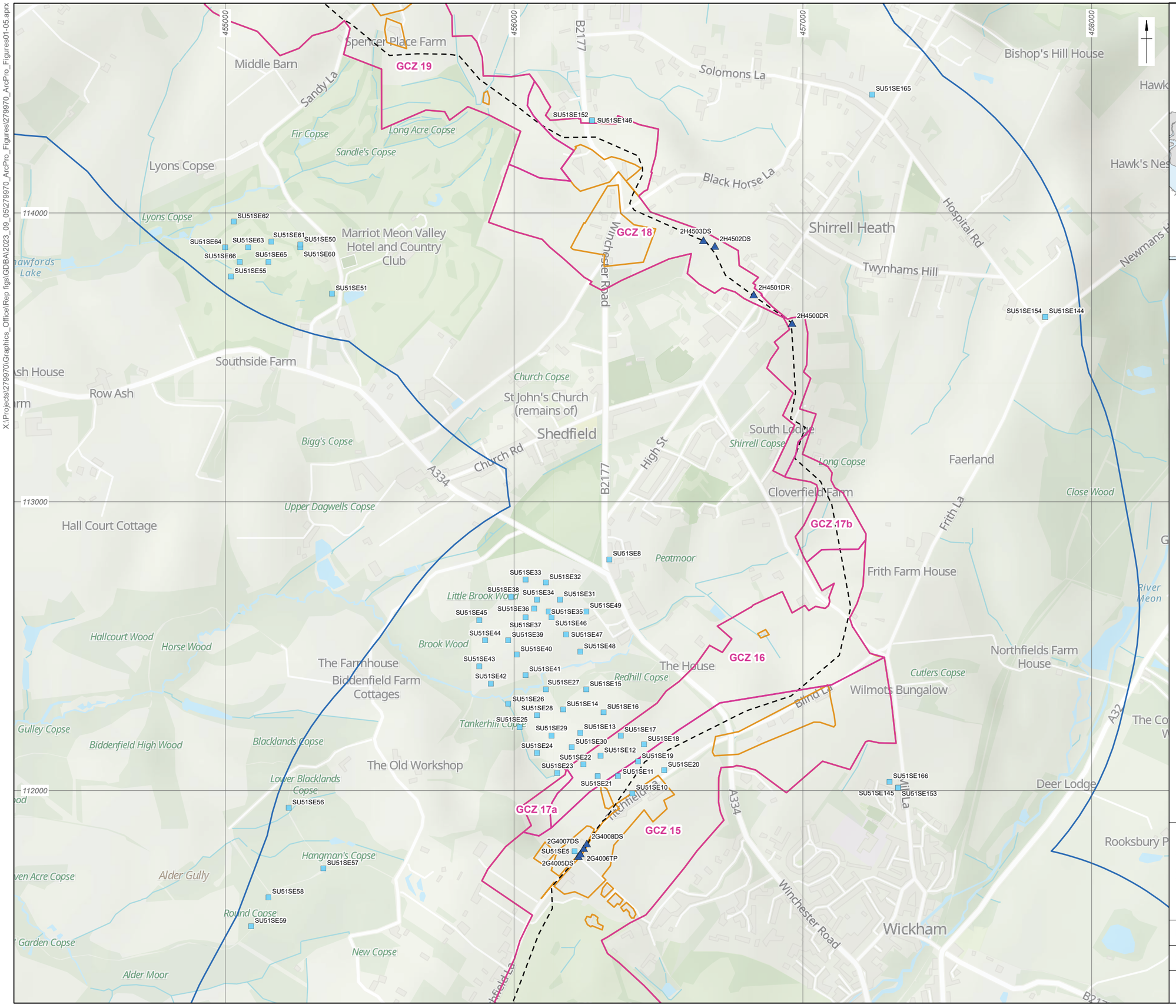
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Figure 5f: Geoarchaeological Character Zones

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Coordinate system: OSGB 1936 British National Grid

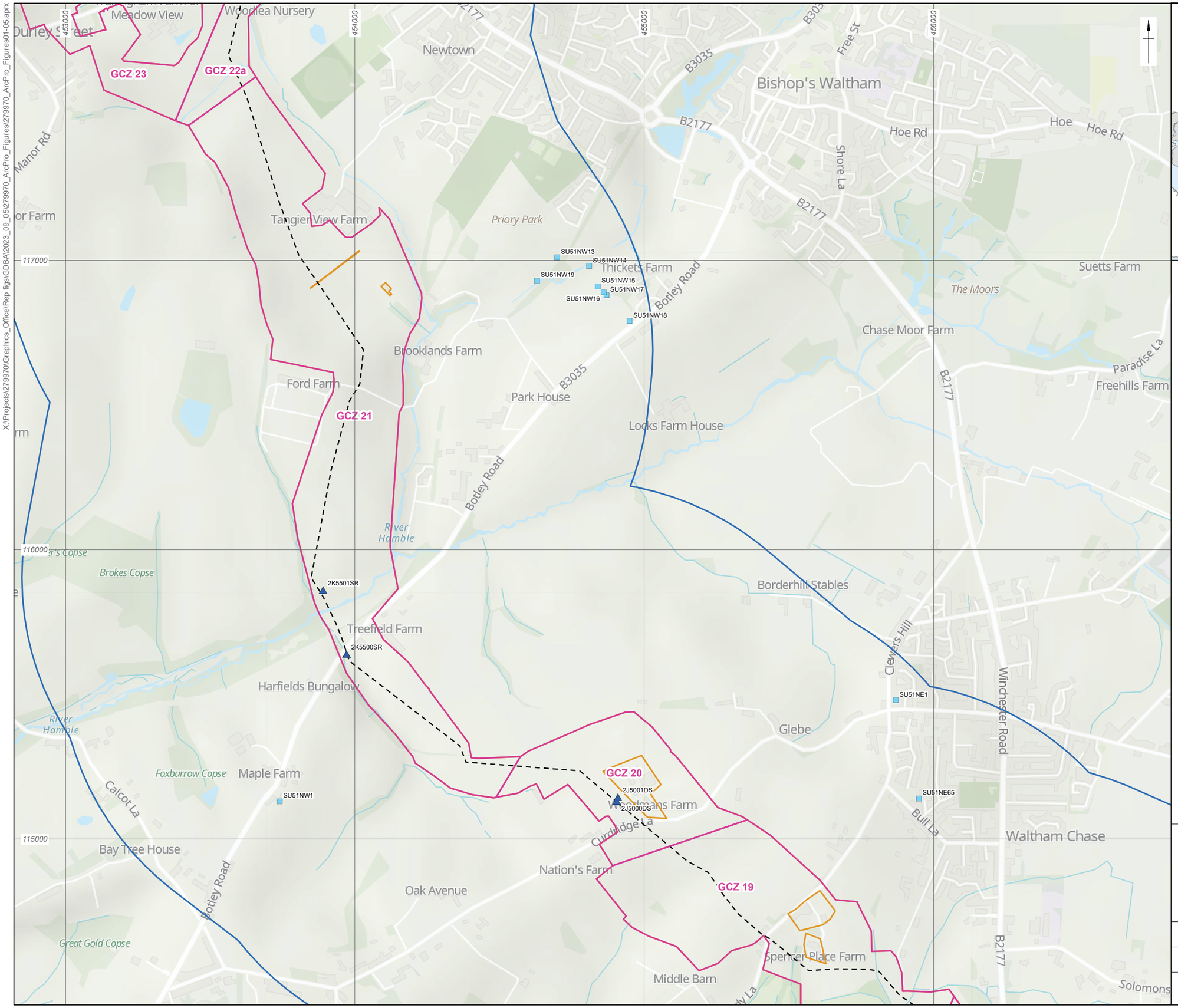
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Figure 5g: Geoarchaeological Character Zones

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Figure 5h: Geoarchaeological Character Zones

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451000
452000
453000
454000
120000
119000
118000

B2177
B3037
Rowlay Farm
White Hill
Sweet Briar Cottage
Deeps Bushes Copse
Deeps Copse
Thistle Ridge Farm
SU52SW24
Upham Copse
Cawtes Copse
SU52SW15
Dell House
Upham
Bushy Copse
Newdeeps Farm
The Beeches
Upham St
Popes Farm
SU51NW5
SU51NW32
Slappinrail Copse
Tylers Copse
Stroudwood La
Stakes La
Peak La
Peak Copse
Blackmans Copse
Lower Upham
Footpath Copse
Stakes Farm
Hawthorns Farm
Winchester Road
Redlands Copse
Mount Pleasant Farm
2K5503DS
2K5502DS
SU51NW29
King George Farm
Cross La
GCZ 23
Alma La
SU51NW24
SU51NW33
Woolstreet Farm
Compton Cottage Farm
SU51NW21
SU51NW35
Cross Lanes Farm
SU51NW25
SU51NW26
SU51NW3
Herons Foot Barn
Kimbers Copse
Winter's Hill
Coach House
SU51NW2
Durley House
SU51NW31
SU51NW30
Giles Farm
Broke Close Farm
SU51NW34
Scivier's La
GCZ 22b
Trullingham Farm or Meadow View
Woodlea Nursery
Durley Street
Longlands Copse
Noyces Copse
Parker's Copse
Greenwood Manor
GCZ 22a
GCZ 21
Newtown

Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 2 GI
BGS borehole records

0
500 m

Coordinate system: OSGB 1936 British National Grid

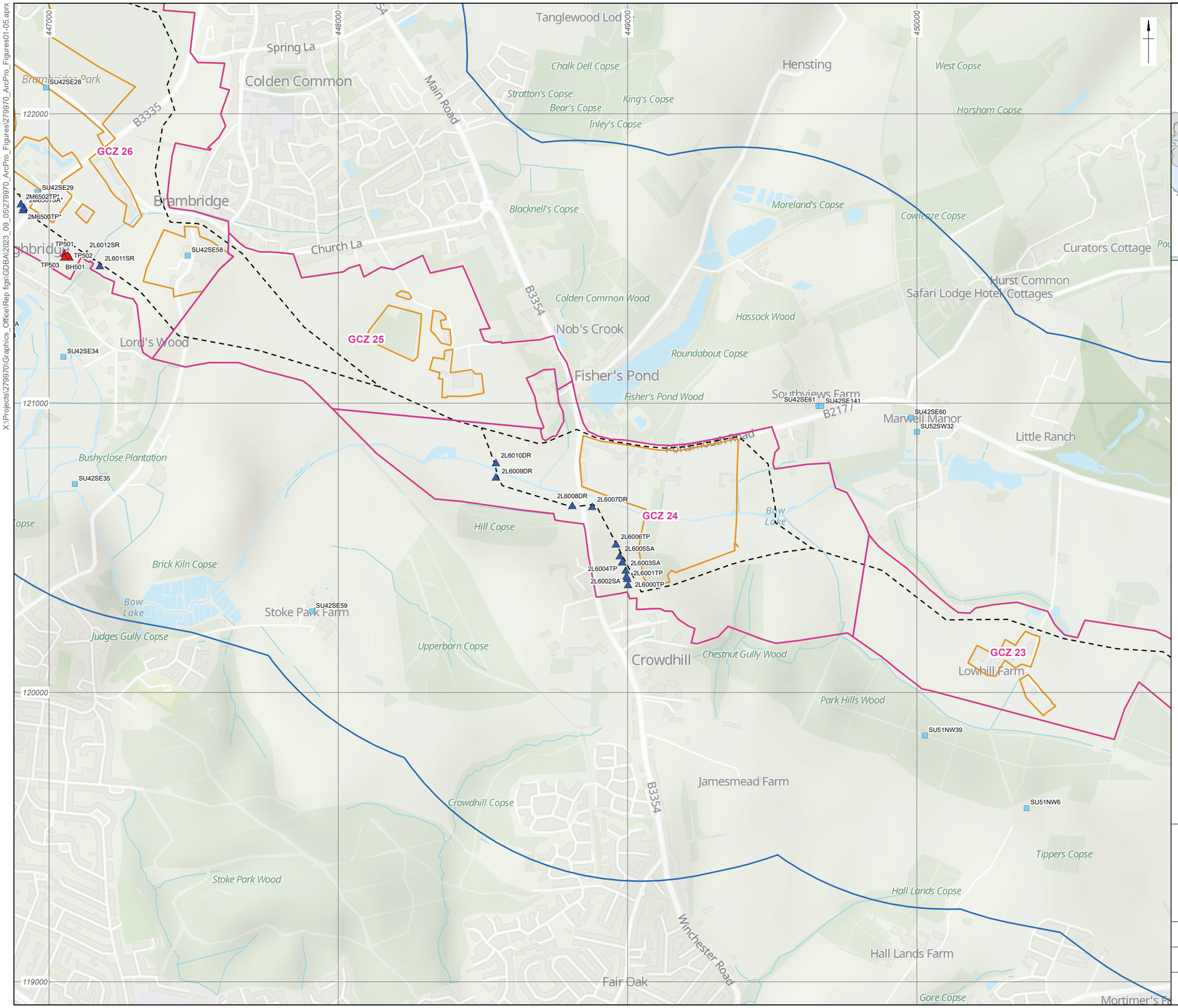
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Figure 5i: Geoarchaeological Character Zones

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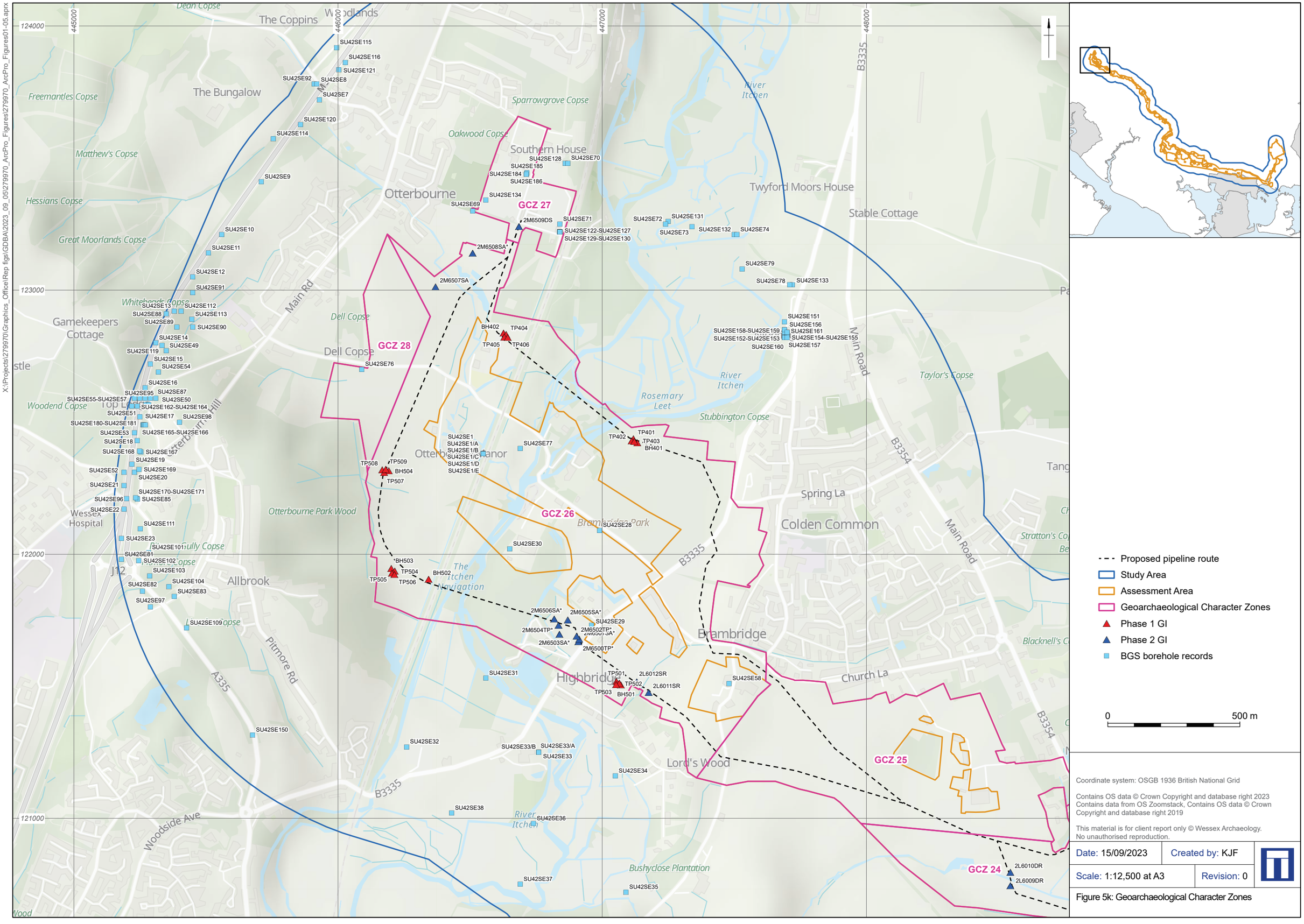
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Figure 5j: Geoarchaeological Character Zones

