Document

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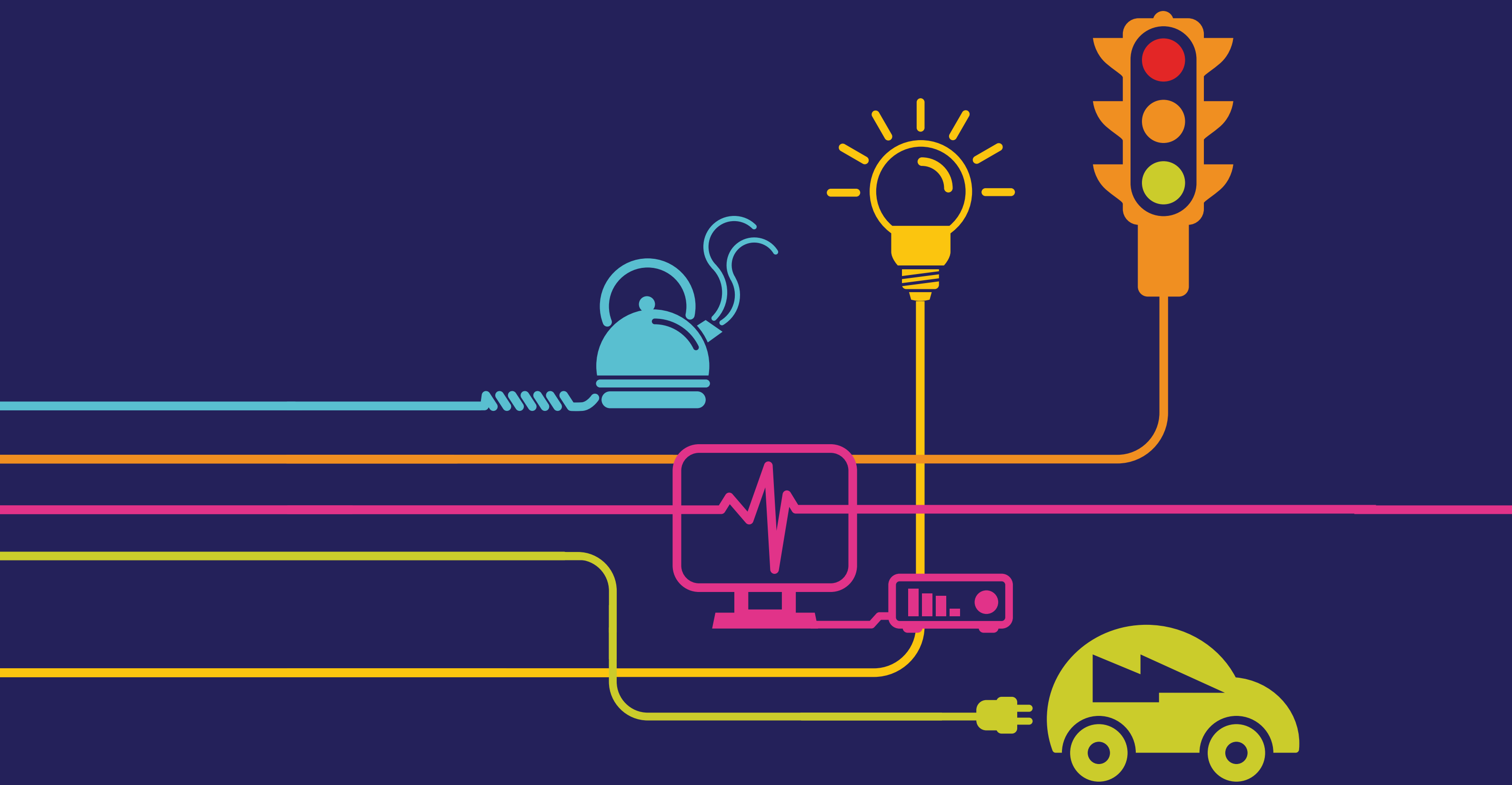
Environmental Statement Historic Environment Appendices 11D to 11E

Hinkley Point C Connection Project

Regulation 5(2)(a) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



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Environmental Statement

Hinkley Point C Connection Project

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11D	Archaeological Trial Trenching Survey
11E	Geoarchaeological Desk-based Assessment and Field Survey

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Appendix 11D – Archaeological Trial Trenching Survey

Hinkley Point C Connection Project (Appendix 11D)

Report on Archaeological Trial Trenching Survey

oxfordarchaeology
southsouthsouth

December 2013

Client: TEP

Issue No: 1

Report on Archaeological Trial Trenching Survey

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FIGURES

PLATES

APPENDICES

1 INTRODUCTION

1.1 Location and scope of work

1.1.1 National Grid Electricity Transmission plc (National Grid) is preparing an application to the Planning Inspectorate (PINS) for an Order to grant Development Consent (DCO) (under Section 37 of the Planning Act 2008) to develop a new 400kV connection between Bridgewater, Somerset and Seabank Substation, north of Avonmouth. The proposed development is a Nationally Significant Infrastructure Project (NSIP) as defined by the Planning Act 2008.

1.1.2 National Grid is proposing to use a combination of overhead line and underground cables for the connection.

1.1.3 Oxford Archaeology (OA) was commissioned by TEP on behalf of National Grid to undertake an intrusive evaluation (trial trenching) along the route of the new 400kV connection between Bridgewater, Somerset and Seabank Substation, north of Avonmouth.

1.1.4 A number of geophysical anomalies were identified during geophysical survey (Bartlett-Clark Consultancy 2013) which were targeted by trial trenching, along with a number of previously known heritage assets. The trenches fell into two groups: one group to the south and east of Banwell, North Somerset (Fig. 1), and a second group to the north of Nailsea, North Somerset (Fig. 2).

1.1.5 All work was undertaken in accordance an approved Written Scheme of Investigation (Oxford Archaeology 2013) and with the '*Somerset County Council Heritage Service Archaeological Handbook*' (2011) and the Institute for Archaeologists' '*Standard and Guidance for an Archaeological Evaluation*' (revised 2008).

1.2 Geology and topography

1.2.1 The trenches lay mainly on Triassic Mercia Mudstone but with areas of Carboniferous limestone to the north of Nailsea (http://mapapps.bgs.ac.uk/geologyofbritain/home.html).

1.3 Archaeological and historical background

1.3.1 The potential impact of the scheme on known archaeological sites and findings in the vicinity of the route is noted in the Preliminary Environmental Information Report (National Grid 2013) and is not repeated here.

1.3.2 This trial trenching survey addresses the results of a geophysical survey (Bartlett-Clarke Consultancy 2013) that covered the following areas:

- the Mendips underground section, including the Sandford and South Mendips compounds and layout areas. A short section at the south of the underground route has yet to be surveyed;
- The Nailsea to Portishead W Route.

1.3.3 A number of anomalies of probable archaeological origin were recorded, including:

- on the Mendips underground section: a series of enclosures east of Loxton and between Banwell and Sandford Batch;
- on the Nailsea to Portishead W Route: a series of anomalies at Whitehouse Lane, close to the site of a Deserted Medieval Village.

2 EVALUATION AIMS AND METHODOLOGY

2.1 Aims

2.1.1 The site specific aims of the trial trenching, as set out in the Specification (National Grid, March 2013), were to:-

- Establish the presence or absence of buried archaeological remains in areas that would be affected by the proposed development;
- Determine the nature, extent, and significance of any archaeological remains;
- Assess the ecofactual and palaeo-environmental potential of buried archaeological remains and to take samples where appropriate;
- Report on the results of the investigations; and
- Provide information to inform the design of a mitigation strategy for the proposed development.

2.2 Methodology

2.2.1 A total of 14 trenches were proposed, targeting a series of geophysical anomalies and previously known heritage assets. In the list below, B-CC Field numbers refer to the numbering sequence used in the geophysical survey report.

Somerset

- Trench 1, B-CC Field 14 (NGR ST 37995 55983): one 20m trench across linear and curvilinear anomalies.

North Somerset

- Trench 2, B-CC Field 29 (NGR ST 39530 57248): one 20m trench across a rectilinear ditched anomaly and a linear anomaly to its west;
- Trenches 3 and 4, B-CC Field 41 (NGR ST 40000 58010 and ST 40045 58035): two 20m trenches, one across curvilinear anomalies, the other for a right-angled linear anomalies to the south-west;
- Trench 5, B-CC Field 43 (NGR ST 40335 58240): one 20m trench across two rectangular anomalies;
- Trench 6, B-CC Field 52 (NGR ST 41460 58845: one 20m trench across a large rectangular anomaly;
- Trenches 7 and 8, B-CC Field 53 (NGR ST 441490 58885 and ST 41458 58947): two 20m trenches, one each for the large rectangular and smaller circular anomalies;
- Trench 9, B-CC Field 94 (NGR ST 45927 71555): one 20m trench on the site of a Roman building;
- Trenches 10 and 11, B-CC Field 110 (NGR ST 47988 73023 and ST 48030 73098): two 20m trenches, near the DMV site to the east and through geophysical anomalies to the south;
- Trench 12, B-CC Field 111 (NGR ST 48005 73375): one 20m trench across a linear geophysical anomaly;
- Trenches 13 and 14, B-CC Field 118 (NGR ST 48650 74388 and ST 48772 74665): two 20m trenches in area of possible prehistoric field system: one across a well-preserved earthwork and one across a linear anomaly to the north.

2.2.2 In the event, access was not available to B-CC Field 53 and Trenches 7 and 8 were not excavated.

2.2.3 All trenches were opened using a wheeled excavator fitted with a toothless ditching bucket under close archaeological supervision.

3 RESULTS

3.1 Introduction and presentation of results

3.1.1 The results of the evaluation are presented below, beginning with a general description of soils, and a stratigraphic account of those trenches which contained archaeological remains. This is followed by an overall discussion and interpretation. An index of trenches giving the extent and depths of all deposits is presented in tabular form in Appendix A. A description and quantification of the finds forms the content of Appendix B.

3.2 General soils and ground conditions

3.2.1 The underlying geology was reached in all the trenches. It consisted of a firm mid reddish brown clay with occasional limestone inclusions other than in Trench 11 where it consisted of a weathered limestone.

3.2.2 All trenches contained topsoil which was between 0.14m and 0.40m thick with an average of 0.30m. A mid brown silty clay subsoil, between 0.10m and 0.50m thick with an average of 0.20m, was present in all trenches except Trenches 1 and 10 which had a sandy silt subsoil, 0.18m and 0.08m thick respectively.