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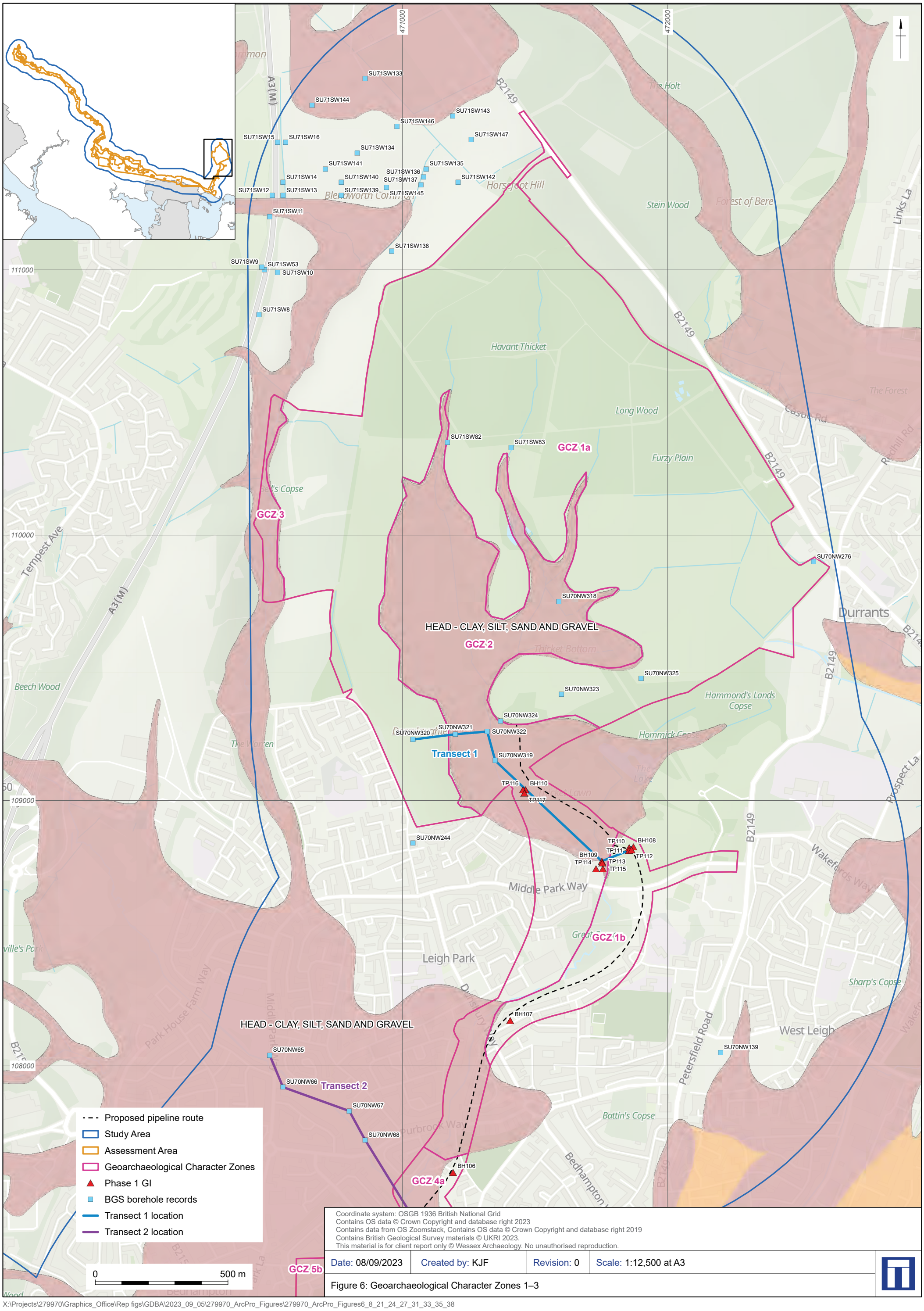
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Figure 5k: Geoarchaeological Character Zones



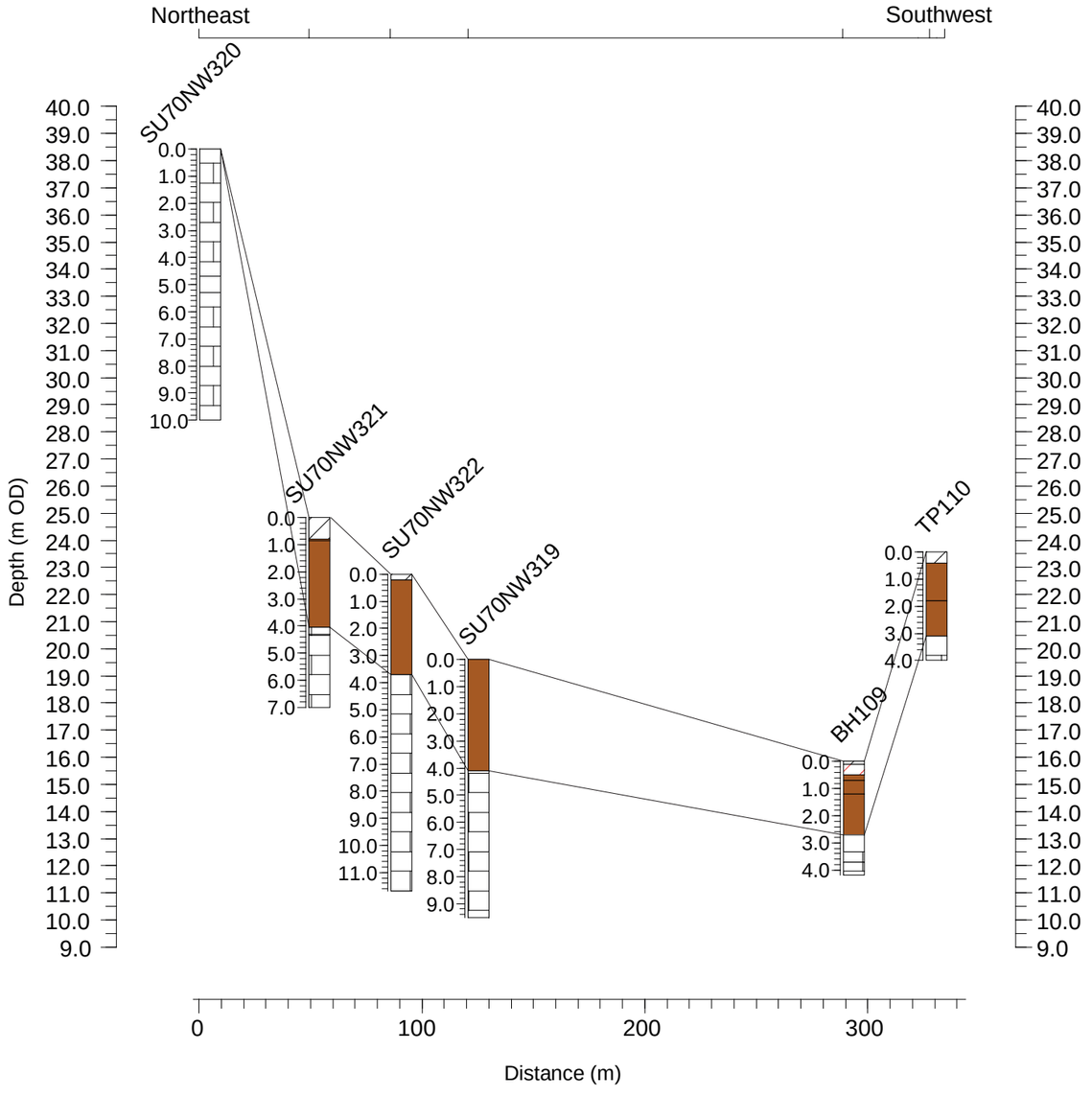
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Figure 6: Geoarchaeological Character Zones 1–3

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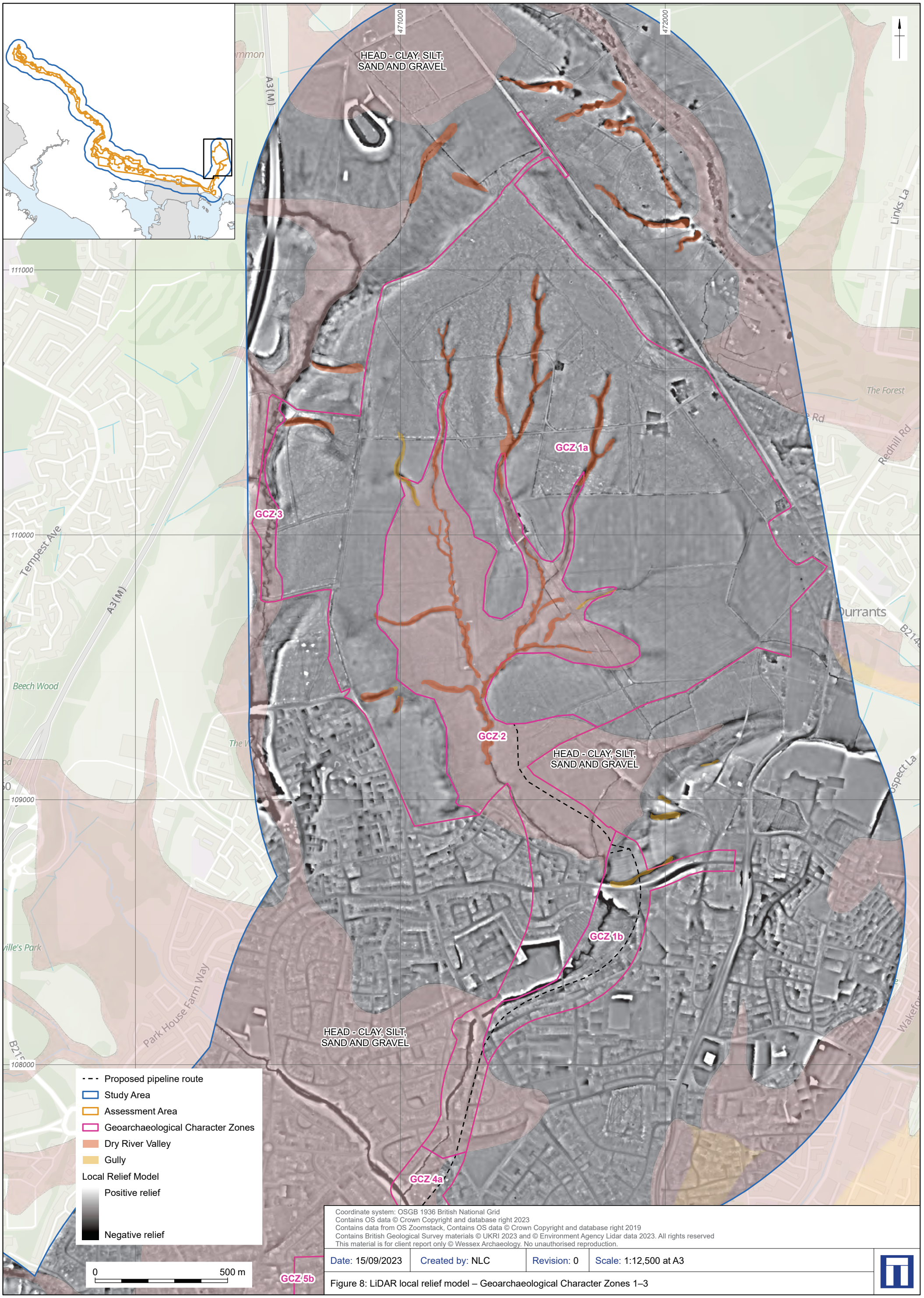
Stratigraphy

- Topsoil
- Head / Colluvium
- Made Ground
- Bedrock

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Figure 7: Transect 1 – Geoarchaeological Character Zone 2



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Figure 8: LiDAR local relief model – Geoarchaeological Character Zones 1–3

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HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

RAISED MARINE DEPOSITS - SAND AND GRAVEL

BEACH AND TIDAL FLAT DEPOSITS - CLAY, SILT, SAND AND GRAVEL

Transect 2 Transect 3 Transect 4 Transect 5 Transect 6

GCZ 1b GCZ 2 GCZ 4a GCZ 4b GCZ 5a GCZ 5b GCZ 5c GCZ 6 GCZ 7 GCZ 8

- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Phase 0 GI
- Phase 1 GI
- Phase 2 GI
- BGS borehole records
- Transect 2 location
- Transect 3 location
- Transect 4 location
- Transect 5 location
- Transect 6 location

PaMELA findspots
- Late Upper Palaeolithic
- Early Mesolithic
- Undated

HER data
- Mesolithic findspot

0 500 m

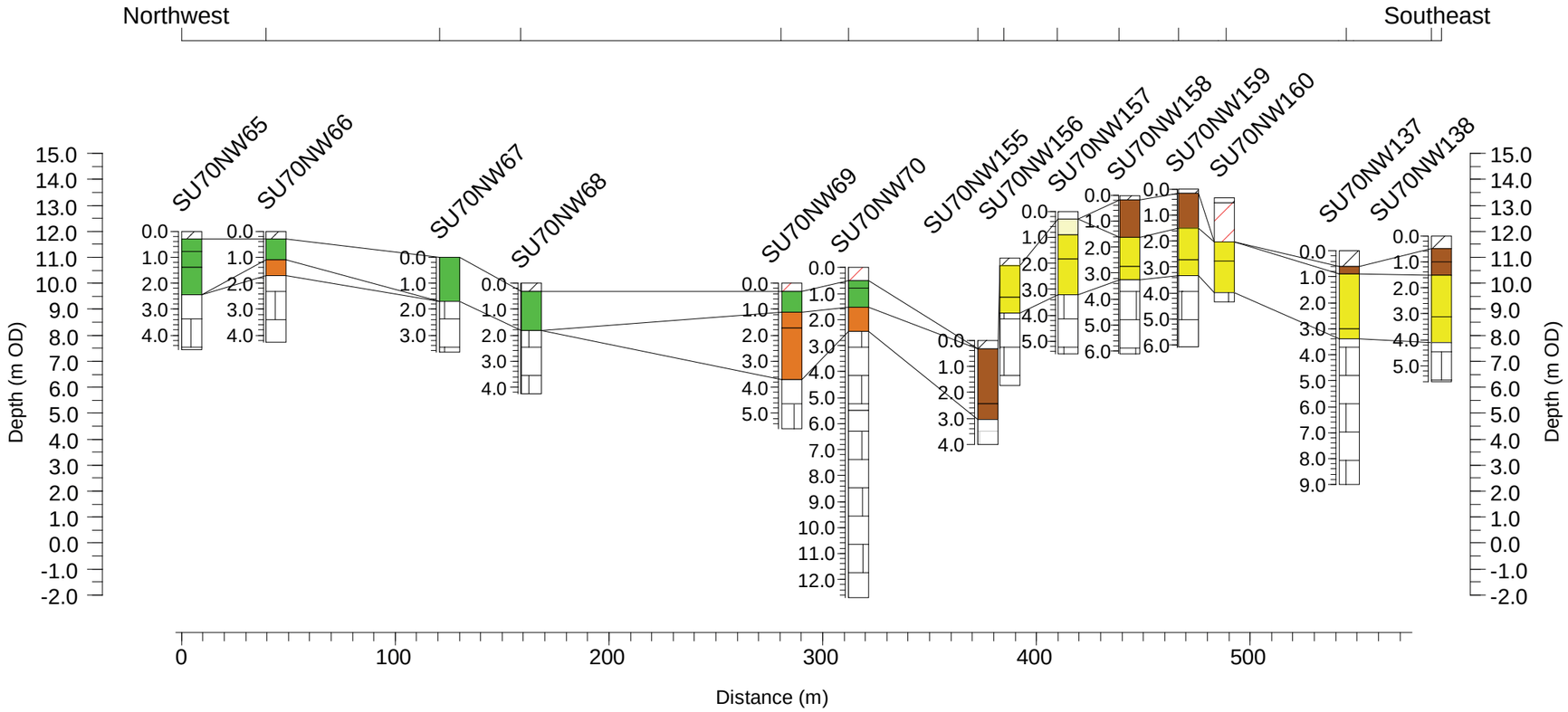
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Figure 9: Geoarchaeological Character Zones 4–6

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Stratigraphy

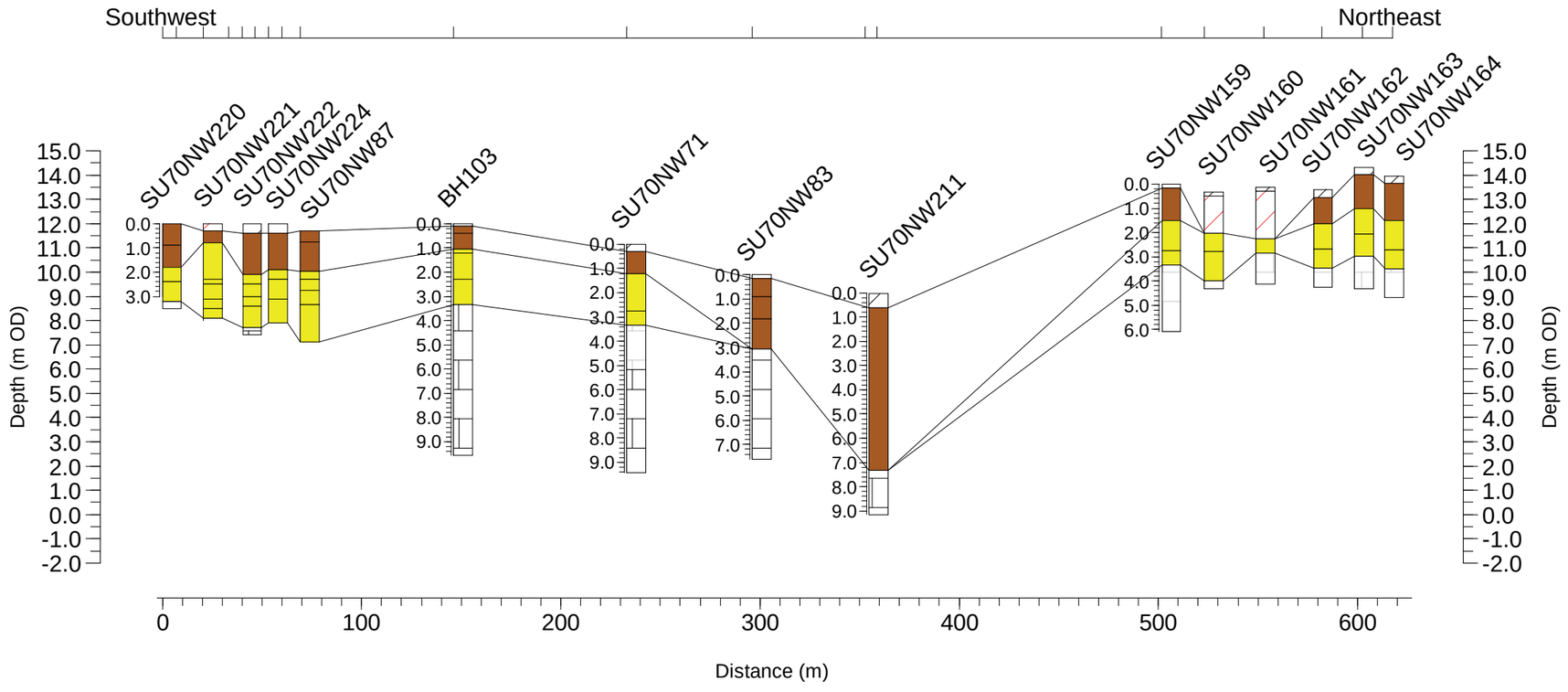
- Topsoil
- Made Ground
- Alluvium
- Head / Colluvium
- Possible Head / Colluvium
- Raised Beach Deposits
- Possible Raised Beach Deposits
- Bedrock
- Possible Bedrock

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Figure 10: Transect 2 – Geoarchaeological Character Zones 4a–5a

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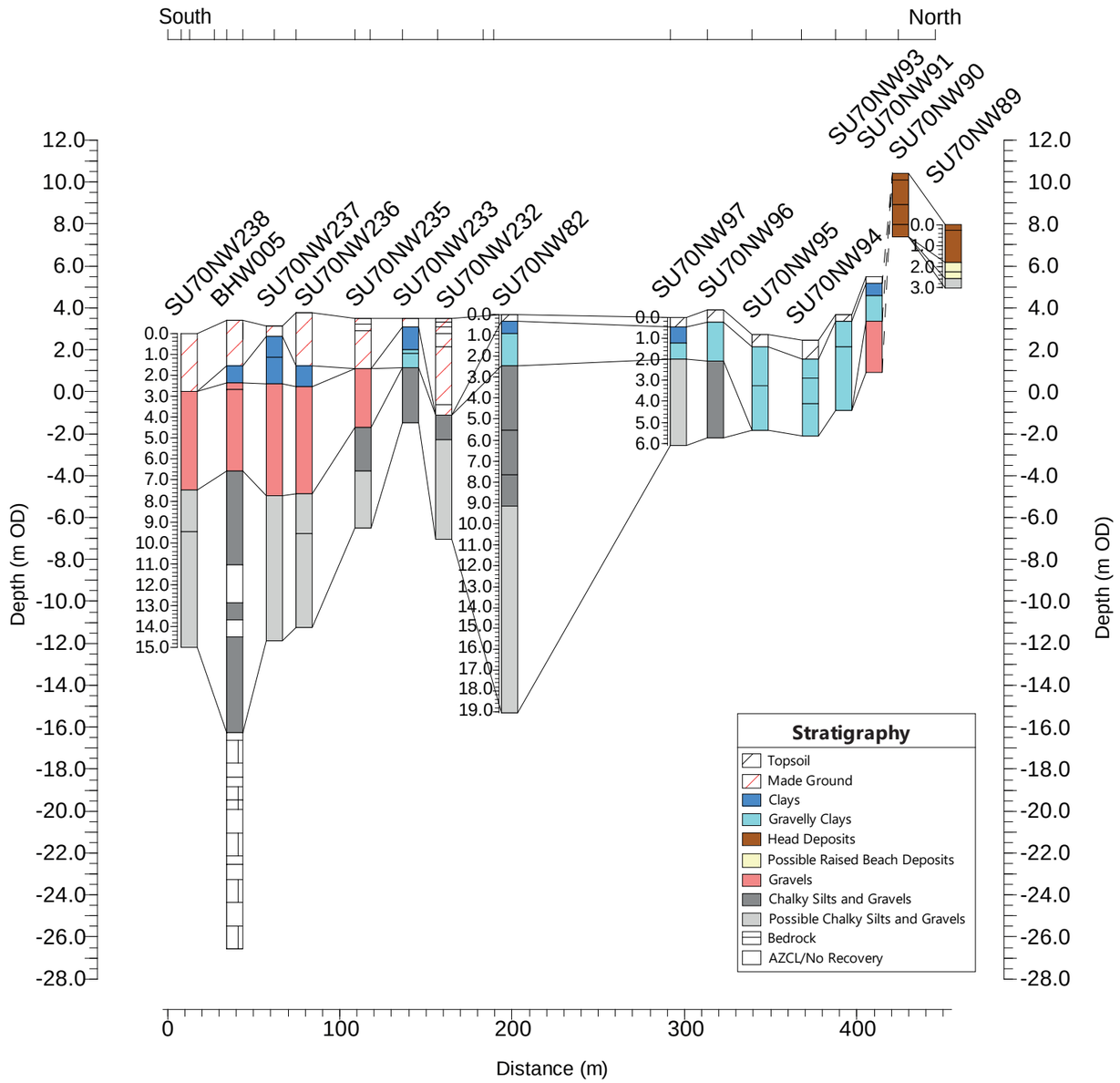
Stratigraphy
- Topsoil
- Made Ground
- Head Deposits
- Raised Beach Deposits
- Bedrock
- Possible Bedrock

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Figure 11: Transect 3 – Geoarchaeological Character Zones 5a–5b

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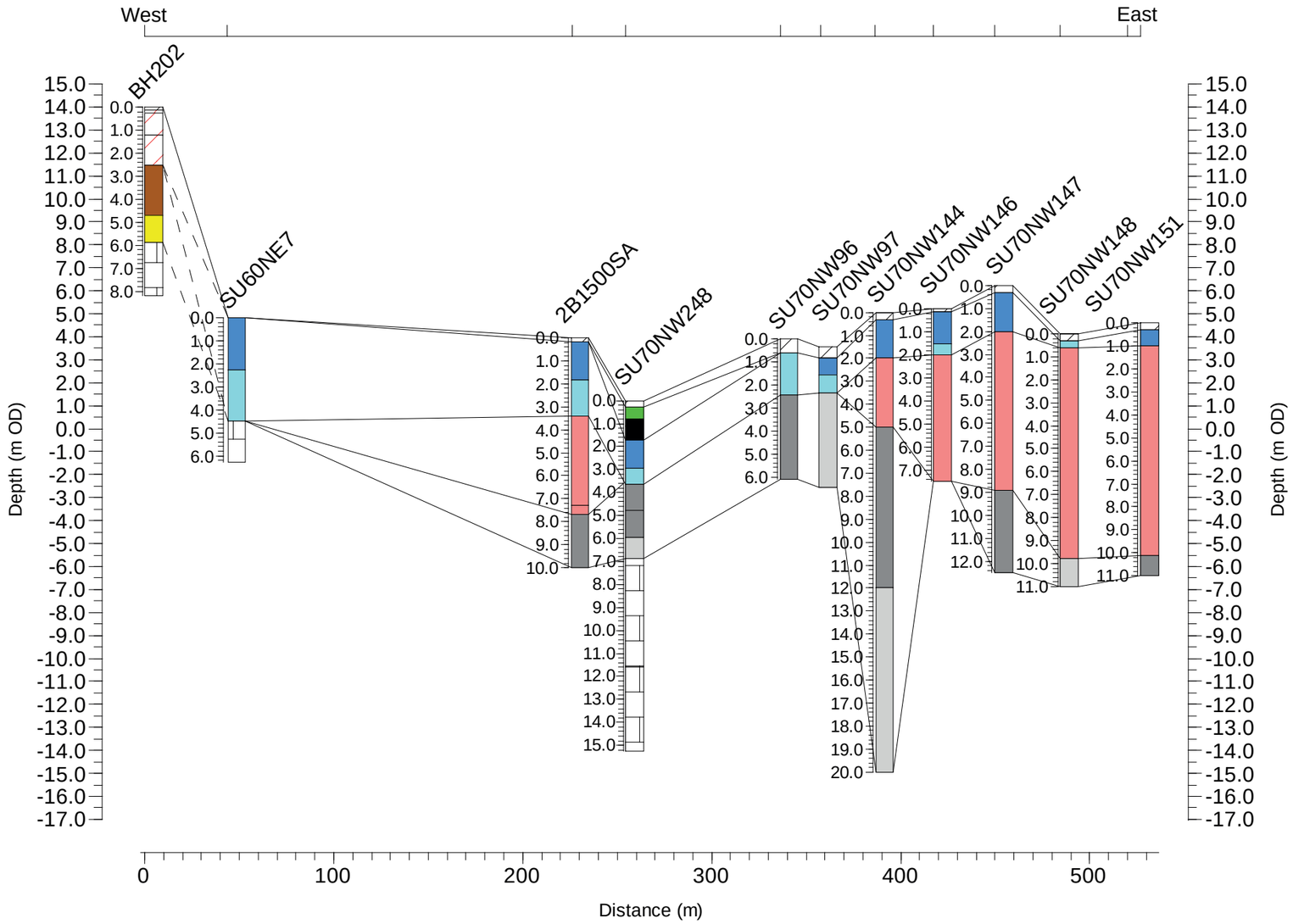
Stratigraphy
Topsoil
Made Ground
Clays
Gravelly Clays
Head Deposits
Possible Raised Beach Deposits
Gravels
Chalky Silts and Gravels
Possible Chalky Silts and Gravels
Bedrock
AZCL/No Recovery

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Figure 12: Transect 4 – Geoarchaeological Character Zone 6

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Stratigraphy

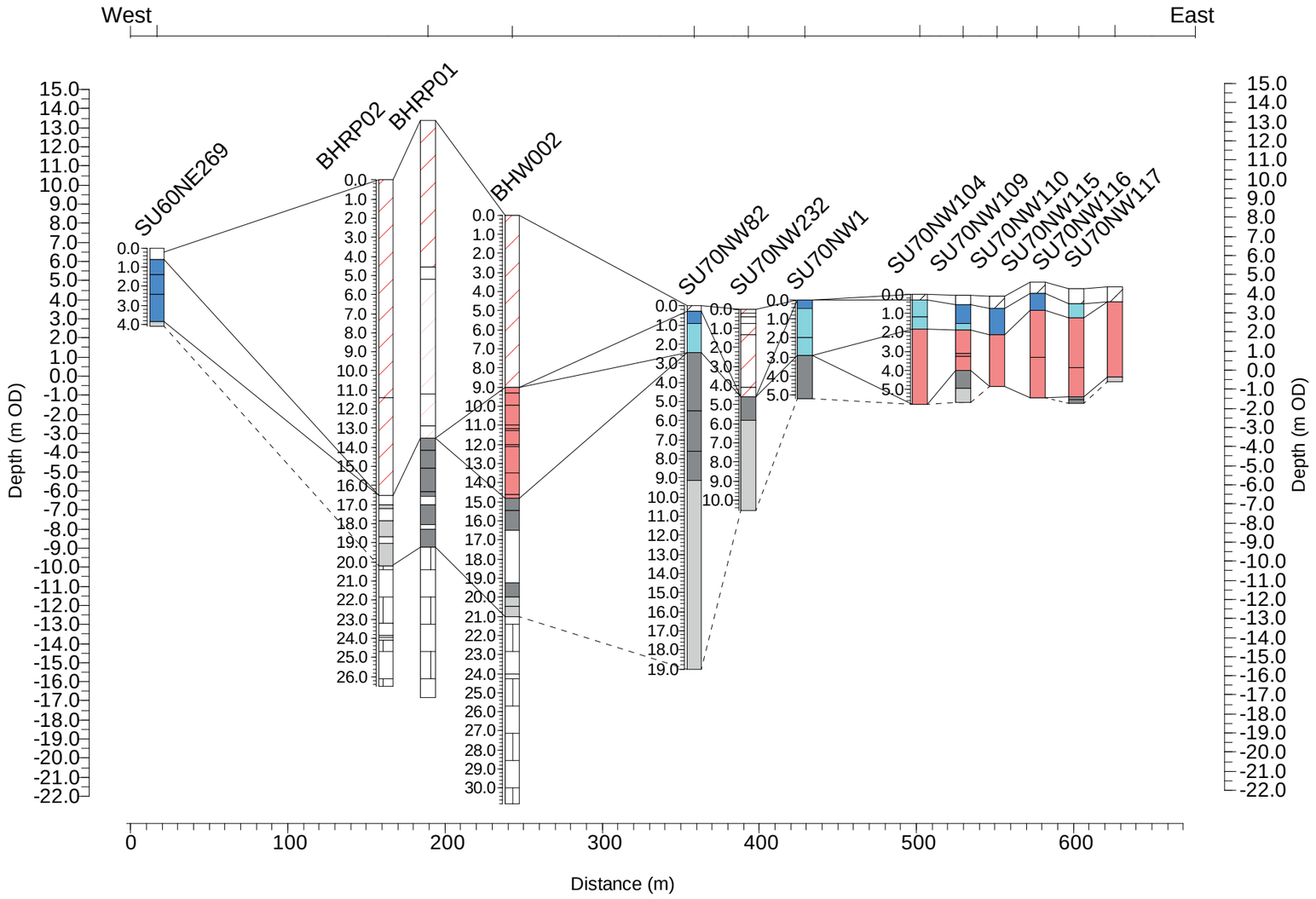
- Topsoil
- Made Ground
- Peat
- Alluvium
- Clay
- Gravelly Clay
- Head Deposits
- Gravels
- Chalky Silts and Gravels
- Possible Chalky Silts and Gravels
- Bedrock
- Raised Beach Deposits

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Figure 13: Transect 5 – Geoarchaeological Character Zone 6