3.3 General distribution of archaeological deposits

3.3.1 Archaeological features were present in all trenches except Trench 10 and Trench 12, which contained modern features and.

3.4 **Trench 1** (Figs 3a and 4)

3.4.1 Trench 1 contained a ditch (110), aligned NE-SW, which was filled by a dark brownish grey silty clay deposit (109).

3.4.2 It was truncated by circular pit 108 (Plate 1) which contained two greyish brown clay fills (106 and 107). Fill 106 produced three sherds of Roman pottery and fill 107 contained a sherd of Iron Age pottery. Both fills contained animal bone. A soil sample from fill 107 produced a small quantity of charred remains including oat/brome and wheat. Fragments of animal bone, including frog bones, were also present.

3.4.3 Another, smaller, pit (103) was also investigated further to the south. This contained two fills (104 and 105). Fill 105 produced 22 sherds of Iron Age pottery, three fragments of fired clay and animal bone. A soil sample from fill 105 produced a small quantity of charred remains including oat/brome, wheat and possibly barley.

3.5 **Trench 2** (Figs 3a and 4)

3.5.1 Trench 2 contained two N-S aligned ditches (203 and 206).

3.5.2 Ditch 206 appears form part of a large enclosure ditch. It was filled with firm brown clays (207, 208, 209 and 210), two of which (207 and 210) contained animal bone.

3.5.3 Ditch 203 (Plate 2) contained two brownish grey clay fills (204 and 205) which both contained animal bone. Fill 205 contained a sherd of late Iron Age/Roman pottery and a sherd of 19th century pottery.

3.5.4 Neither ditch was excavated to its full depth due to the unstable nature of the trench edges.

3.6 Trench 3 (Figs 3a and 5)

3.6.1 Trench 3 contained two ditches and two pits.

3.6.2 Pit 303 was filled by deposit 304 which contained frequent fragments of limestone. No artefacts were present.

3.6.3 Ditch 305, aligned NW-SE, contained fill 306 which contained frequent limestone fragments, some of which were heat-reddened. It produced 37 sherds of Roman pottery.

3.6.4 Pit 309 was filled by deposit 310 which contained frequent limestone fragments. No artefactual material was present.

3.6.5 Ditch 307, aligned NW-SE, was filled by deposit 308 which contained frequent limestone fragments. No artefactual material was present.

3.7 Trench 4 (Figs 3a and 5)

3.7.1 Trench 4 contained a wall-footing and a spread of limestone rubble.

3.7.2 Wall-footing 403, aligned NW-SE and constructed of limestone fragments, was 0.5m wide and survived to a depth of 0.18m. No artefactual material was recovered.

3.7.3 To the NE of footing 403, a layer of limestone rubble was present beneath the subsoil.

3.8 Trench 5 (Figs 3b and 6)

3.8.1 Trench 5 contained a large N-S enclosure ditch (503) which contained three fills (504, 505 and 506). Fills 505 and 506 both contained quantities of animal bone and pottery: fill 505 produced 27 sherds of 2nd century AD pottery and fill 506 produced 80 sherds of 2nd-3rd century AD pottery. Fill 506 also produced four fragments of limestone, three of which were of dimensions suitable for use as *tesserae*.

3.8.2 At the southern end of the trench there were a series of inter-cutting ditches. A ditch (510), aligned NE-SW, contained fills 508 and 511. It was recut by ditch 507 which contained fill 509 which produced two sherds of Roman pottery and animal bone.

3.8.3 Ditches 510 was cut by ditch 512, aligned NW-SE. The full width of ditch 512 was not apparent due to its proximity to a large service drain truncating it to the south. It was filled by deposit 513 which contained animal bone and a sherd of Roman pottery.

3.9 Trench 6 (Figs 3b and 6)

3.9.1 Trench 6 contained a ditch (603), aligned NE-SW, which was filled by a brown-grey silty sand (604) which contained no finds.

3.10 Trench 9 (Fig. 3b and Plate 3)

3.10.1 Trench 9 contained a limestone floor surface (904) at its southern end which consisted of several large, flat slabs of limestone lying directly on top of the natural geology (902). This had been partially covered by a large area of rubble (903) comprising roughly hewn limestone blocks. Part of this layer was removed but no underlying features or wall footings were revealed. Excavation was kept to a minimum so as not to cause unnecessary damage to the deposits revealed. Pottery and other finds were recovered from the subsoil (901) which overlay the rubble and limestone slabs, including 27 sherds of Roman pottery and a sherd of 18th century pottery. Eleven sherds of Roman pottery and a sherd of medieval pottery were also recovered from the topsoil.

3.10.2 There are also visible earthworks and masonry protruding from the topsoil in the area immediately to the south and west of the trench, towards Tickenham Court, which are likely to be related to the deposits found within Trench 9.

3.11 Trench 10

3.11.1 Trench 10 was devoid of archaeology. The geophysical anomaly that the trench was targeted on was investigated and proved to be a slight depression in the natural geology.

3.12 Trench 11 (Figs 3b and 6)

3.12.1 Trench 11 contained E-W aligned ditch 1103 (Plate 4) with a single fill of brown clayey silt (1104). This ditch was not dug to its full depth due to the unstable nature of the surrounding soils. No artefactual material was present.

3.12.2 A small tree throw-hole (1105) was also investigated. No finds were recovered from either feature. No artefactual material was present.

3.13 Trench 12

3.13.1 Trench 12 contained two land drains on a NE-SW alignment which had been identified by the geophysical survey. No archaeological features were located.

3.14 Trench 13

3.14.1 Trench 13 contained no archaeological features. However, several firm brown silt deposits were recorded in the trench section which make up a lynchet, visible as an earthwork, on which the trench was targeted. No artefactual remains were recovered.

3.15 Trench 14 (Figs 3c and 6)

3.15.1 Trench 14 contained a single shallow N-S aligned ditch (1403) with a mid-brown clayey silt fill (1404) which contained a fragment of animal bone.

3.16 Finds summary

3.16.1 A total of 215 sherds of pottery, weighing 5,307g, was recovered during the evaluation. The majority of the pottery was of Roman date although some Iron Age pottery was also present. Occasional sherds of medieval and post-medieval pottery were also recovered.

3.16.2 Three fragments of fired clay were recovered, one of which had the indentation of a wattle rod suggesting it was structural.

3.16.3 Five fragments of worked stone were present: of these, three had possibly been used as *tesserae*, and a fourth was probably a fragment of stone roof tile.

3.16.4 A total of 220 animal bones were recovered, primarily from contexts dated to Iron Age and Roman periods. In addition, a number of amphibian bones (frog) were present in a soil sample.

3.16.5 A single fragment of clay pipe stem was recovered along with one iron object, a nail.

4 DISCUSSION

4.1 Reliability of field investigation

4.1.1 The trenches were opened in reasonable weather conditions and the revealed features were generally easily identifiable. The trenches remained relatively dry throughout the evaluation. Anomalies that were identified by the geophysical survey were generally present within the trenches.

4.1.2 It is therefore felt that the results of the evaluation present a reasonably reliable indication of the nature and date of the features present.

4.2 Interpretation

4.2.1 In general, the recorded geophysical anomalies provide a reasonable accurate representation of the below ground deposits recorded in the evaluation trenches.

4.2.2 Artefacts recovered from the trenches were largely of Iron Age or Roman date. No artefacts of earlier date were recovered and very few artefacts of post-Roman date were present.

Trench 1

4.2.3 Trench 1 was positioned to investigate a linear and a curvilinear geophysical anomaly. No evidence of the linear anomaly was present but a ditch and two pits coincided with the linear anomaly. A substantial quantity pottery was recovered from one of the pits and this, along with the presence of animal and small quantities of charred cereal remains, suggests that a settlement exists in the immediate vicinity. The pottery is not closely dateable, but a middle-late Iron Age date seems likely.

4.2.4 The presence of a few sherds of Roman pottery from the upper fill of one of the pits may suggest that the pit remained open as a partially infilled feature into the Roman period rather than indicating a continuation of settlement activity.

Trench 2

4.2.5 Trench 2 was positioned to investigate a rectilinear anomaly and a parallel linear anomaly. Two ditches were present on a similar alignment to the anomalies, although one of them was slightly offset.

4.2.6 Both ditches were reasonably substantial but only a single sherd of late Iron Age/Roman pottery was recovered. A sherd of Victorian china from the same feature could be intrusive. Both features also contained animal bone.

4.2.7 The paucity of pottery or other artefacts perhaps suggests that the features here are not part of a settlement site but, rather, may be some form of stock enclosure.

Trenches 3 and 4

4.2.8 Trenches 3 and 4 were positioned to investigate a series of geophysical anomalies forming a series of enclosures and possible trackways.

4.2.9 A series of pits and ditches were recorded in Trench 3 and a wall-footing and layer of limestone rubble were recorded in Trench 4. A significant quantity of Roman pottery was recovered from one of the features in Trench 3 and it is likely that the site represents a settlement site of this date. The presence of large quantities of limestone rubble in all features may indicate that substantial buildings are present in the vicinity.

4.2.10 A scatter of pottery and coins has previously been found in the area (HER ref: 00226) and a reference also exists to the presence of multiple Roman buildings (HER ref: 40685).

Trench 5

4.2.11 Trench 5 was positioned to investigate two rectilinear geophysical anomalies and a possible trackway. Features corresponding to both possible enclosures were present in the trench. A substantial quantity of pottery, as well as animal bone, was recovered, particularly from a ditch which appears to form the eastern edge of a trackway.

4.2.12 The quantity of artefactual material does suggest that these enclosures were associated with settlement and the presence of three possible *tesserae* could indicate the presence of a relatively high status building in the area although this is far from certain.

Trench 6

4.2.13 No evidence of the rectilinear anomaly recorded in the geophysical survey was present in the trench. A single, very shallow, undated ditch was present, running parallel to the current field boundary.

Trench 9

4.2.14 Trench 9 was located in an area where Roman building remains were excavated in the 1960s by the North Somerset Archaeological Research Group (NSARG). Few details are available, but the site is described as a possible villa (HER ref: 00536).

4.2.15 The current works revealed a possible floor surface constructed of limestone slabs overlain by a substantial deposit of limestone rubble. Although no wall footings were found, it is likely that at least one stone-founded building exists in this field.

4.2.16 Pottery was recovered from the overlying subsoil and topsoil, much of which can be dated to the 2nd century AD or later. The NSARG excavation recovered pottery of 3rd century date along with a quern stone.

4.2.17 The field in which the trench was located also contains a number of prominent earthworks and fragments of limestone were visible at various locations.

Trench 10

4.2.18 Trench 10 was positioned to investigate a linear geophysical anomaly. No archaeological features were present and the anomaly coincided with a slight hollow in the natural geology.

Trench 11

4.2.19 Trench 11 was positioned to investigate a rectilinear geophysical anomaly and lies close to the site of a deserted medieval village (HER ref: 00565).

4.2.20 A substantial ditch was present but no artefactual remains were present. It remains possible, therefore, that the rectilinear enclosure is associated with the former settlement.

Trench 12

4.2.21 Trench 12 was positioned to investigate a linear geophysical anomaly. Two parallel field drains coincided with the anomaly.

Trench 13

4.2.22 Trench 13 was positioned to investigate well-preserved earthwork in area of possible prehistoric fields. The earthwork was formed from several distinct layers and probably represents a lynchet built up through ploughing. No artefactual material was recovered and the date of origin of the earthwork could not be determined.

Trench 14

4.2.23 Trench 14 was positioned to investigate a linear geophysical anomaly in the area of possible prehistoric fields. The anomaly corresponded to a very shallow, broad ditch but no dating evidence was recovered and its origin can not be determined.

Appendix A. TRENCH DESCRIPTIONS AND CONTEXT INVENTORY

Trench 1						
General description					**Orientation**	N-S
Trench contained two pits and a NE-SW ditch. All features were sealed by a topsoil and subsoil which overlay a clay natural with occasional sandstone inclusions.					**Avg. depth (m)**	0.52
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
100	Layer	-	0.34	Topsoil	-	-
101	Layer	-	0.18	Subsoil	-	-
102	Layer	-	-	Natural	-	-
103	Cut	1.15	0.40	Pit	-	-
104	Fill	1.15	0.12	Fill of 103	-	-
105	Fill	1.15	0.28	Fill of 103	Pottery, Bone	-
106	Fill	1.70	0.50	Fill of 108	Pottery, Bone	-
107	Fill	1.70	0.20	Fill of 108	Pottery, Bone	-
108	Cut	1.70	0.70	Pit	-	-
109	Fill	0.80	0.20	Fill of 110	-	-
110	Cut	0.80	0.20	Ditch	-	-

Trench 2						
General description					**Orientation**	E-W
Trench contains two large ditches both are sealed by a topsoil and subsoil which overlay a clay natural.					**Avg. depth (m)**	0.50
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
200	Layer	-	0.30	Topsoil	-	-
201	Layer	-	0.20	Subsoil	-	-
202	Layer	-	-	Natural	-	-
203	Cut	2.30	0.40	Ditch	-	-
204	Fill	2.30	0.20	Fill of 203	Bone	-
205	Fill	2.30	0.20	Fill of 203	Pottery, Bone	-
206	Cut	3.40	0.65	Ditch	-	-

207	Fill	3.40	0.10	Fill of 206	Bone	-
208	Fill	3.40	0.30	Fill of 206	-	-
209	Fill	1.80	0.20	Fill of 206	Bone	-
210	Fill	3.40	0.15	Fill of 206	-	-

Trench 3						
General description					**Orientation**	E-W
Trench contains four features containing limestone rubble lying underneath the topsoil which overlay a subsoil and a clay natural.					**Avg. depth (m)**	0.90
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
300	Layer	-	0.40	Topsoil	-	-
301	Layer	-	0.50	Subsoil	-	-
302	Layer	-	-	Natural	-	-
303	Cut	1.00	0.50	Pit	-	-
304	Fill	1.00	0.50	Fill of 303	-	-
305	Cut	2.00	0.70	Pit	-	-
306	Fill	2.00	0.70	Fill of 305	Pottery	-
307	Cut	1.60	0.50	Pit	-	-
308	Fill	1.60	0.50	Fill of 307	-	-
309	Cut	0.80	0.50	Pit	-	-
310	Fill	0.80	0.50	Fill of 309	-	-

Trench 4						
General description					**Orientation**	E-W
Trench contains two deposits of limestone rubble underneath the subsoil which overlay a clay natural.					**Avg. depth (m)**	0.80
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
400	Layer	-	0.40	Topsoil	-	-
401	Layer	-	0.40	Subsoil	-	-
402	Layer	-	-	Natural	-	-
403	Fill			Wall footing	-	-

404	Cut		0.20		-	-
405	Layer		0.20	Layer	-	-

Trench 5						
General description					**Orientation**	E-W
Trench contains four linear features, three running NE-SW and one running NW-SE, these were overlain by a subsoil and topsoil which overlay a natural of sandy clay					**Avg. depth (m)**	0.34
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
500	Layer	-	0.34	Topsoil	-	-
501	Layer	-		Subsoil	-	-
502	Layer	-	-	Natural	-	-
503	Cut	2.00	0.40	Ditch	-	-
504	Fill	0.75	0.10	Fill of 503	-	-
505	Fill	0.75	0.20	Fill of 503	Pottery, Bone	
506	Fill	0.75	0.10	Fill of 503	Pottery, Bone	-
507	Cut	1.70	0.65	Ditch	-	-
508	Fill	0.50	0.20	Fill of 510	-	-
509	Fill	0.90	0.50	Fill of 507	-	-
510	Cut	1.30	0.56	Ditch	-	-
511	Fill	1.30	0.56	Fill of 510	Bone, Stone	
512	Cut	1.10	0.40	Ditch	-	-
513	Fill	1.10	0.40	Fill of 512	Pottery, Bone	

Trench 6						
General description					**Orientation**	N-S
Trench contains a single NE-SW ditch sealed by topsoil and subsoil which overlay a silty clay natural.					**Avg. depth (m)**	0.53
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
600	Layer	-	0.30	Topsoil	-	-

601	Layer	-	0.23	Subsoil	-	-
602	Layer	-	-	Natural	-	-
603	Cut	0.36	0.06	Ditch	-	-
604	Fill	0.36	0.06	Fill of 603	-	-

Trench 9						
General description					**Orientation**	NE-SW
Trench contained a stone floor, overlain by a large quantity of tumbled masonry sealed by a subsoil and topsoil which overlay a clay natural					**Avg. depth (m)**	0.30
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
900	Layer	-	0.24	Topsoil	-	-
901	Layer	-	0.06	Subsoil	-	-
902	Layer	-	-	Natural	-	-
903	Deposit	1.50	-	Building demolition	-	-
904	Structure		-	Stone Floor	-	-

Trench 10						
General description					**Orientation**	NE-SW
Trench devoid of archaeology. Consists of soil and subsoil overlying a natural of silty clay with frequent limestone inclusions.					**Avg. depth (m)**	0.22
					Width (m)	1.50
					Length (m)	20.00
Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
100	Layer	-	0.17	Topsoil	-	-
101	Layer	-	0.08	Subsoil	-	-
102	Layer	-	-	Natural	-	-

Trench 11		
General description	**Orientation**	N-S
Trench contains a large E-W ditch and a small tree throw, both are sealed by a subsoil and topsoil which overlay a limestone natural.	**Avg. depth (m)**	0.24
	Width (m)	1.50
	Length (m)	20.00

Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
1100	Layer	-	0.14	Topsoil	-	-
1101	Layer	-	0.10	Subsoil	-	-
1102	Layer	-	-	Natural	-	-
1103	Cut	2.00	0.60	Ditch	-	-
1104	Fill	2.00	0.60	Fill of 1103	-	-
1105	Cut	0.80	0.15	Tree-throw	-	-
1106	Fill	0.80	0.15	Fill of 1105		

Trench 12		
General description	**Orientation**	NW-SE
Trench devoid of archaeology. Consists of topsoil and subsoil overlying a natural of clay.	**Avg. depth (m)**	0.48
	Width (m)	1.50
	Length (m)	20.00

Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
1200	Layer	-	0.20	Topsoil	-	-
1201	Layer	-	0.28	Subsoil	-	-
1202	Layer	-	-	Natural	-	-

Trench 13		
General description	**Orientation**	N-S
Trench devoid of archaeology. Consists of a topsoil and several subsoil layers which overlay a natural of clay.	**Avg. depth (m)**	1.00
	Width (m)	1.50
	Length (m)	20.00

Contexts						
context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
1300	Layer	-	0.80	Topsoil	-	-
1301	Layer	-	0.20	Subsoil	-	-
1302	Layer	-	-	Natural	-	-
1303	Layer	-	-	Subsoil	-	-
1304	Layer	-	-	Subsoil	-	-

Trench 14		
General description	**Orientation**	E-W

Trench contained a single N-S ditch which was sealed by a topsoil and subsoil which overlay a clay natural with frequent limestone inclusions.	**Avg. depth (m)**	0.57
	Width (m)	1.50
	Length (m)	20.00

Contexts

context no	**type**	**Width (m)**	**Depth (m)**	**comment**	**finds**	**date**
1400	Layer	-	0.28	Topsoil	-	-
1401	Layer	-	0.22	Subsoil	-	-
1402	Layer	-	-	Natural	-	-
1403	Cut	1.85	0.10	Ditch	-	-
1404	Fill	1.85	0.10	Fill of 1403	Bone	

Appendix B. FINDS REPORTS

B.1 Pottery

By Edward Biddulph

Introduction and methodology

B.1.1 Some 215 sherds of pottery, weighing 5307g, were recovered from the evaluation. The assemblage was scanned to identify diagnostic forms and fabrics to assess the character of the assemblage and suggest provisional dates for deposition. Each context-group was quantified by weight (g) and sherd count, and Roman-period fabrics were given standard Oxford Archaeology fabric codes. The post-Roman pottery was identified by John Cotter.

Description

B.1.2 The earliest pottery included the remains of a jar in a sand-and-grog/clay pellet-tempered fabric from context 105. The form could not be more closely identified to type, but an Iron Age date, probably middle to late Iron Age, is likely. A similar date can be suggested for the pottery from context 107.

B.1.3 Large groups of pottery were recovered from contexts 505 and 506. Forms such as a Severn Valley ware tankard (O40), a 'cooking-pot'-type jar in black-burnished ware (B11), and an everted-rimmed jar in sandy grey ware (R30), potentially date deposition to the second half of the 2nd century, although date of the pottery from 506 may extend into the first half of the 3rd century. The date is supported by pottery (including a flanged bowl and jars with everted rims in fabrics B11 and R30) from contexts 901 and 900, although these also contained post-Roman wares that may identify the Roman pottery as residual. The pottery from contexts 106, 509, and 513 was broadly dated to the Roman period.