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Stratigraphy

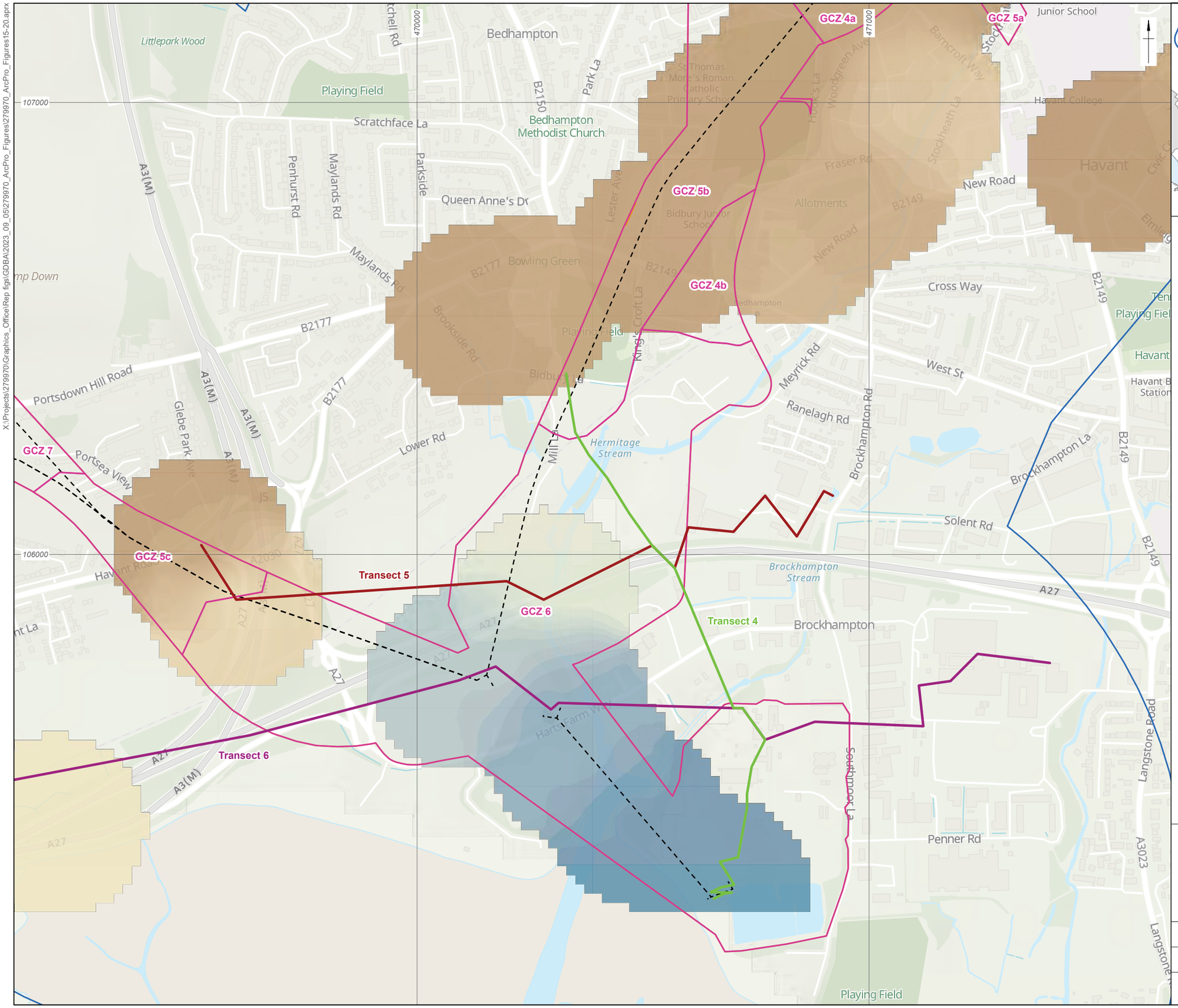
- Topsoil
- Made Ground
- Clay
- Gravelly Clay
- Head Deposits
- Gravels
- Chalky Silts and Gravels
- Possible Chalky Silts and Gravels
- Bedrock
- AZCL/No Recovery

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Figure 14: Transect 6 – Geoarchaeological Character Zone 6

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- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Transect 4 location
- Transect 5 location
- Transect 6 location

Bedrock Surface Depth
Metres OD

- 9.01 - 10.00
- 8.01 - 9.00
- 7.01 - 8.00
- 6.01 - 7.00
- 5.01 - 6.00
- 4.01 - 5.00
- 3.01 - 4.00
- 2.01 - 3.00
- 1.01 - 2.00
- 0.01 - 1.00
- -0.99 - 0.00
- -1.99 - -1.00
- -2.99 - -2.00
- -3.99 - -3.00
- -4.99 - -4.00
- -5.99 - -5.00
- -6.99 - -6.00
- -7.99 - -7.00
- -8.99 - -8.00
- -9.99 - -9.00
- -10.99 - -10.00
- -11.99 - -11.00
- -12.99 - -12.00
- -13.99 - -13.00
- -14.99 - -14.00
- -15.99 - -15.00
- -16.29 - -16.00

0 250 m

Coordinate system: OSGB 1936 British National Grid

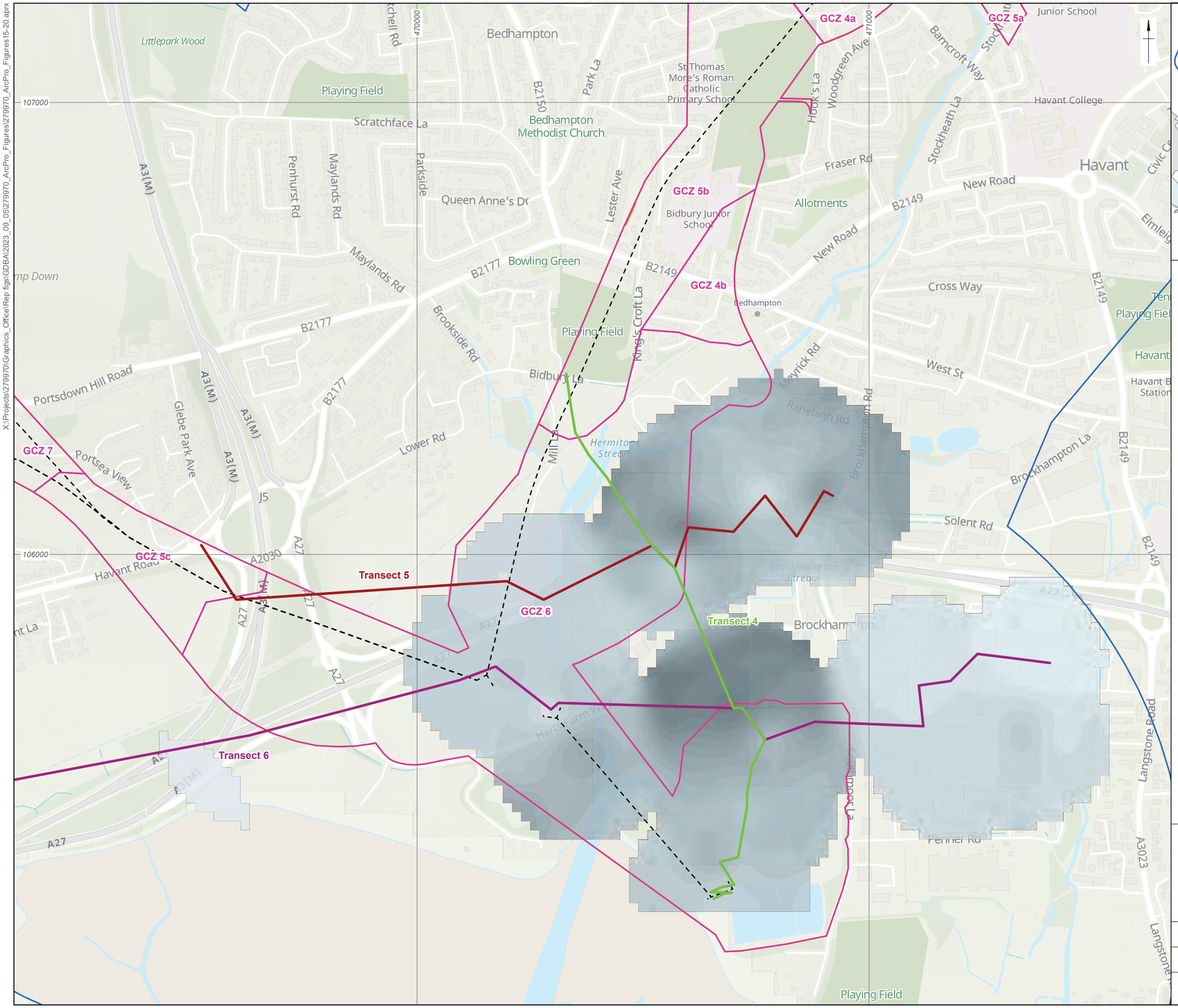
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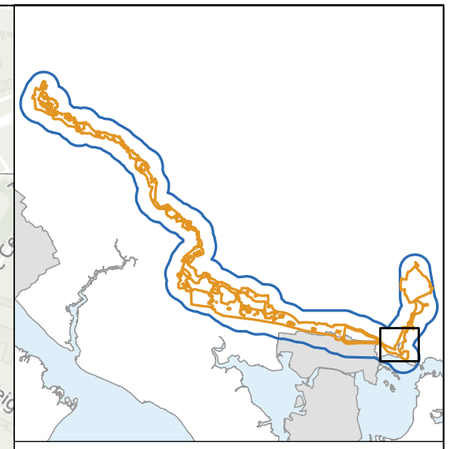
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Figure 15: Bedrock surface elevation – Geoarchaeological Character Zone 6

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- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Transect 4 location
- Transect 5 location
- Transect 6 location

Chalky Silts and Gravels Thickness (m)

- 15.01 - 16.00
- 14.01 - 15.00
- 13.01 - 14.00
- 12.01 - 13.00
- 11.01 - 12.00
- 10.01 - 11.00
- 9.01 - 10.00
- 8.01 - 9.00
- 7.01 - 8.00
- 6.01 - 7.00
- 5.01 - 6.00
- 4.01 - 5.00
- 3.01 - 4.00
- 2.01 - 3.00
- 1.01 - 2.00
- 0.01 - 1.00

0 250 m

Coordinate system: OSGB 1936 British National Grid

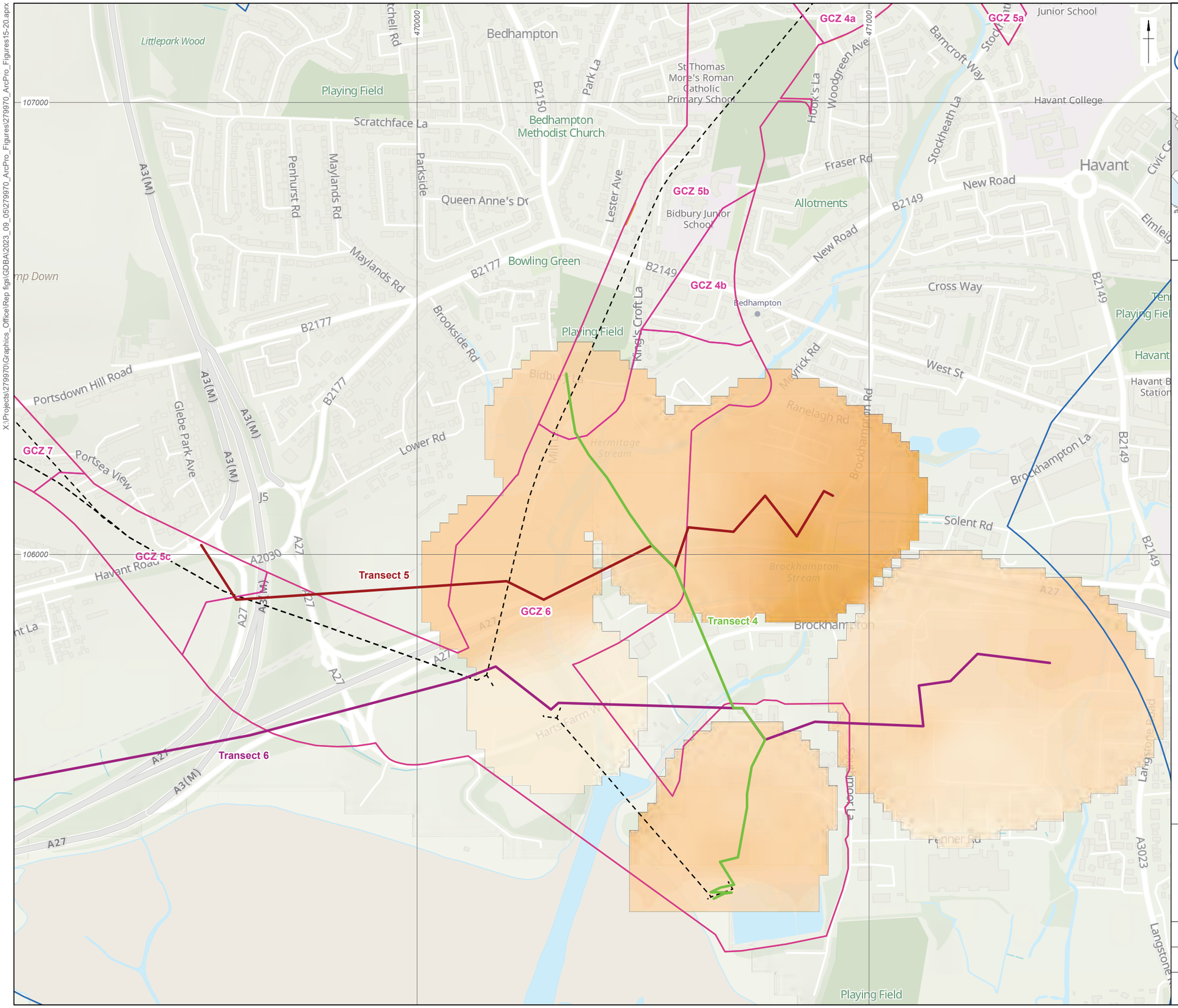
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Figure 16: Thickness of Chalky Silts and Gravels – Geoarchaeological Character Zone 6

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- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Transect 4 location
- Transect 5 location
- Transect 6 location

Gravels Thickness (m)

- 9.01 - 9.50
- 8.51 - 9.00
- 8.01 - 8.50
- 7.51 - 8.00
- 7.01 - 7.50
- 6.51 - 7.00
- 6.01 - 6.50
- 5.51 - 6.00
- 5.01 - 5.50
- 4.51 - 5.00
- 4.01 - 4.50
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.31 - 0.50

Coordinate system: OSGB 1936 British National Grid

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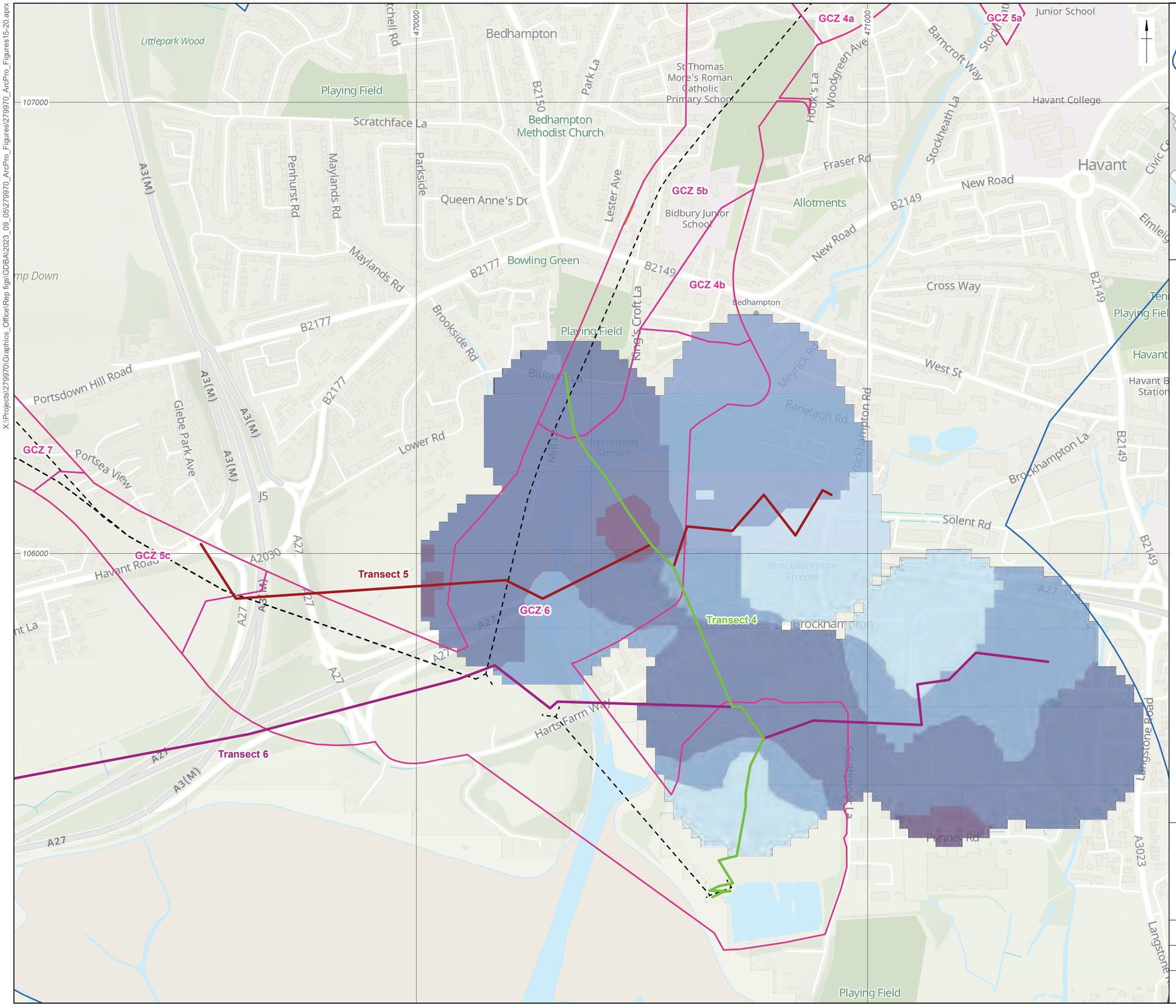
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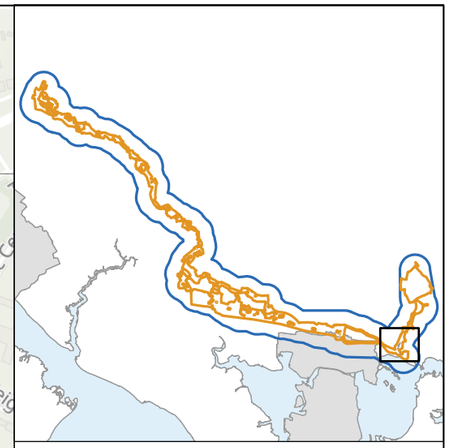
Date: 15/09/2023 | Created by: KJF