B.1.4 Post-Roman pottery comprised a jug handle fragment in Ham Green ware dating to the 12th or 13th century from context 900, 18th century marbled and mottled wares in context 901, and a sherd from a plate or bowl in Victorian china from context 205.

Context	Count	Weight (g)	Description	Spot-date
105	22	260	Jar body sherds in sandy fabric with clay pellets or grog and occasional calcareous inclusions	Iron Age
106	3	24	Sandy grey ware (R30 Shell-tempered ware (E40/C10)	AD 43-410
107	1	12	Body sherd in sandy fabric with clay pellets or grog	Iron Age
205	2	35	Coarse-tempered body sherd, mainly grog-tempered (O80) Victorian china	1830-1900 (LIA/Roman = AD 1-410)
306	37	1172	Jar – body and base sherds (R30)	AD 43-410
505	27	428	Tankard (O40) Everted rim jars (B11, R30) Flange from white-ware mortarium (M20) Body sherd from South Gaulish samian ware (S20) cup - ?Drag. 33	AD 120-200
506	80	2690	Necked curving-sided bowl (R30) Everted rim jar (B11) Curving-sided flanged bowl or dish (R30)	AD 150-250
509	2	23	Sandy grey ware (R30)	AD 43-410

Context	Count	Weight (g)	Description	Spot-date
513	1	4	Sandy grey ware (R30)	AD 43-410
900	12	238	Everted rim jar (R30) Straight-sided bowl with flange and slight bead (B11) Curving-sided bowl with flanged rim (R30) Neckless jar with horizontal everted rim (R30) Jug handle (Ham Green ware)	1120-1300 (Roman = AD 200-300)
901	28	421	Jars with everted rims (R30) Black-burnished ware (B11) Marbled ware Staffordshire mottled ware	1750-1800 (Roman = AD 120-410)
TOTALS	215	5307		

Table B.1: Pottery from HINK13

Condition and recommendations

B.1.5 Overall, the condition of the Roman-period pottery was good. The mean sherd weight was 25g, which supports the impression gained during the recording of the assemblage that the Roman-period sherds were large and in relatively fresh condition. This suggests that the pottery underwent little, if any, disturbance and redeposition after original breakage and initial discard, and that the foci of settlement activity are likely to be close to the location of the evaluation trenches. Further excavation at the sites is likely to uncover more evidence of settlement, including pottery.

B.1.6 The wares encountered are regional or local in origin and typical of the area. The ranking of the settlements is difficult to ascertain based on the amount of material recovered, but a single sherd of imported samian ware from Trench 5 suggests that this settlement was not of very low status.

B.2 Fired Clay

By Edward Biddulph

B.2.1 Context 105 contained three fragments of fired clay (356g). One piece was a soft buff fabric with occasional sand, clay pellet, organic and flint inclusions. One surface had an elongated indentation probably of a wattle rod, suggesting that the piece is structural. The other two pieces were more amorphous. Both were in a hard red, sandy fabric and were of uncertain function, although it is possible that both were burnt and were from hearths. All fragments are suggestive of settlement.

B.3 Clay Pipe

By John Cotter

Context	Description	Date
900	Single fragment clay tobacco pipe stem, 2g	19th century

B.4 Metal

By Ian Scott

B.4.1 A single nail was recovered from context 901. It appears to be a modern 2in drawn wire nail of oval section, though somewhat corroded.

B.5 Stone

By Ruth Shaffrey

Introduction and methodology

B.5.1 A total of 17 pieces of stone were retained. Any that were deemed to be worked were examined with aid of a x10 magnification hand lens.

Description

B.5.2 Of the retained stone, 12 pieces are unworked and unused. Four pieces of liassic limestone, from context 506, had been broken into cuboid shapes – three of these are of dimensions roughly suitable to use as *tesserae* (24 x 25 x 15mm, 25 x 21 x 15mm and 29 x 22 x 20mm) while the fourth is too large and irregular (30 x 35 x 20mm).

B.5.3 A small fragment of reddish brown sandstone (probably Pennant sandstone), from context 900, has a single biconical perforation of 6mm diameter. No original edges survive but it is likely that it is a fragment of stone roofing.

B.6 Animal Bone

By Lena Strid

B.6.1 A total of 225 hand-collected animal bone fragments were recovered from this site (Table B2). The majority of the assemblage came from features preliminarily dated to the Iron Age and Roman periods.

B.6.2 The bone condition was generally fair, regardless of phase. A small number of bones had traces of gnawing by carnivores, probably dogs. Burnt bones were absent.

B.6.3 The assemblage contains bones from cattle, sheep/goat, pig and horse. The presence of these domestic taxa are common for Iron Age and Roman assemblages, although due to the small sample size it is not possible to extrapolate on the frequency of cattle, sheep/goat and pig and their contribution to the economy and diet.

B.6.4 A small number of bones could be attributed to minimum age at death. The predominance of fused cattle bones suggest that they were mostly killed as surplus animals after their first few winters and later on as adults past their prime. Generally in the Iron Age and Roman periods sheep/goat have a wide range of slaughter ages, but were rarely kept to an old age. This suggests that they were kept for a variety of products, possibly primarily meat (van Dijk and Groot 2013, 184). Pigs were raised for meat and due to their high fecundity and growth rate they were mostly killed as sub-adults after reaching maximum size. Horses were killed as adults, indicating their main use as riding or pack animals.

B.6.5 Butchery marks were noted on one cattle bone each in the middle Iron Age/late Iron Age, Iron Age/Roman and in Roman phase. Another three cattle bones with butchery marks came from the undated ditch 206. The butchery marks include cut marks from disarticulation of the mandible, the hip joint and the meat-poor lower leg. Chop marks on the distal humerus suggests disarticulation of the elbow joint. A radius was chopped in two mid-shaft, possibly to extract marrow or to fit the cut into a pot for boiling. Filleting is evidenced by cut marks on a pelvis.

Context	**Quantity**	**Species**
105	8	Cattle, Medium mammal, Sheep/goat, indet
106	11	Cattle, large mammal, sheep/goat, indet
107	6	Horse, sheep/goat, indet
204	9	Cattle, horse, large mammal, sheep/goat, indet
205	4	Horse, Medium mammal, indet

Context	Quantity	Species
207	3	Large mammal, Medium mammal, Sheep/goat, indet
210	30	Cattle, horse, Large mammal, Medium mammal, indet
505	16	Cattle, Large mammal, Medium mammal, Sheep/goat, Pig, indet
506	18	Horse, Large mammal, Medium mammal, Pig, Sheep/goat, indet
509	5	Cattle, Sheep/goat, Large mammal, Medium mammal
513	1	Cattle
900	3	Cattle, Large mammal
901	16	Cattle, Horse, Large mammal, Medium mammal, Sheep/goat
1404	1	Pig

Table B2: Animal bone

Appendix C. ENVIRONMENTAL REPORTS

C.1 Environmental samples

By Sharon Cook

Introduction

C.1.1 This report describes two samples taken from the evaluation at Hinkley Point, Somerset, in October 2013.

C.1.2 Both samples (sample 100 from context 107 and sample 101 from context 105) were taken from the fills of pits of Late Iron Age and early Roman date within Trench 1.

Methodology

C.1.3 The samples were processed for charred plant remains (CPR) by water flotation using a modified Siraf style flotation machine. The flot was collected on a 250µm mesh and the heavy residue sieved to 500µm; both were dried in a heated room, after which the residue was sorted by eye for artefacts and organic remains.

C.1.4 The dried flot was scanned for charred plant remains using a binocular microscope at approximately x10 magnification.

C.1.5 Seed identifications were made with reference to Oxford Archaeology's reference collection and with the assistance of Kath Hunter. Nomenclature for the plant remains follows Stace (2010). Animal bone identification was done by Lena Strid.

Results

C.1.6 Sample 100 was a dark reddish grey silty clay (2.5YR 3/1) and was a total of 35L in size. Animal bone was recovered from the residue consisting of two pieces of a horse metatarsal, part of a sheep metatarsal, an unfused sheep phalanx and a partial sheep astragalus, one rib fragment from a medium sized mammal, five frog bones, one amphibian bone which is probably also frog and nine unidentified fragments of mammal bone.

C.1.7 The sample yielded approximately 10ml of flot material of which 100% was scanned.

C.1.8 The flot for this sample contains small quantities of fine modern roots. Charcoal is present; although the fragments are mostly <4mm, and so probably not identifiable, they do appear to be in good condition. Two charred seeds are present, but they are not identifiable. Two fragments of oat/brome (*Avena/Bromus*) were noted; these were too small to firmly identify to species. In addition three glume base fragments were noted, one of which can be identified as probable spelt wheat (*Triticum spelta*); the remaining glume bases can only be identified as coming from hulled wheat (*Triticum* sp), such as spelt, emmer or einkorn.

C.1.9 Sample 101 was an 8L sample of dark reddish grey silty clay (2.5YR 3/1). Animal bone consisting of a skull fragment from a medium sized mammal and three unidentifiable fragments of mammal bone, as well as a small fragment of pottery, were recovered from the residue. The sample yielded approximately 15ml of flot material of which 100% was scanned.

C.1.10 The flot for this sample contains small quantities of fine modern roots. Charcoal is present; although the fragments are mostly <4mm, and so probably not identifiable, they do appear to be in good condition. Two charred plant seeds are present, one of which is unidentifiable although the other is from a fairly common plant, cleavers (*Galium aparine*). Three fragments of oat/brome (*Avena/Bromus*) were noted; these are too small to firmly identify to species, although one of these does seem more likely to be from oat (*Avena* sp.) than brome grass. A number of grass seeds (*Poaceae*) are present, these are from a variety of species but have not been identified further. Three glume base fragments were noted, one of which can be identified as probably spelt wheat (*Triticum spelta*), the remaining glume bases can only be identified as hulled wheat (*Triticum* sp). In addition a number of grain fragments are also present, the majority can only be identified as wheat (*Triticum* sp), although one grain may be barley (*Hordeum vulgare*). Fragments of straw were also noted.

Discussion

C.1.11 The plant material is largely well preserved, which indicates that this is a site with some potential for the recovery of charred remains. While few wild seeds were noted, the existence of wheat and oat fragments would indicate settlement activity in the vicinity.

C.1.12 The flots from these samples, while small in volume did include both charred seeds and charcoal and the animal bone while fragmentary was in good overall condition. Since charred remains and animal bone are evidently well preserved at this site, any future excavations should incorporate a sampling policy in accordance with the most recent sampling guidelines (e.g. Oxford Archaeology, 2005 and English Heritage 2011), with 40L samples taken for the recovery of charred remains.