Scale: 1:8,000 at A3 | Revision: 0

Figure 17: Thickness of Gravels – Geoarchaeological Character Zone 6

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- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Transect 4 location
- Transect 5 location
- Transect 6 location

Lower Alluvium Thickness (m)

- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.21 - 0.50

0 250 m

Coordinate system: OSGB 1936 British National Grid

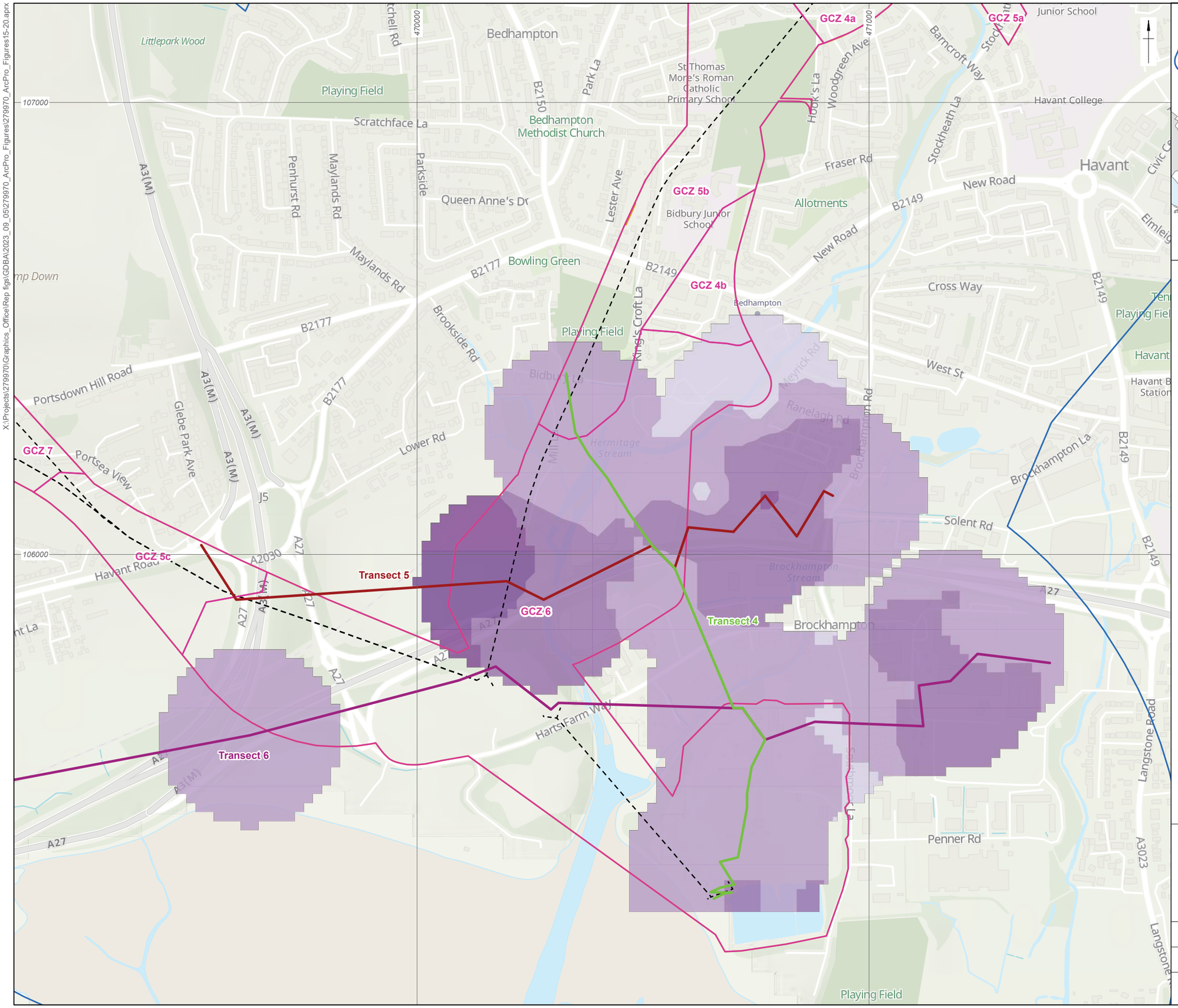
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Figure 18: Thickness of Gravelly Clays – Geoarchaeological Character Zone 6

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- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Transect 4 location
- Transect 5 location
- Transect 6 location

Upper Alluvium Thickness (m)

- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.31 - 0.50

0 250 m

Coordinate system: OSGB 1936 British National Grid

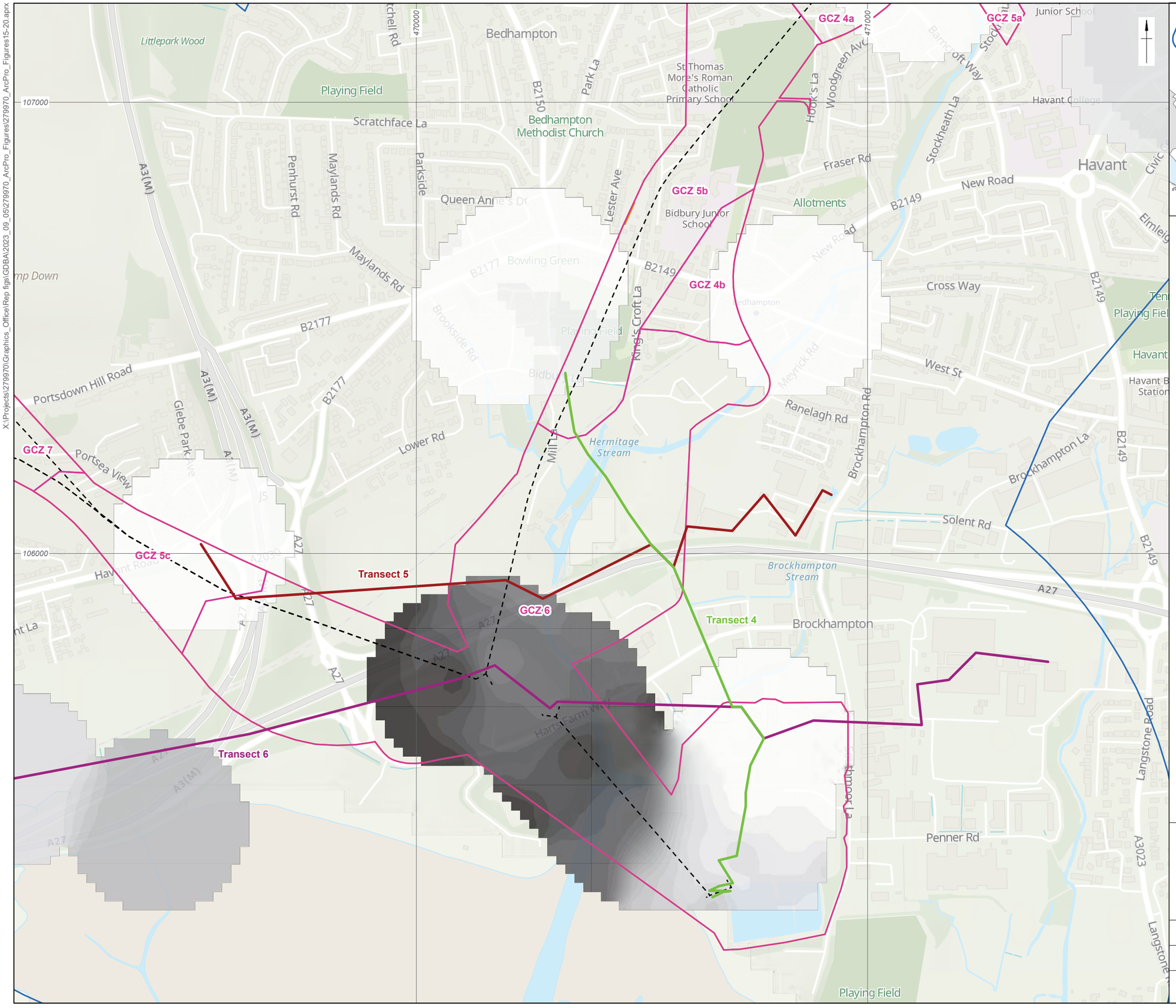
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Figure 19: Thickness of Clays – Geoarchaeological Character Zone 6

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- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Transect 4 location
- Transect 5 location
- Transect 6 location

Made Ground Thickness (m)

- 11.01 - 11.50
- 10.51 - 11.00
- 10.01 - 10.50
- 9.51 - 10.00
- 9.01 - 9.50
- 8.51 - 9.00
- 8.01 - 8.50
- 7.51 - 8.00
- 7.01 - 7.50
- 6.51 - 7.00
- 6.01 - 6.50
- 5.51 - 6.00
- 5.01 - 5.50
- 4.51 - 5.00
- 4.01 - 4.50
- 3.51 - 4.00
- 3.01 - 3.50
- 2.51 - 3.00
- 2.01 - 2.50
- 1.51 - 2.00
- 1.01 - 1.50
- 0.51 - 1.00
- 0.11 - 0.50

0 250 m

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Figure 20: Thickness of Made Ground – GCZ 6

X:\Projects\279970\Graphics_Office\Rep figs\GDBA\2023_09_05\279970_ArcPro_Figures\279970_ArcPro_Figures6_8_21_24_27_31_33_35_38

HEAD - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

Aldermoor Coppice
Sandy Coppice
Widley
Widley Farm
Crookhorn
Purbrook Way
Gundymoor Wood
Hurstmark Wood
Camp Down
Farlington
Portsdown Hill Road
London Road
Farlington Ave
College Rd
Crookhorn La
Eastern Road
A3
A3(M)
B2177
A2030
J4
J5

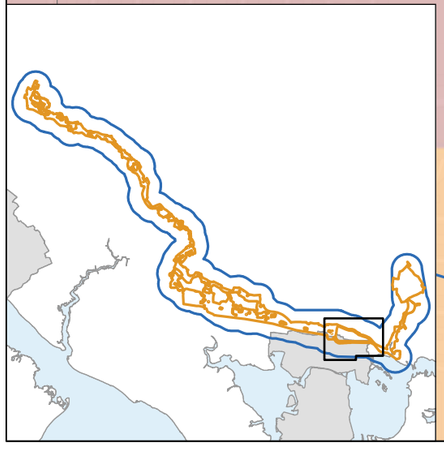
GCZ 8
GCZ 7
GCZ 5c
GCZ 6

466000
467000
468000
469000
107000
106000

SU60NE124
SU60NE154
SU60NE333
SU60NE123
SU60NE334
SU60NE321
SU60NE320
SU60NE155
SU60NE104
SU60NE103
SU60NE95
SU60NE102
SU60NE101
SU60NE70
SU60NE71
SU60NE14
SU60NE13
SU60NE57
SU60NE55
SU60NE73
SU60NE74
SU60NE72
SU60NE56
SU60NE85
SU60NE76
SU60NE12
SU60NE75
SU60NE84
SU60NE86
SU60NE54
SU60NE83
SU60NE77
SU60NE11
SU60NE87
SU60NE91
SU60NE82
SU60NE79
SU60NE10
SU60NE89
SU60NE80
SU60NE92
SU60NE78
SU60NE81
SU60NE93
SU60NE9
SU60NE90
SU60NE88
SU60NE259
SU60NE258
SU60NE260
SU60NE263
SU60NE269
SU60NE4
SU60NE268
SU60NE53
SU60NE65
SU60NE7
SU60NE243
SU60NE241
SU60NE242

20963
11152
33705
10995

BH306
TP310
TP312
TP311
BH604
BH305
TP307
BH304
TP309
TP308
2E3004DS
2E3005RC
TP304
TP305
TP306
BH303
2E3001RC
2E3003HP
2E3002RC
2E3000RC
BH302
2D2501DS
BH603
TP607
TP609
TP608
BH602
TP604
TP605
TP606
BH301
2D2500SA
2F3503SA
TP601
BH601
TP602
TP603
BH202
TP206
TP205
TP204
BH201
TP203
TP201
TP202



Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 1 GI
Phase 2 GI
BGS borehole records
Transect 5 location
Transect 6 location

TERPS findspots

PaMELA findspots
Early Mesolithic
Late Mesolithic
Undated

HER data
Mesolithic findspot

0 500 m

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Figure 21: Geoarchaeological Character Zone 7

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GCZ 13
GCZ 11
GCZ 10
GCZ 9
GCZ 12
GCZ 8
GCZ 7
Transect 7
Transect 8
HEAD - CLAY, SILT, SAND AND GRAVEL
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
HEAD - CLAY, SILT, SAND AND GRAVEL
RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY
Southwick
Boarhunt Rd
Downend Rd
Portsdown Hill Rd
Portsdown Hill Road
Common La
Belney La
Crocked Walk La
Mill La
Pigeon House La
Nine Elms La
Dirty Ground Copse
Orchard Copse
Walton Heath
Ashlands Plantation
Wynn's Copse
Little Belney Copse
Jays Copse
Place Wood
Bucks Copse
Pigeonhouse Coppice
Lodge Coppice
Friar's Coppice
Hazelhook Coppice
Sheepwash Coppice
Short's Coppice
Ward's Coppice
Dunsland Coppice
Hoburn Coppice
Littlehunts Coppice
Portland Coppice
Drivetts Coppice
Cooper Hill
Greathunts Coppice
Potwell Coppice
Sawyer's Wood
Dirtystile Copse
Ashleydown Coppice
Stroud Copse
Mountemoor's Coppice
Pinsley Coppice
Tree Coppice
Pinsley Plantation
Sandy Coppice
Allaway Ave
Paulsgrove
Cosham
Wymering
Purbrook
Havant
Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 1 GI
Phase 2 GI
BGS borehole records
Transect 7 location
Transect 8 location
TERPS findspots
PaMELA findspots
Early Mesolithic
Mesolithic
Undated
HER data
Palaeolithic findspot
Mesolithic findspot
0
1 km
Coordinate system: OSGB 1936 British National Grid
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Figure 22: Geoarchaeological Character Zones 8–11

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460000 461000 462000 463000 464000 465000 466000

110000 109000 108000 107000

GCZ 13 GCZ 11 GCZ 10 GCZ 9 GCZ 12 GCZ 8 GCZ 7

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY

Wynn's Copse
Little Belney Copse
Jays Copse
Belney La
Place Wood
Assells Coppice
Hazelhook Coppice
Sheepwash Coppice
Newlands La
Short's Coppice
Ward's Coppice
Dunsland Coppice
Hobern Coppice
Newlandsmoor
Littlehunts Coppice
Compthouse Moor Coppice
Portland Coppice
Cooper Hill
A27
M27
Downend Rd
Allaway Ave
Paulsgrove
A3
Castle St
Paulsgrove Lake

- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Dry River Valley
- Gully
- Hollow
- Palaeochannel

Local Relief Model

- Positive relief
- Negative relief

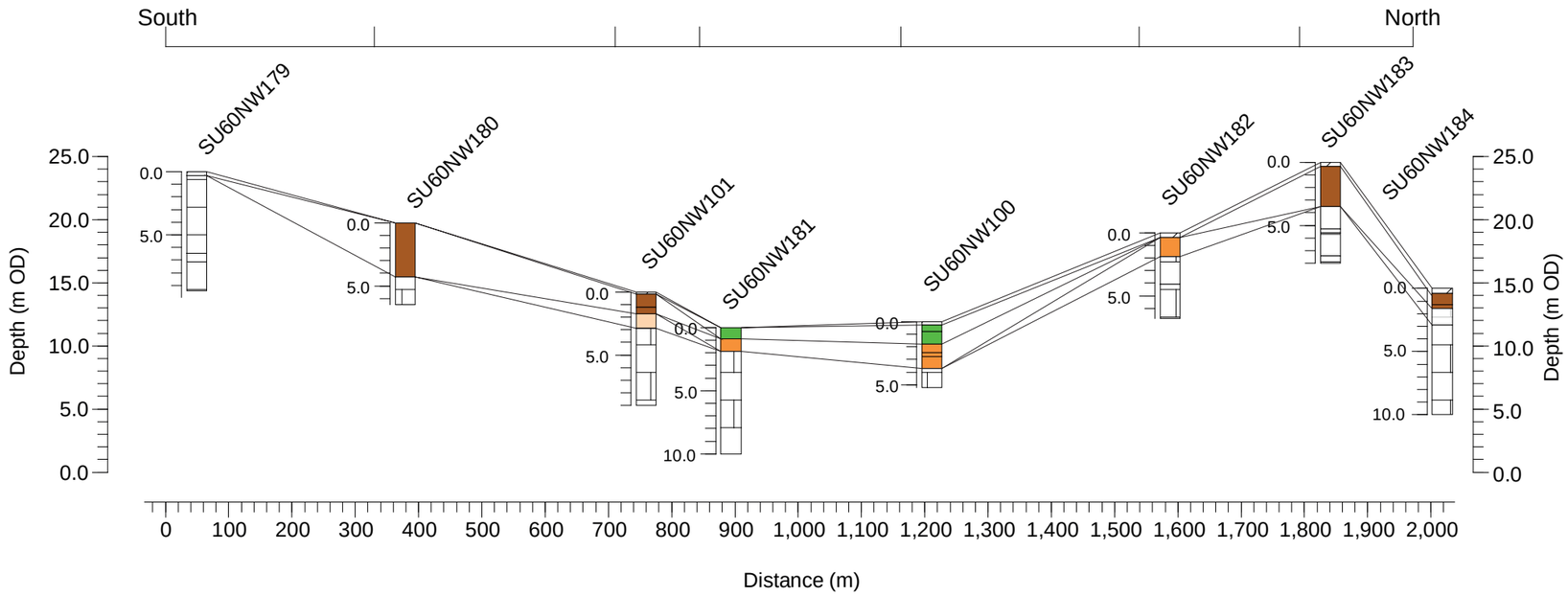
0 1 km

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Figure 23: LiDAR local relief model – Geoarchaeological Character Zones 8–11

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Stratigraphy

- Topsoil
- Alluvium
- Head / Colluvium
- River Terrace Deposits
- Possible River Terrace Deposits
- Bedrock

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Figure 24: Transect 7 – Geoarchaeological Character Zones 9–11

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Webb's Land Farm
Hundred Acres
Mellishes Bottom
Fullimore's Copse
Wickham Common
Withy Bed
Tramperts La
Bramble Cottage
A32
MWC5381
MWC5383
MWC884
Wickham Common
North Boarhunt
B2177
Bone's Copse
Birchfrith Copse
Martin's Copse
Fiddlers Green
Birching Copse
Orchard Copse
Dirty Ground Co
Shaftesbury Copse
Crockerhill Farm
Blakes Copse
Misty Hollow
Aytesbury Copse
Dash Wood
The Hanger
Yewtree F
Staversash Copse
Ravens Wood
SU50NE249
Forest La
Carmans Copse
SU60NW184
Heytesbury Farm
Carpenters Copse
Chancellors Copse
Homerhill Copse
SU60NW185
Prior's Hold Farm
SU60NW183
Carman
Bere Farm
Bucks Copse
Pigeonhouse Coppice
SU60NW177
SU60NW182
Chalk Pit Farm House
Gravelhole Copse
SU60NW100
SU60NW181
SU50NE279
SU50NE207
SU60NW145
SU60NW101
SU60NW180
Grub Coppice
Albany Farm
20134
20202
SU50NE205
SU50NE206
Mill Coppice
SU50NE204
SU60NW178
SU60NW179
Dirtystile
SU50NE203
SU50NE236
2F3502SA
10861
SU60NW149
SU60NW147
SU60NW144
SU60NW148
SU60NW141
20689
63878
2F3501DS
2F3500DS
MWC883
North Fareham
SU50NE255
SU50NE251
SU50NE141
SU50NE254
SU50NE256
SU50NE252
2F3514DS
2F3513DS
2F3515DS
2F3511DS
2F3509TP
2F3512RC
2F3510TP
2F3507SA
2F3508SA
2F3506TP
2F3505DS
2F3504DS
2G4001SA
2G4000SA
110000
109000
456000
457000
458000
459000
460000
GCZ 15
GCZ 14
GCZ 13
GCZ 12
GCZ 11
GCZ 10
GCZ 9
GCZ 8
Transect 10
Transect 9
Transect 8
HEAD - CLAY, SILT, SAND AND GRAVEL
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
RIVER TERRACE DEPOSITS - GRAVEL, SAND AND SILT

Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 2 GI
BGS borehole records
Transect 7 location
Transect 8 location
Transect 9 location
Transect 10 location
TERPS findspots
PaMELA findspots
Undated
HER data
Palaeolithic findspot
Mesolithic findspot

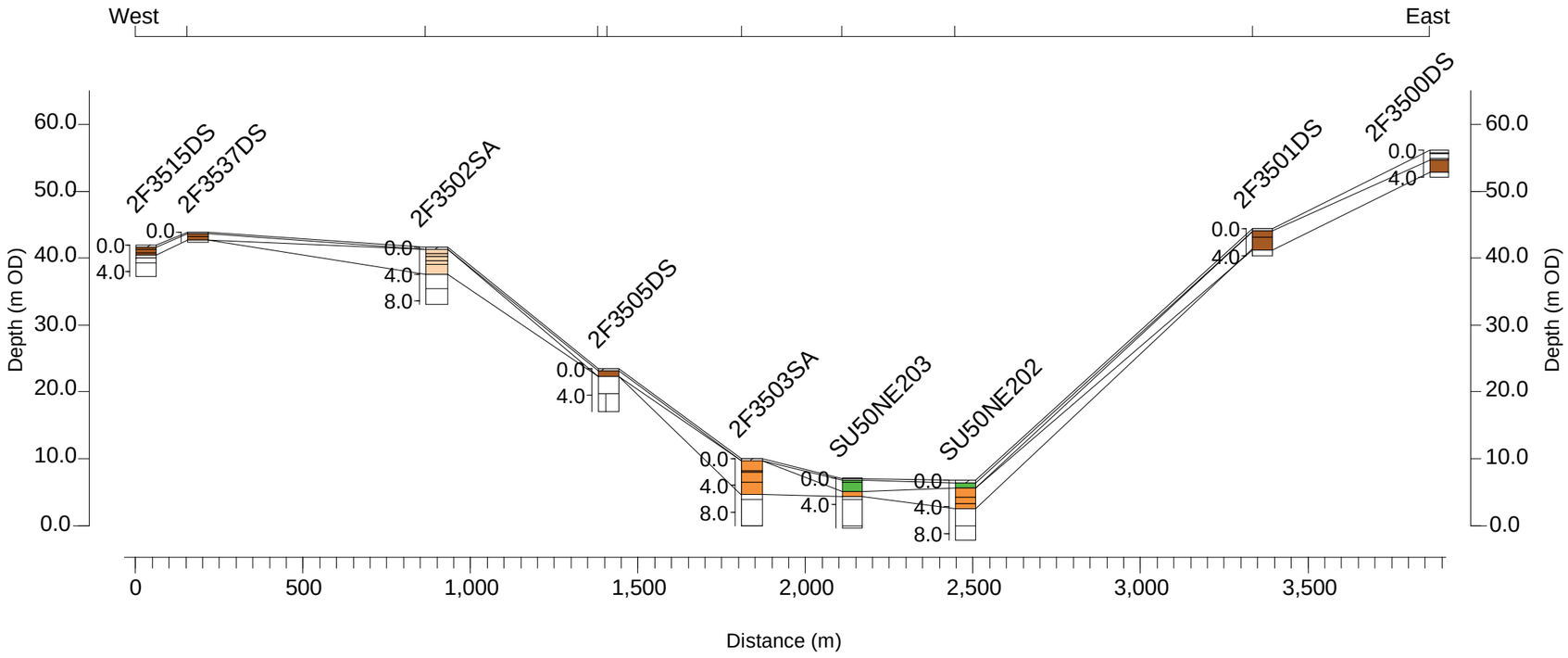
0 500 m

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Figure 25: Geoarchaeological Character Zones 12–14

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Stratigraphy

- Topsoil
- Made Ground
- Alluvium
- Head / Colluvium
- River Terrace Deposits
- Possible River Terrace Deposits
- Bedrock

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Figure 26: Transect 8 – Geoarchaeological Character Zones 8, 12 and 14

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110000
109000
108000
457000
458000
459000
460000

Transect 8

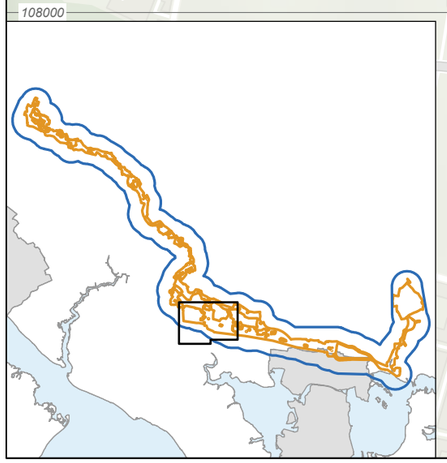
GCZ 15
GCZ 14
GCZ 13
GCZ 13
GCZ 12
GCZ 8

HEAD - CLAY, SILT, SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - GRAVEL, SAND AND SILT

Funtley Rd
J10



- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Dry River Valley
- Gully
- Hollow
- Palaeochannel

Local Relief Model

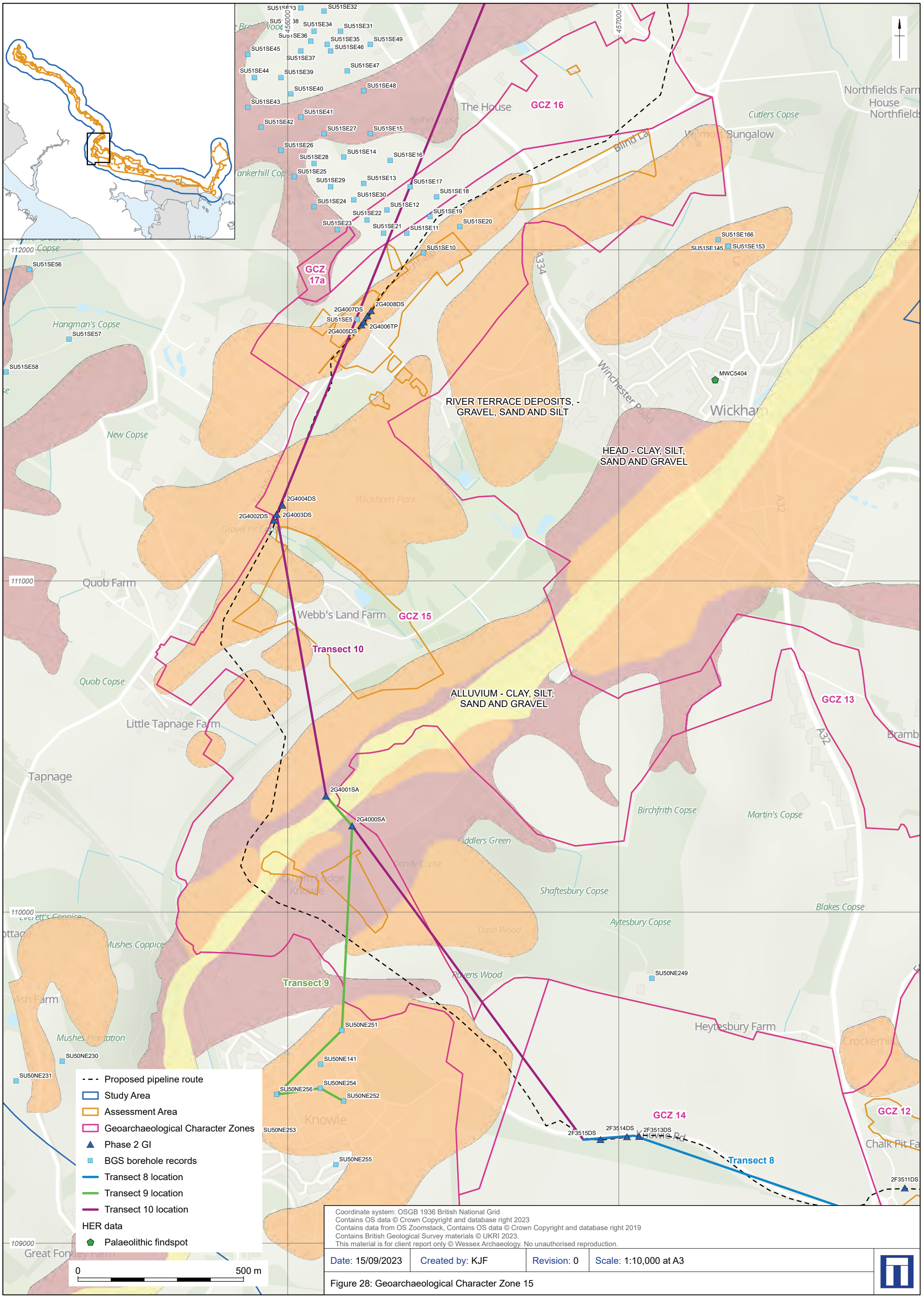
- Positive relief
- Negative relief

0 500 m

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Figure 27: LiDAR local relief model – Geoarchaeological Character Zones 12 and 14



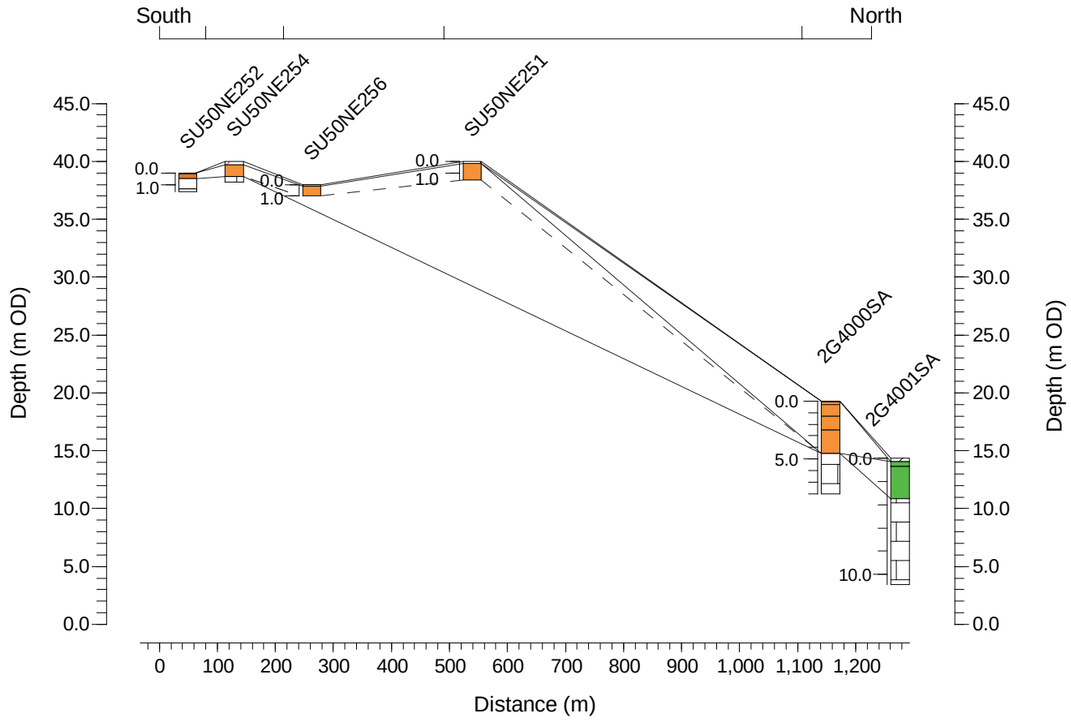
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Figure 28: Geoarchaeological Character Zone 15