Appendix D. BIBLIOGRAPHY AND REFERENCES

Bartlett-Clark Consultancy, 2013 Hinkley Point C Connection Project: Report on Archaeological Geophysical Surveys

English Heritage, 2011 Environmental Archaeology. *A guide to the theory and practice of methods, from sampling and recovery to post-excavation* (2nd edition). Centre for Archaeology guidelines.

National Grid, 2013 Hinkley Point C Connection Project: Preliminary Environmental Information Report (PEIR)

Oxford Archaeology, 2005 *Sampling guidelines*. Unpublished document

Oxford Archaeology, 2013 Hinkley Point C Connection: Written Scheme of Investigation for Geophysical Survey and Intrusive Evaluation

Stace, C, 2010 *New Flora of the British Isles* (3rd edition). Cambridge: Cambridge University Press.

van Dijk, J, and Groot, M, 2013 The late Iron Age-Roman transformation from subsistence to surplus production in animal husbandry in the central and western parts of the Netherlands, in *Barely surviving or more than enough? The environmental archaeology of subsistence, specialisation and surplus food production* (eds M Groot, D Lentjes and J Zeiler), Leiden, 175-200

Appendix E. Summary of Site Details

Site name: Hinkley Point C Connection Project

Site code: HINK13

Grid reference: NGR ST 39530 57248 - ST 48772 74665

Type: Evaluation

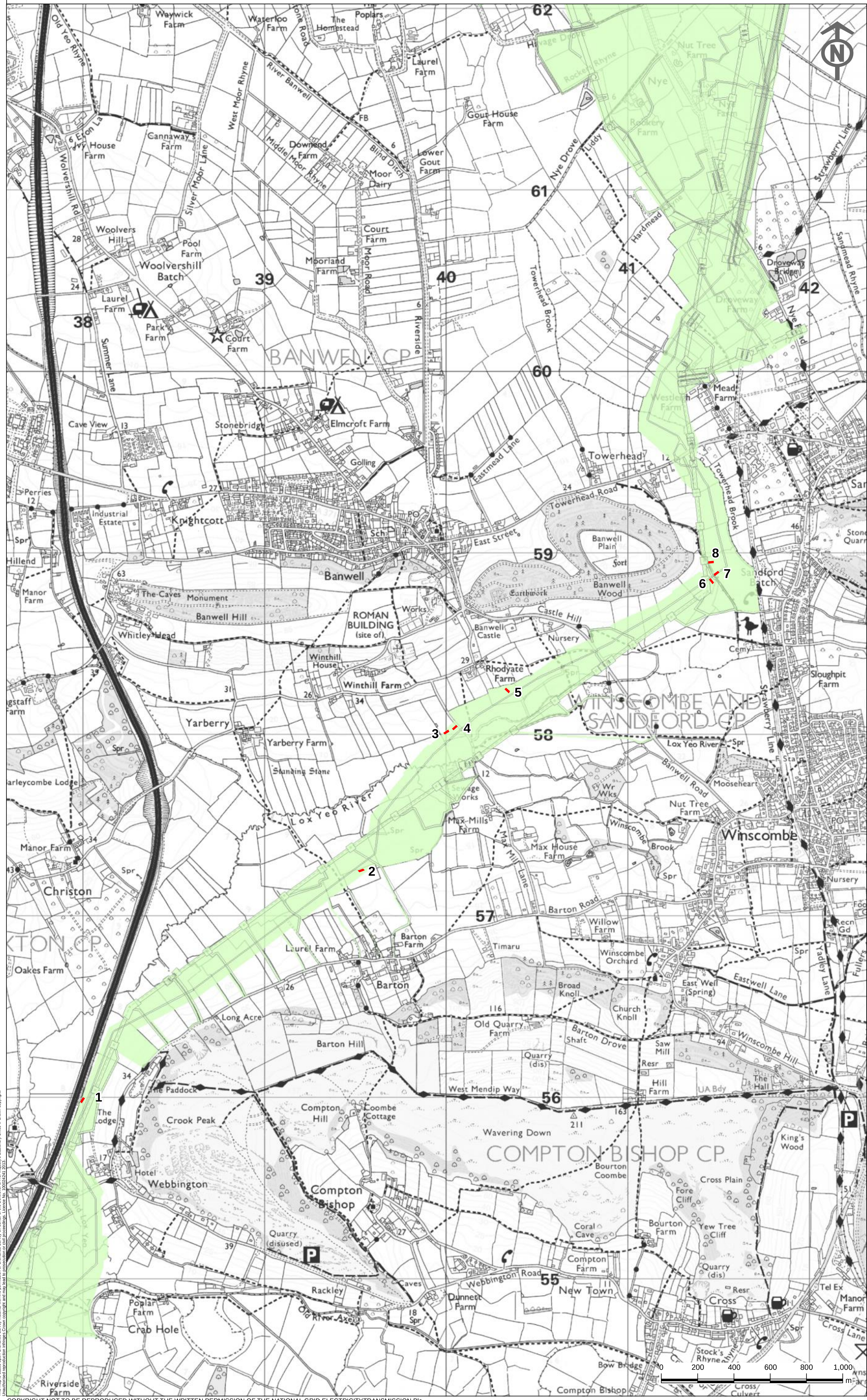
Date and duration: 14/10/2013 – 22/10/2013

Area of site: Twelve 20m x 1.50m trenches

Summary of results: Twelve trenches were excavated along the route of the proposed Hinkley Point C Connection, targeted on a series of geophysical anomalies and other known heritage assets.

The results of the evaluation indicate the presence of a number of settlement sites of Iron Age and Roman date along the route. Significant quantities of pottery and animal bone were recovered

Location of archive: The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES. The archive for Trench 1 will be deposited with the Somerset County Museum Service in due course, under the following accession number: TTNCM:104/2013. The archive for Trenches 2-14 will be deposited with the North Somerset Museum Service in due course, under the following accession number: WESTM:2013.25



Key

- Key Route Corridor
- Evaluation Trench

Notes

ISSUE	DATE	COMMENTS	DRAW	CHK'D	APP'D
A	28/02/2013				

Title

NATIONAL GRID (HINKLEY POINT C CONNECTION PROJECT)
FIELD RECONNAISSANCE SURVEY
FINAL REPORT

"Trench Locations - Southern Area"

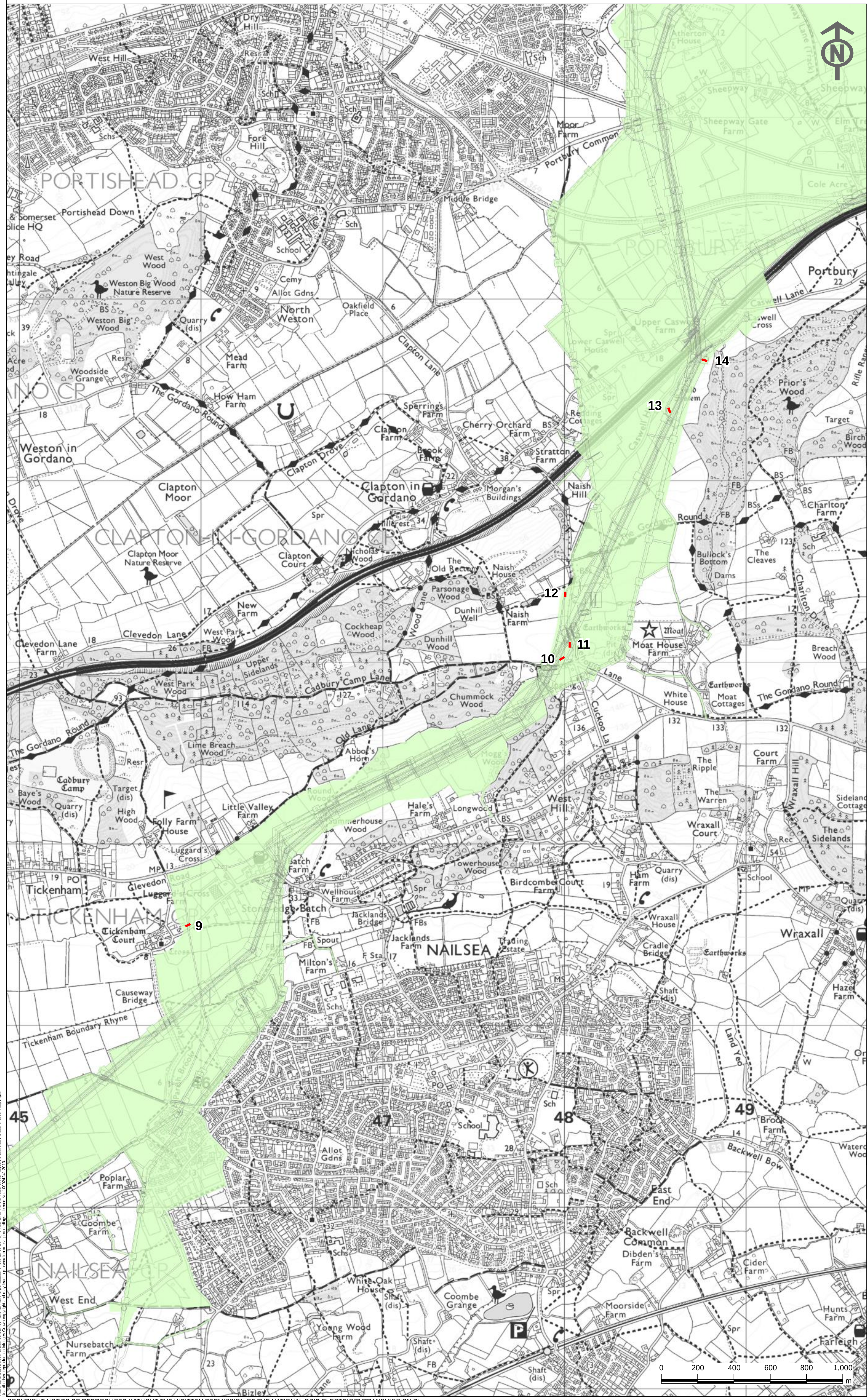
nationalgrid

National Grid plc, Warwick Technology Park, Gallows Hill, Warwick, CV34 6DA

NG INVESTMENT No.	FIGURE No.	GIS
20897	1	A3
DRAWING No.		SCALE 1:20,000
		ISSUE A

NATIONAL GRID (HINKLEY POINT C CONNECTION PROJECT)
FIELD RECONNAISSANCE SURVEY FINAL REPORT

"Trench Locations - Northern Area"



SITE MAP

Key

Key Route Corridor

Evaluation Trench

Notes

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"Trench Locations - Northern Area"

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NG INVESTMENT No.	FIGURE No.	GIS
20897	2	A3

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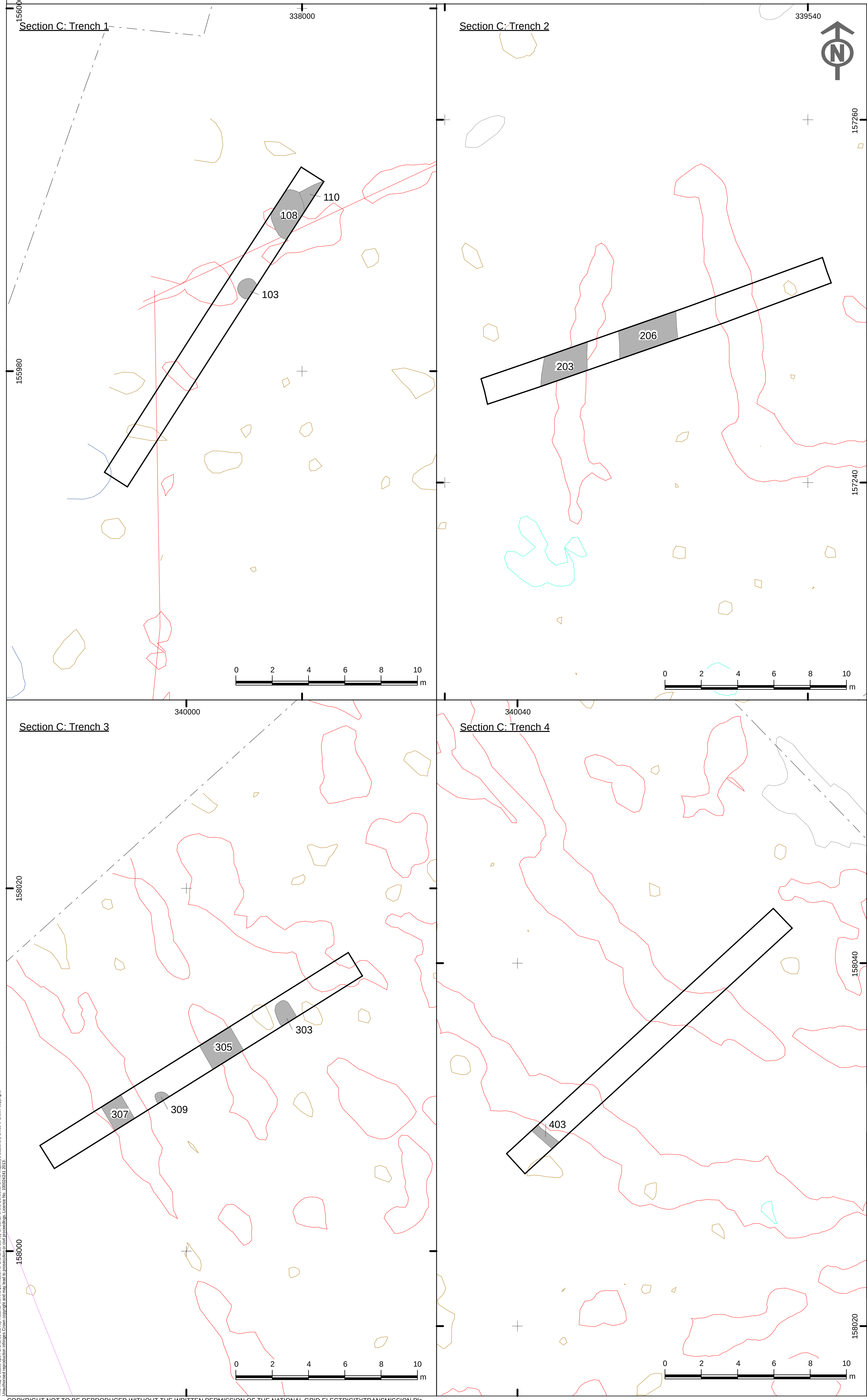
ISSUE A

NATIONAL GRID (HINKLEY POINT C CONNECTION PROJECT)
WRITTEN SCHEME OF INVESTIGATION
GEOPHYSICAL SURVEY AND INTRUSIVE EVALUATION

"Trench Plans"



SITE MAP

Key

- Evaluation Trench
- Archaeological Feature

Geophysics

- Limit of Survey
- Magnetic anomalies (Archaeological?)
- Recent magnetic disturbances?
- Broad / weak natural magnetic anomalies (wetland)
- Small background magnetic anomalies (natural / non-archaeological?)
- Cultivation
- Pipe
- Drain?
- Strong (ferrous) magnetic anomalies

Notes

ISSUE	DATE	COMMENTS	DRAW	CHK'D	APP'D
A	28/02/2013				

Title

NATIONAL GRID (HINKLEY POINT C CONNECTION PROJECT)
WRITTEN SCHEME OF INVESTIGATION
GEOPHYSICAL SURVEY AND INTRUSIVE EVALUATION

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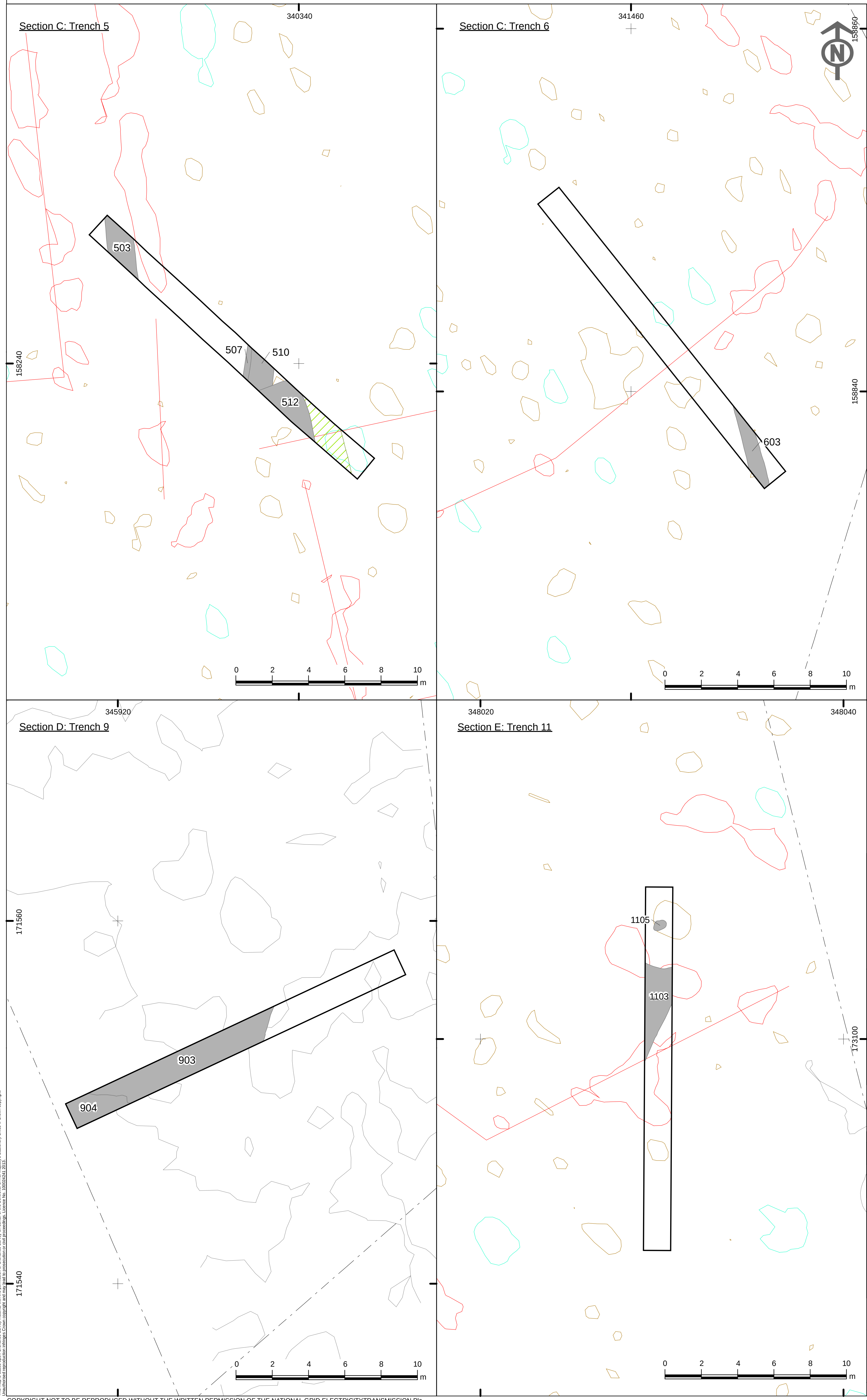

SITE MAP

Key

- Evaluation Trench
- Archaeological Feature
- Land Drain

Geophysics

- Limit of Survey
- Magnetic anomalies (Archaeological?)
- Recent magnetic disturbances?
- Broad / weak natural magnetic anomalies (wetland)
- Small background magnetic anomalies (natural / non-archaeological?)
- Cultivation
- Pipe
- Drain?
- Strong (ferrous) magnetic anomalies