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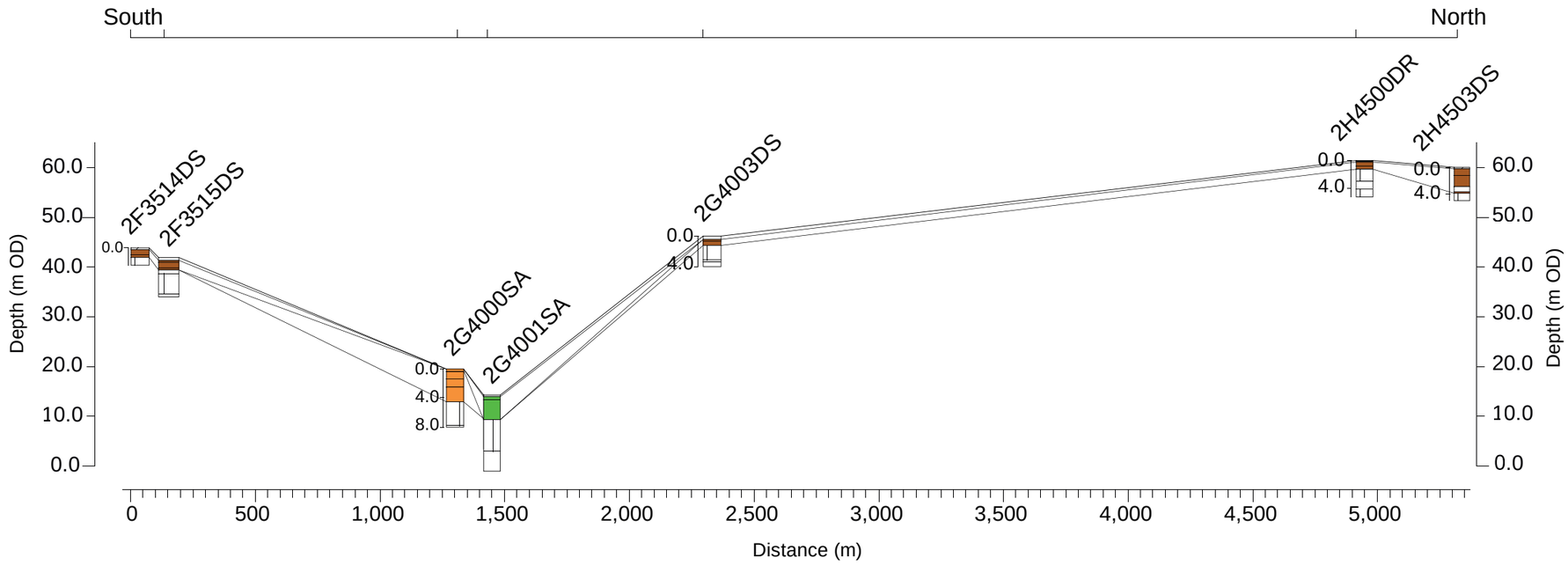
Stratigraphy
- Topsoil
- Alluvium
- River Terrace Deposits
- Bedrock

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Figure 29: Transect 9 – Geoarchaeological Character Zone 15

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Stratigraphy

- Topsoil
- Alluvium
- Head / Colluvium
- River Terrace Deposits
- Bedrock
- AZCL/No Recovery

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Figure 30: Transect 10 – Geoarchaeological Character Zones 14–18



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Figure 31: LiDAR local relief model – Geoarchaeological Character Zone 15

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GCZ 21
GCZ 20
GCZ 19
GCZ 18
GCZ 17b
GCZ 16
GCZ 15
Transect 10
2J5001DS
2J5000DS
SU51NE1
SU51NE65
SU51SE165
SU51SE152
SU51SE146
SU51SE62
SU51SE61
SU51SE64
SU51SE63
SU51SE50
SU51SE66
SU51SE65
SU51SE60
SU51SE55
SU51SE51
11170
2H4503DS
2H4502DS
2H4501DR
2H4500DR
SU51SE154
SU51SE144
SU51SE8
SU51SE33
SU51SE32
SU51SE38
SU51SE34
SU51SE31
SU51SE49
SU51SE45
SU51SE36
SU51SE35
SU51SE37
SU51SE46
SU51SE44
SU51SE39
SU51SE47
SU51SE40
SU51SE48
SU51SE43
SU51SE41
SU51SE42
SU51SE27
SU51SE15
SU51SE26
SU51SE14
SU51SE28
SU51SE16
SU51SE25
SU51SE29
SU51SE13
SU51SE17
SU51SE30
SU51SE18
SU51SE24
SU51SE12
SU51SE19
HEAD - CLAY, SILT, SAND AND GRAVEL
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY
Glebe
Twelve Oaks Farm
Heathfield House
Forest Rd
Longridge Farm
Waltham Chase
Gravelhill Plantation
Gravel Hill
Bull La
Winchester Road
B2177
Curridge La
Wrantmans Farm
Nation's Farm
Oak Avenue
Middle Barn
Spencer Place Farm
Solomons La
Bishop's Hill Hou
Sandy La
Long Acre Copse
Sandle's Copse
Lyons Copse
Black Horse La
Hospital Rd
Shirrell Heath
Twynhams Hill
Marriot Meon Valley Hotel and Country Club
Wmchester Road
Southside Farm
Row Ash House
Row Ash
Raglington Farm
A334
Church Copse
St John's Church (remains of)
Shedfield
Bigg's Copse
Church Rd
High St
Shirrell Copse
South Lodge
Faerland
Frith La
Frith Farm House
Cloverlea Farm
Fernu Copse
Upper Dagwells Copse
Hall Court Cottage
Hallcourt Wood
Horse Wood
Brook Wood
The Farmhouse
Biddenfield Farm Cottages
The House
Pedhill Copse
Cutlers Copse
Wilmots Bungalow
Northfields Farm House
Gulley Copse
Biddenfield High Wood
Blacklands Copse
Tankerhill Copse
Blind La
115000
114000
113000
455000
456000
457000

- - - Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 2 GI
BGS borehole records
Transect 10 location
PaMELA findspots
Early Mesolithic
Mesolithic
Undated

0 500 m

Coordinate system: OSGB 1936 British National Grid

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Figure 32: Geoarchaeological Character Zones 16–20

X:\Projects\279970\Graphics_Office\Rep figs\GDBA\2023_09_05\279970_ArcPro_Figures\279970_ArcPro_Figures09_22_26_30_32_34_36_42_LiDAR.aprx

GCZ 21
GCZ 20
GCZ 19
GCZ 18
GCZ 17b
GCZ 16
GCZ 14

HEAD - CLAY, SILT, SAND AND GRAVEL

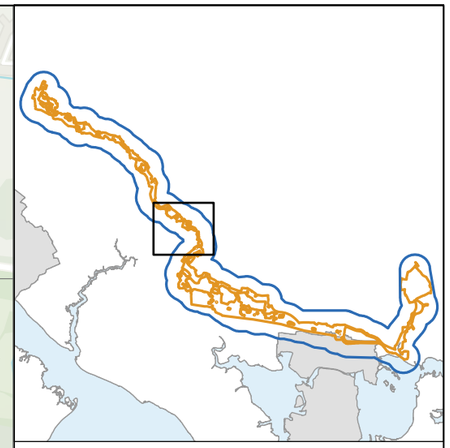
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

HEAD - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND, SILT AND CLAY

455000
456000
457000
115000
114000
113000

Twelve Oaks Farm
Heathfield House
Forest Rd
Longridge Farm
Gravelhill Plantation
Gravel Hill
Bishop's Hill Hou
Shawfords Lake
A334
Row Ash House
Row Ash
Raglington Farm
Southside Farm
Bigg's Copse
Ferny Copse
Upper Dagwells Copse
Hall Court Cottage
Hallcourt Wood
Horse Wood
Gulley Copse
Biddenfield High Wood



- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Dry River Valley
- Gully

Local Relief Model

- Positive relief
- Negative relief

0 500 m

Coordinate system: OSGB 1936 British National Grid

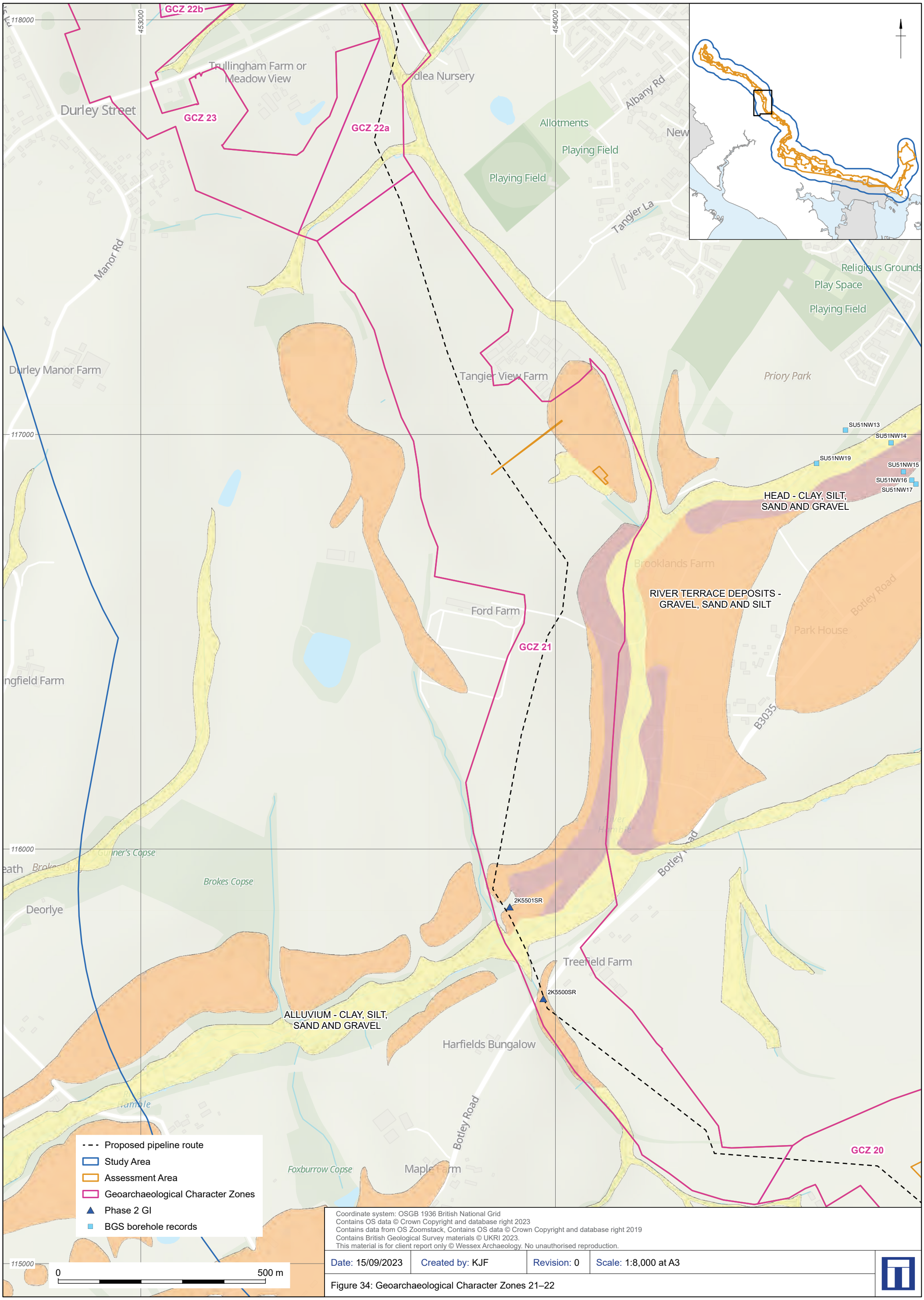
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Figure 33: LiDAR local relief model – Geoarchaeological Character Zones 16–20



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Figure 34: Geoarchaeological Character Zones 21–22

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Figure 35: LiDAR local relief model – Geoarchaeological Character Zones 21–22

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X:\Projects\279970\Graphics_Office\Rep figs\GDBA\2023_09_05\279970_ArcPro_Figures\279970_ArcPro_Figures6_8_21_24_27_31_33_35_38

GCZ 26
GCZ 25
GCZ 24
GCZ 23
GCZ 22b
Transect 11
MWC1256
HEAD - CLAY, SILT, SAND AND GRAVEL
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL
RIVER TERRACE DEPOSITS - CLAY AND SILT
2L6010DR
2L6009DR
2L6008DR
2L6007DR
2L6006TP
2L6005SA
2L6004TP
2L6003SA
2L6001TP
2L6002SA
2L6000TP
SU42SE59
SU42SE61
SU42SE141
SU42SE60
SU52SW32
SU52SW24
SU52SW15
SU51NW39
SU51NW6
SU51NW5
SU51NW32
SU51NW29
SU51NW24
SU51NW25
SU51NW26
SU51NW3
SU51NW2
SU51NW34
2K5503DS
2K5502DS
Colden Common Wood
Hassock Wood
Fisher's Pond Wood
Hill Copse
Brick Kiln Copse
Upperbarn Copse
Park Hills Wood
Crowdhill Copse
Stoke Park Wood
Hall Lands Copse
Gore Copse
Scotland Copse
Knowle Hill
Knowlehill Copse
Tippers Copse
Deeps Bushes Copse
Deeps Copse
Cowtes Copse
Bushy Copse
Tylers Copse
Durley Copse
Longlands Copse
Noyces Copse
Nob's Crook
Fisher's Pond
Southviews Farm
Marwell Manor
Little Ranch
Oldmans Farm
Rowhay Farm
Sweet Briar Cottage
Thistle Rise Farm
Newdeeps Farm
Dell House
Lowhill Farm
Popes Farm
Stoke Park Farm
Crowdhill
Jamesmead Farm
Lower Upham
Hawthorns Farm
Mount Pleasant Farm
Compton Cottage Farm
Woodstreet Farm
Mortimer's Farm
Hall Lands Farm
Fair Oak
Herons Foot Barn
Coach House
Giles Farm
Brook Close Farm
East Horton Farm
Knowle Hill Farm
Greenwood Manor
Durley Street
Firtree Farm
Home Park
Sarl Lodge Hotel
Burnsmeath Road
Winchester Road
Mortimers Lane
Stoddwood La
Alma La
Knowle La
Scivier's La
Hursley La
B3354
B3037
B2177
2CA
448000
449000
450000
451000
452000
453000
121000
120000
119000

Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Phase 2 GI
BGS borehole records
Transect 11 location

PaMELA findspots
Early Mesolithic
Undated
HER data
Palaeolithic findspot

0 500 m

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Figure 36: Geoarchaeological Character Zones 23–25

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448000 449000 450000 451000 452000 453000

121000 120000 119000

GCZ 26
GCZ 25
GCZ 24
GCZ 23
GCZ 22b

HEAD - CLAY, SILT, SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - CLAY AND SILT

Transect 9

Oldmans Farm
Rowhay Farm
Sweet Briar Cottage
Cawtes Copse
Bushy Copse
Upham St
Happinrail Copse
Stoke Park Wood
Winchester Road
Fair Oak
Fair Oak Rd
B3037
Hall Lands Farm
Gore Copse
Mortimer's Farm
Mortimers Lane
Scotland Copse
Knowle La
Knowle Hill
Knowlehill Copse
2CA
East Horton Farm
Giles Farm
Knowle Hill Farm
Botley Road
Home Park
Durley Copse
Longlands Copse
Noyces Copse
Greenwood Manor

Proposed pipeline route
Study Area
Assessment Area
Geoarchaeological Character Zones
Dry River Valley
Gully
Palaeochannel
Positive relief
Negative relief

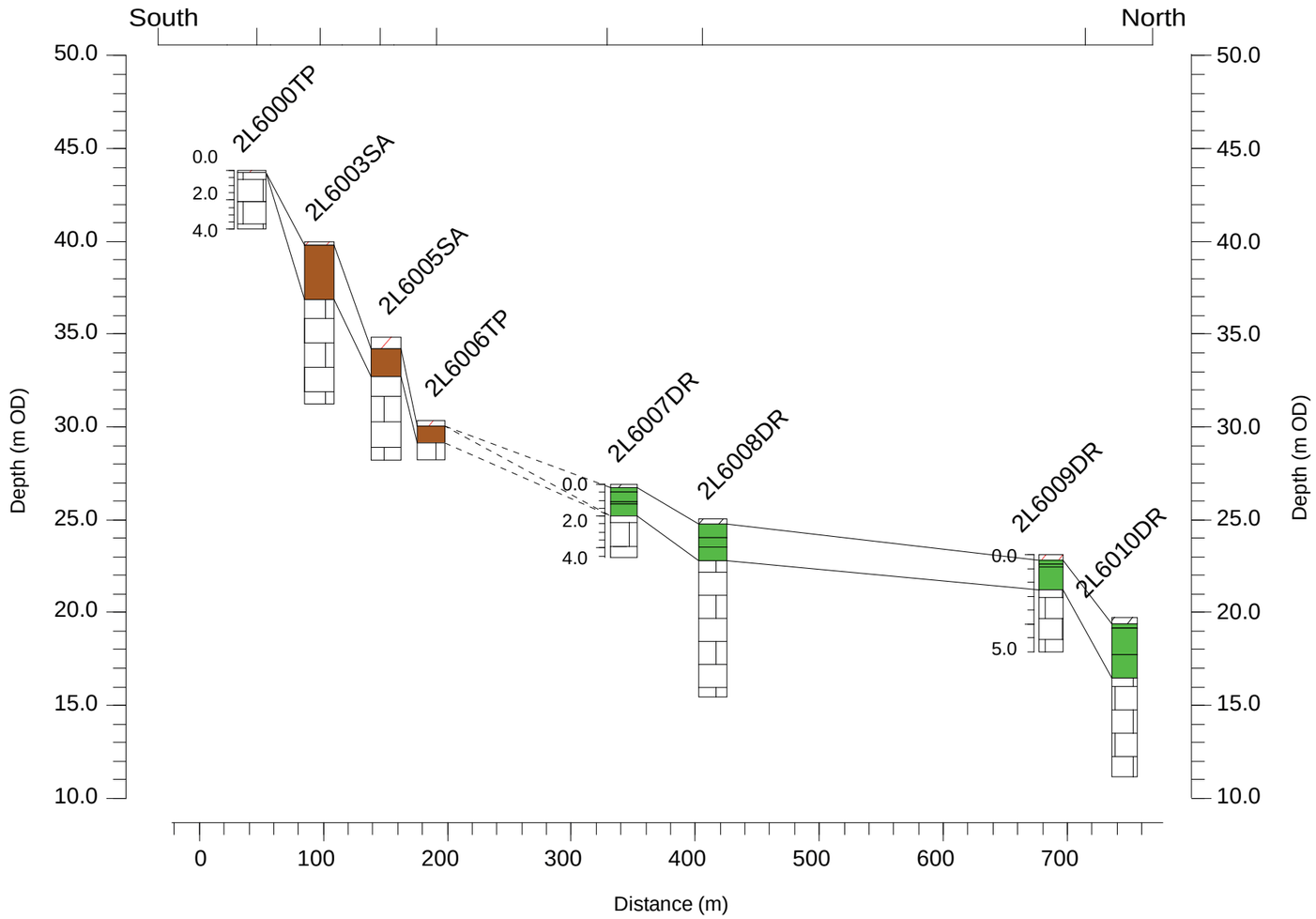
0 500 m

Coordinate system: OSGB 1936 British National Grid
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Figure 37: LiDAR local relief model – Geoarchaeological Character Zones 23–25