Notes

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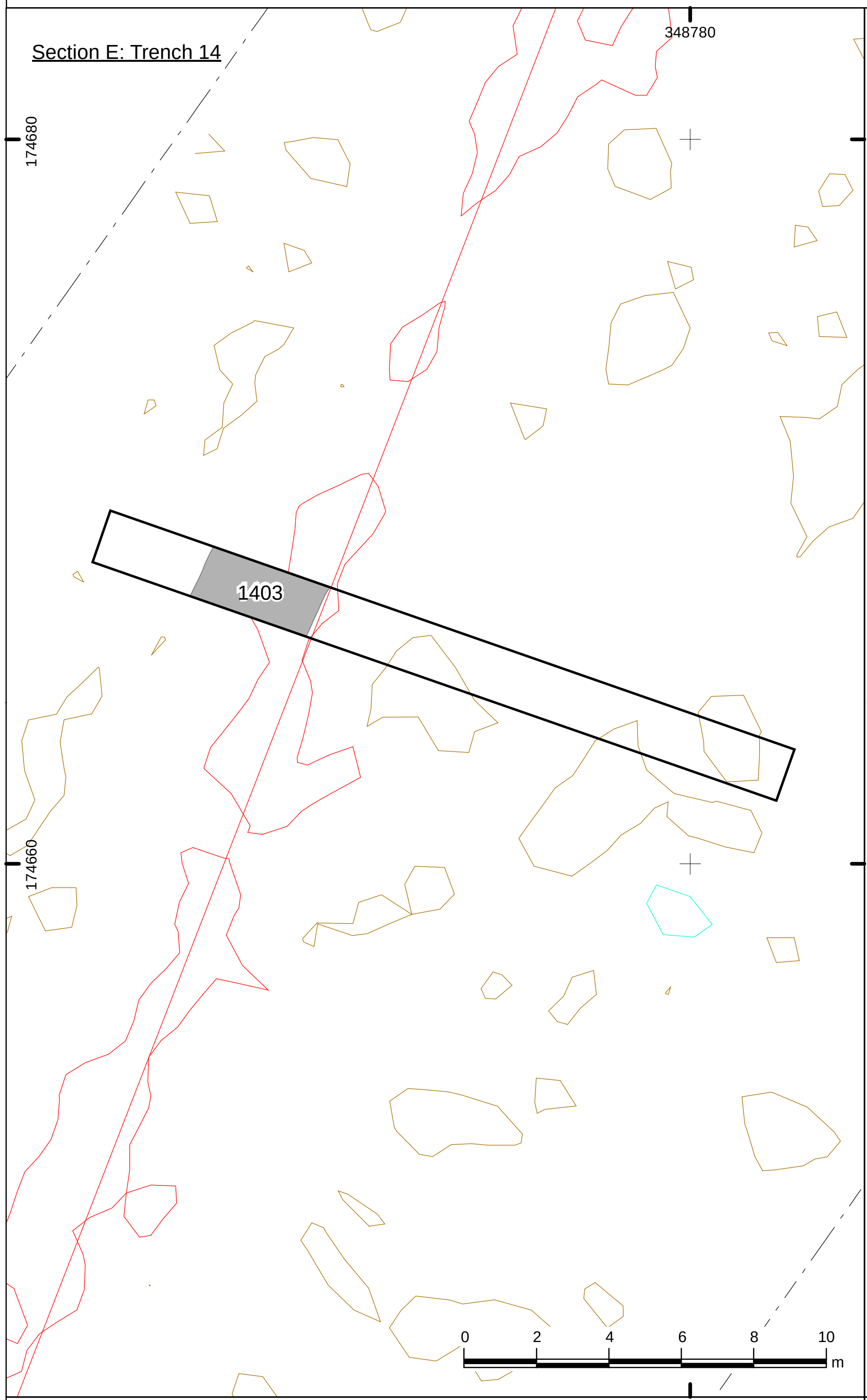

SITE MAP

Key

Evaluation Trench
Archaeological Feature

Geophysics

Limit of Survey
Magnetic anomalies (Archaeological?)
Recent magnetic disturbances?
Broad / weak natural magnetic anomalies (wetland)
Small background magnetic anomalies (natural / non-archaeological?)
Cultivation
Pipe
Drain?
Strong (ferrous) magnetic anomalies

Notes

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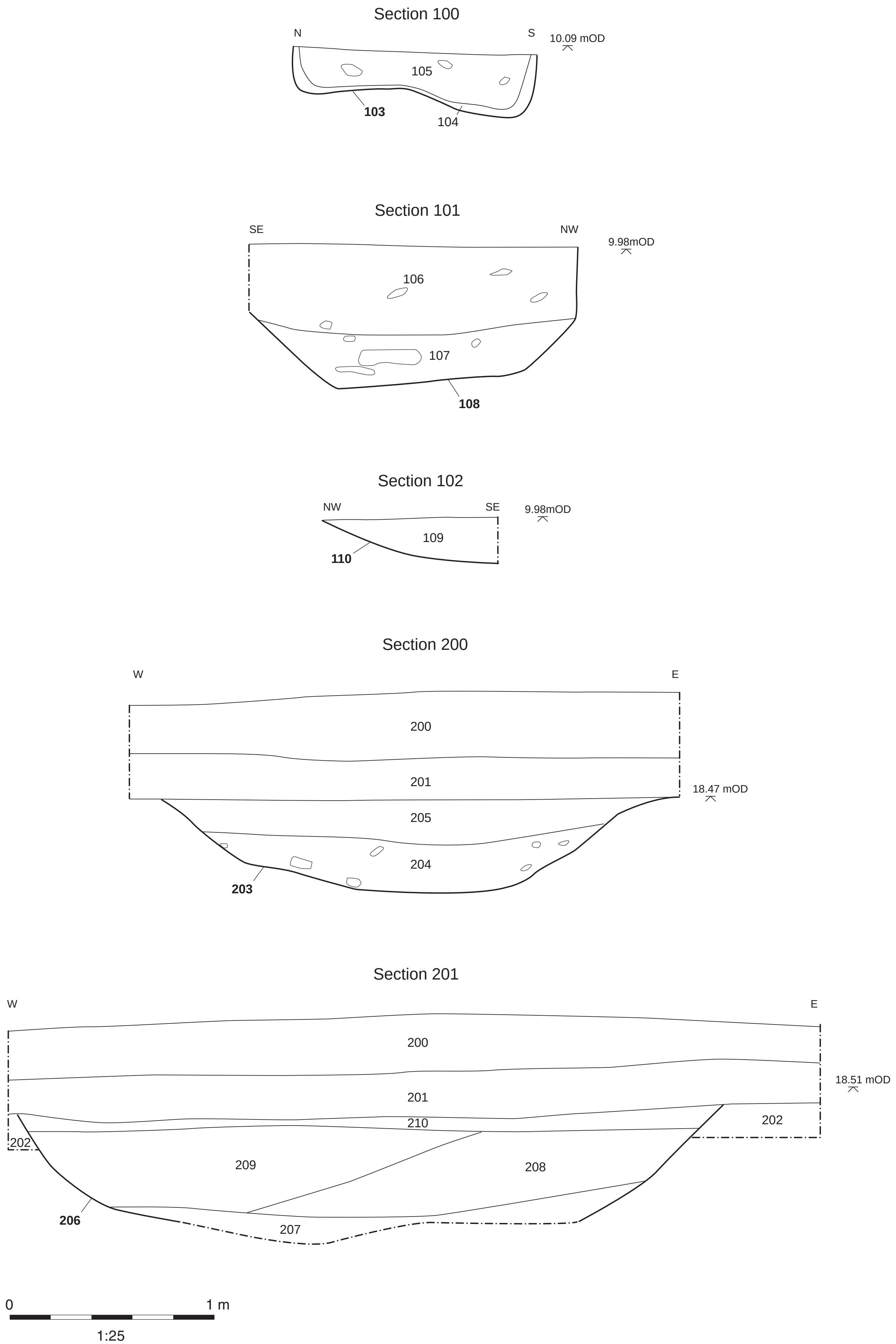