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Stratigraphy
- Topsoil
- Alluvium
- Head / Colluvium
- Bedrock

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Figure 38: Transect 11 – Geoarchaeological Character Zone 24

HEAD - CLAY, SILT, SAND AND GRAVEL

CLAY-WITH-FLINTS FORMATION - CLAY, SILT, SAND AND GRAVEL

RIVER TERRACE DEPOSITS - SAND AND GRAVEL

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

Transect 14

Transect 13

Transect 12

GCZ 28

GCZ 27

GCZ 26

GCZ 25

GCZ 24

- Proposed pipeline route
- Study Area
- Assessment Area
- Geoarchaeological Character Zones
- Phase 1 GI
- Phase 2 GI
- BGS borehole records
- Transect 12 location
- Transect 13 location
- Transect 14 location
- TERPS findspots

PaMELA findspots

- Early Mesolithic
- Undated

HER data

- Palaeolithic findspot
- Mesolithic findspot

0 500 m

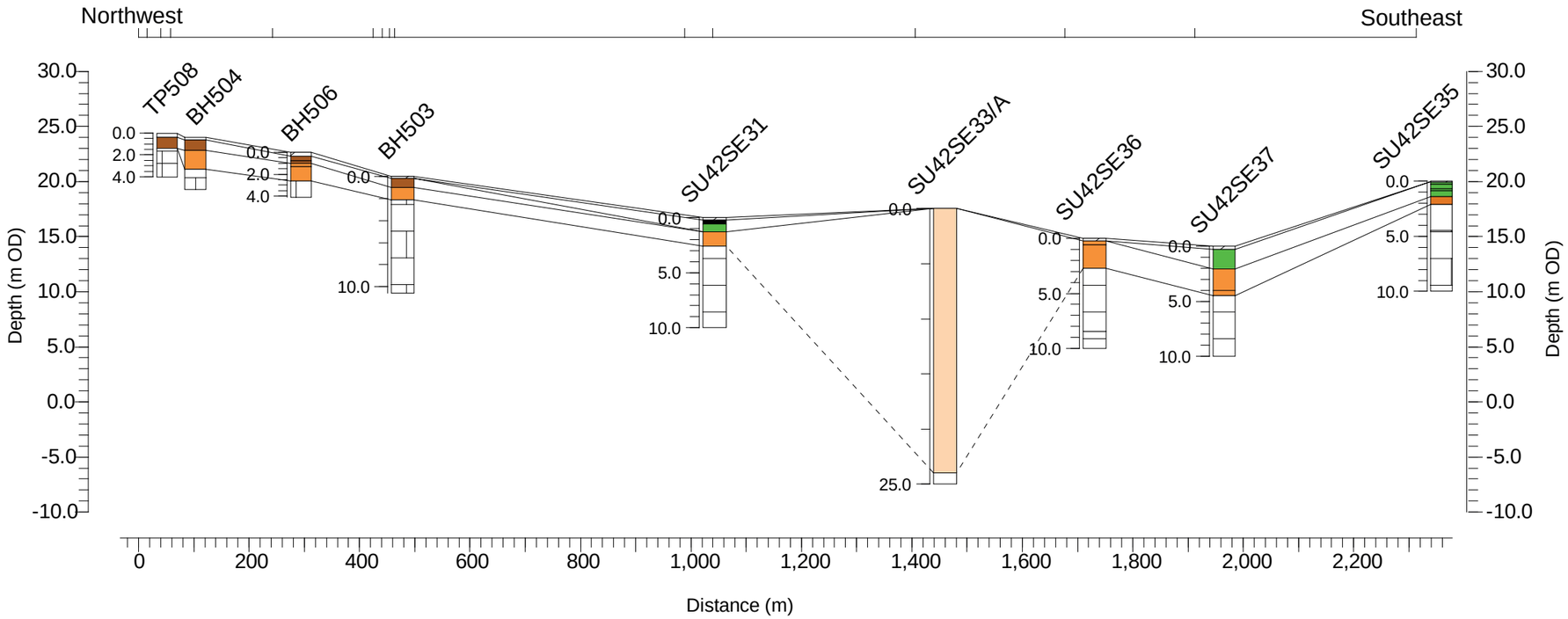
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Figure 39: Geoarchaeological Character Zones 26–28

X:\Projects\279970\Graphics_Office\Rep figs\GDBA\2023_09_05\279970_ArcPro_Figures\279970_ArcPro_Figures6_8_21_24_27_31_33_35_38

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Stratigraphy

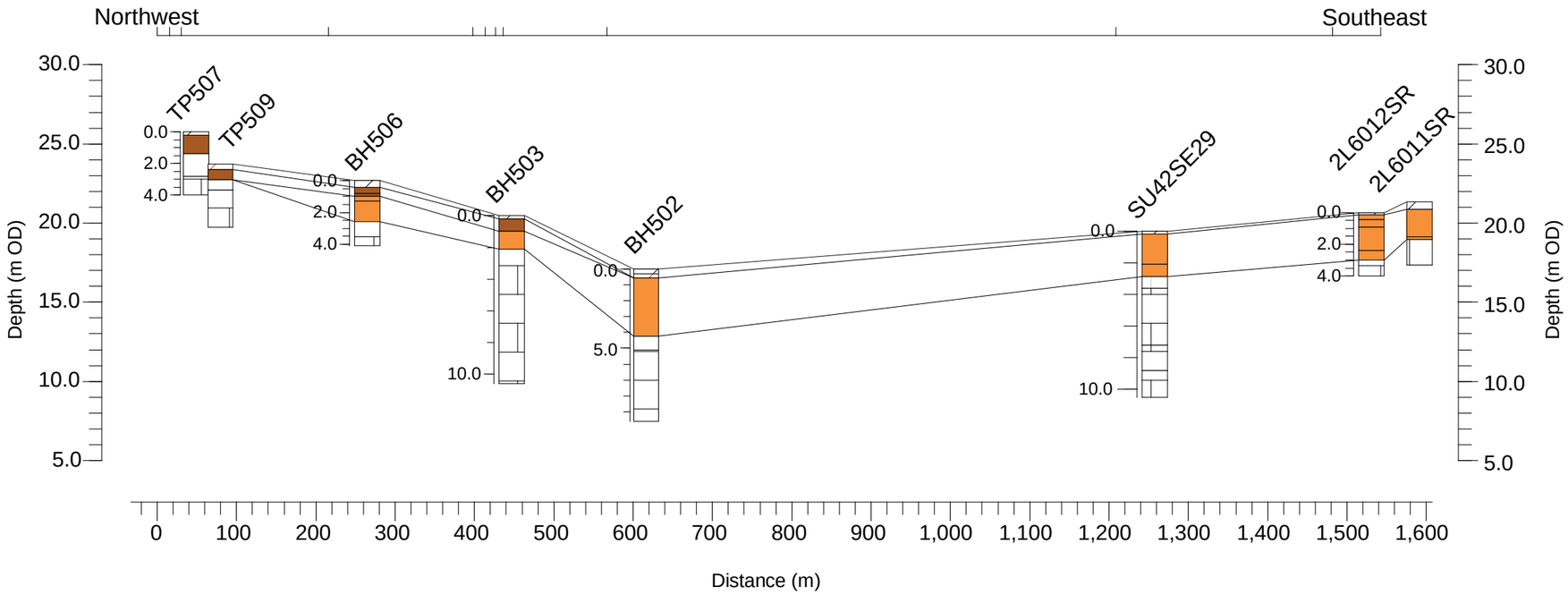
- Topsoil
- Peat
- Alluvium
- Head Deposits
- River Terrace Deposits
- Possible River Terrace Deposits
- Bedrock

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Figure 40: Transect 12 – Geoarchaeological Character Zone 26

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Stratigraphy

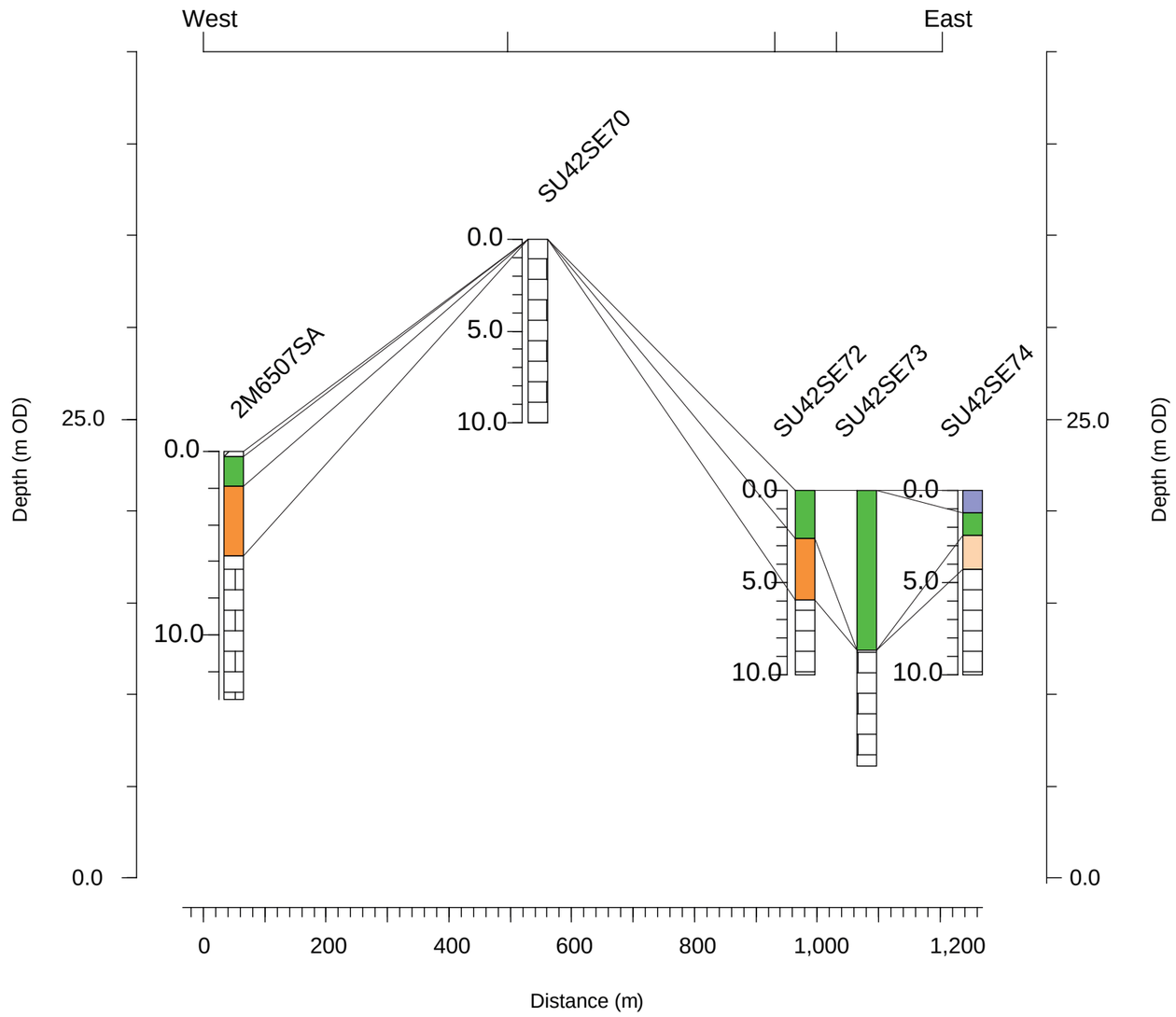
- Topsoil
- Head Deposits
- River Terrace Deposits
- Bedrock

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Figure 41: Transect 13 – Geoarchaeological Character Zone 26

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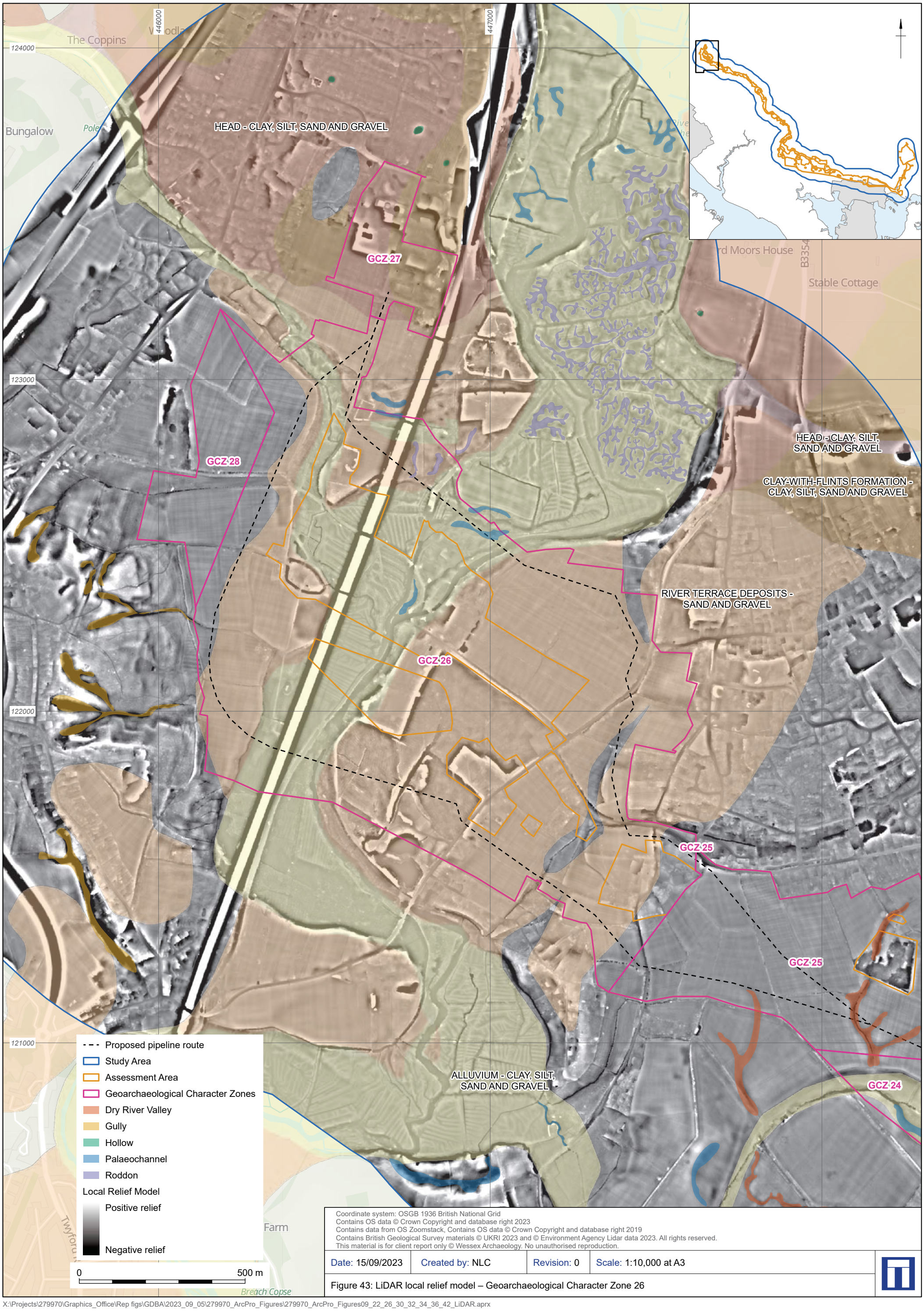
Stratigraphy

- Topsoil
- Tufa
- Alluvium
- River Terrace Deposits
- Possible River Terrace Deposits
- Bedrock

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Figure 42: Transect 14 – Geoarchaeological Character Zone 26



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Figure 43: LiDAR local relief model – Geoarchaeological Character Zone 26

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