Figure 4: Sections 100, 101, 102, 200 and 201

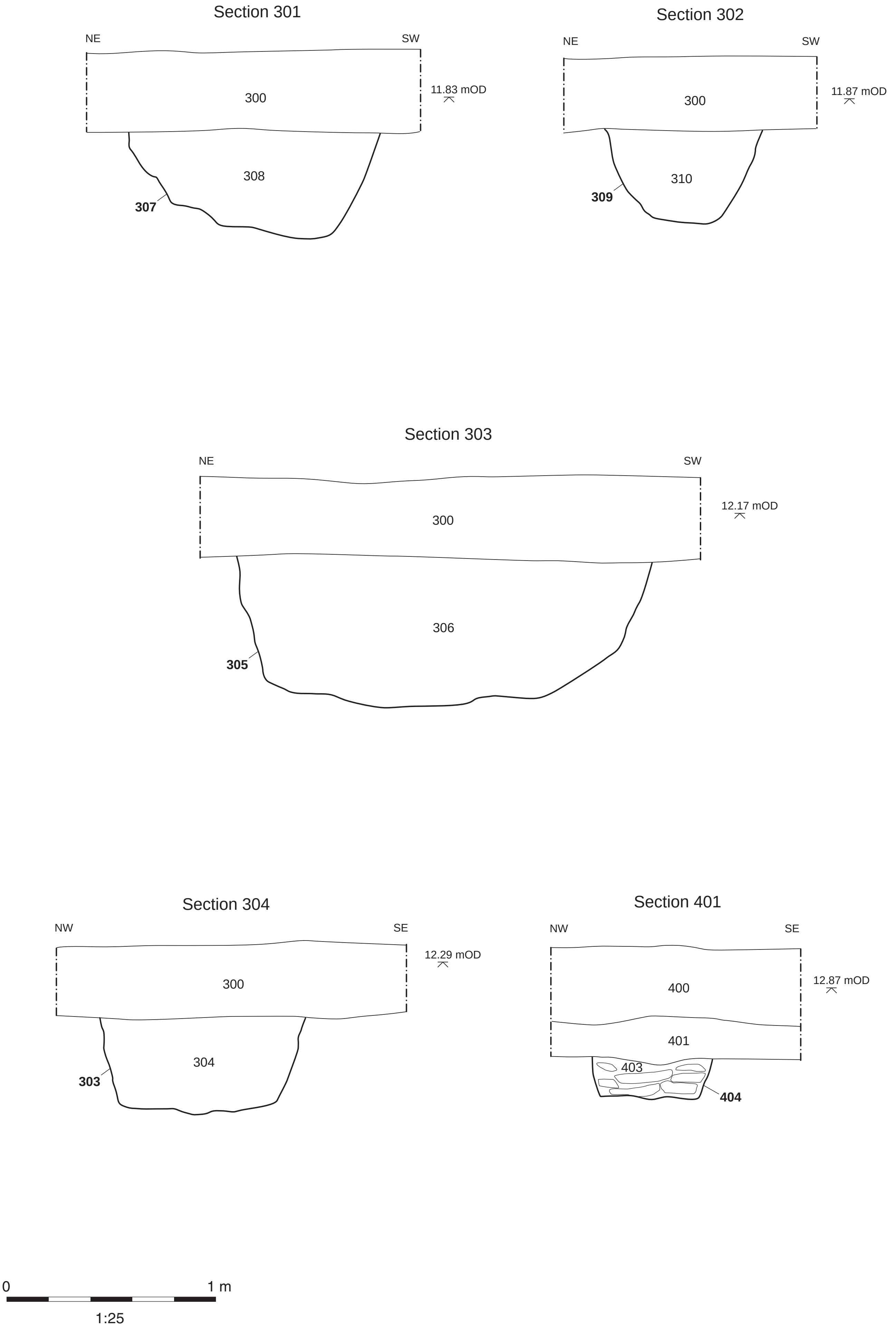

Figure 5: Sections 301, 302, 303, 304 and 401

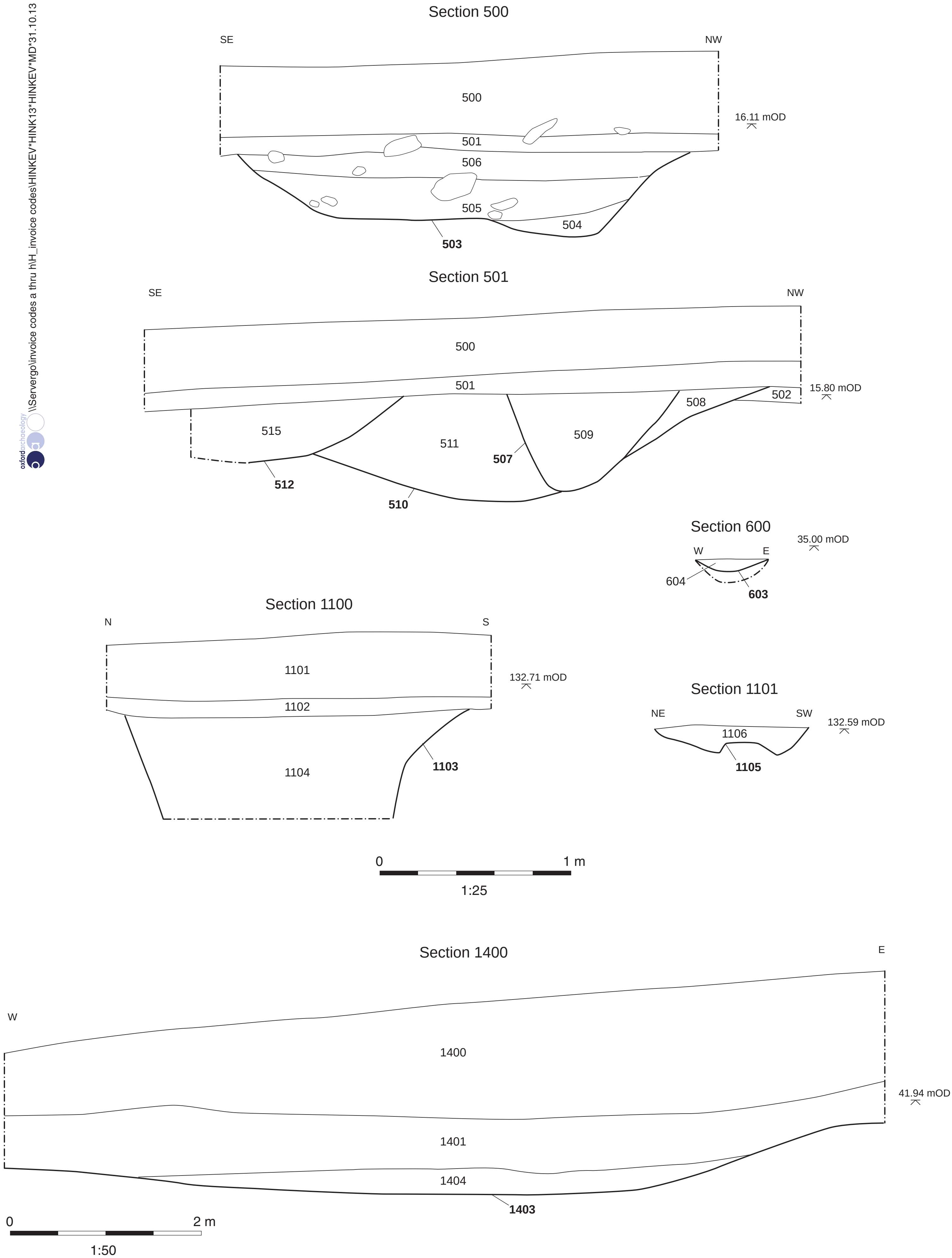

Figure 6: Sections 500, 501, 600, 1100, 1101 and 1400

Plate 1: Trench 1: Pit 108

Plate 2: Trench 2: ditch 203

Plate 3: Trench 9: Limestone slabs (904) in foreground, rubble spread (903) beyond

Plate 4: Trench 11: ditch 1103

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Appendix 11E – Geoarchaeological Desk-based Assessment and Field Survey

Geoarchaeology

November 2013

Report Number: 1314-7

HINKLEY POINT C CONNECTION (APPENDIX 11E): GEOARCHAEOLOGICAL DESK-BASED ASSESSMENT REPORT AND FIELD SURVEY

Prepared for:
TEP

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CONTENTS

FIGURES

1 GEOARCHAEOLOGICAL DESK-BASED ASSESSMENT REPORT AND FIELD SURVEY

1.1 INTRODUCTION

1.1.1 This document reports the results of geoarchaeological works conducted in advance of the construction of 55km of electricity cabling between a new reactor (C) being constructed at Hinkley Point power station, Somerset and the Seabank power station, City of Bristol ('Hinkley Point C Connection' [HPCC]). The cabling will be as overhead line from Bridgwater to Biddisham; underground line from Biddisham to Sandford and then as overhead line once more from Sandford to Seabank (National Grid 2013, 4). In addition the northern of the two lines between Nailsea and Portishead, North Somerset will also be placed underground (Figure 1). The works reported upon here were conducted on behalf of Electricity Alliance West and were commissioned by Tom Wilson of Stonebow Heritage on behalf of his client TEP.

1.1.2 The geoarchaeological works reported here comprised three elements: firstly an assessment of borehole logs held by the British Geological Survey (BGS) for the entire cable route (BGS 2013a), secondly a watching brief maintained during geotechnical borehole drilling undertaken by Structural Soils Ltd on one of the sub-surface parts of the route between Biddisham and Sandford and thirdly the drilling of 70 geoarchaeological boreholes at pylon locations along the proposed route (Figure 1).

1.1.3 The remaining elements of the report discuss the geology and geomorphology of the cable route (Section 1.2), the methodology employed during all stages of geoarchaeological works (Section 1.3) and the stratigraphy of the route as revealed by the geoarchaeological and geotechnical borehole (Section 1.4). The final sections of the report present assessments of the archaeological and palaeoenvironmental potential of the strata encountered (Section 1.5).

1.2 GEOLOGY AND GEOMORPHOLOGY

1.2.1 In progressing from its starting point on Horsey Level, 3.2 km to the north-west of Bridgwater to its termination 47.5 km north-west at Seabank power station, the new element[1] of the HPCC route crosses eight geological zones, comprising from south to north: a. the northern part of King's Sedgemoor (Somerset Levels), b. the Polden Hills, c. the Brue valley (Somerset Levels), d. the Lox Yeo valley, e. the Mendip Hills, f. the North Somerset Levels, g. the Gordano Hills

[1] As opposed to existing infrastructure which will be reused to the south and west of this point.

and h. the Avonmouth Levels (Figure 1). The geology and geomorphology of each zone are described in the text below on the basis of the relevant 1/50,000 BGS and 1/25,000 Ordnance Survey maps, and other published sources as relevant.

1.2.2 *King's Sedgemoor*: The southernmost 1.15km of the cable route across Horsey Level lies on King's Sedgemoor. This low-lying (c. +6m OD) and flat area of moorland comprises Holocene Tidal flat deposits overlying Mercia Mudstone Group (MMG) basement. The latter are of Triassic age (248.2-205.7 million years [my] before present [BP]) and formed in a series of alluvial fans emanating from the Mendips and Bristol coalfields (Green 1992, 78). The tidal flat deposits formed as a result of intertidal processes during the last 11,500 (11.5ky) years and prior to the construction of coastal defences. However, previous geoarchaeological works (summarised in Bell 2000) conducted on King's Sedgemoor (and indeed elsewhere on the Somerset Levels) demonstrate that the intertidal deposits mask a Middle and Early Holocene sequence of freshwater and saltmarsh peats, as well as further Early Holocene intertidal deposits. For example a complex of interbedded peats and intertidal deposits, associated with *in situ* Mesolithic − Bronze Age features and artefacts, have been investigated in advance of the construction of the Walpole landfill site on the Pawlett Level 2.2km north west of the cable route (Hollinrake and Hollinrake 2010). Mesolithic artefacts have also recently been uncovered from beneath peat on the flanks of the Chedzoy Burtle island 3.2km to the south-east (Martin Bell, personal communication, 2013). Collectively the Holocene intertidal and freshwater deposits of King's Sedgemoor, the Brue valley and the North Somerset Levels have been grouped as the Somerset Levels Formation by Campbell *et al.* (1999), but, together with similar sequences on the Avonmouth Levels, are termed the Wentlooge Formation by Allen and Rae (1987).

1.2.3 *Polden Hills*: Approximately 2.2km of the cable route, north of King's Sedgemoor and between Knowle Park and Woolavington, lie on the Polden Hills. These narrow uplands rise steeply from the south to +55m OD and then drop more gradually to the north. The hills are constructed of Late Triassic limestones of the Blue Anchor and Westbury Formations overlying MMG in the south. These strata are in turn overlain in a northerly direction by Late Triassic and Early Jurassic mudstones of the undifferentiated Langport and Charmouth Members and the Blue Lias Formation (BGS 2013b). There are no mapped Quaternary (i.e. the last 2.3my) deposits on the Polden Hills, while archaeological investigations at various locations within Shapwick parish suggest that the Holocene soil cover is 0.5m or less (Gerrard and Aston 2007).

1.2.4 *Brue valley*: North of the Polden Hills the cable route passes across the Brue valley for 18km between Woolavington and Webbington. For the southernmost 16.5km the cable will run overhead via pylons, but the northernmost 1.5km will be underground. The Brue valley terrain is flat and low-lying (+5 to +6m OD) throughout, while the Huntspill, Brue and Axe rivers, as well as two large and numerous small rhynes, are all crossed. The BGS maps this part of the route as lying entirely on Tidal Flat Deposits as previously described for King's Sedgemoor. However, considerable archaeological and geoarchaeological work carried out in the middle and upper Brue valley – notably as part of the Somerset Levels Project – has demonstrated that thick peat sequences underlie a relatively thin intertidal cover (see reviews in Coles and Coles 1988 and Bell 2000 for a summary). For example Wilkinson (1999) encountered 3m of Mesolithic to Bronze Age peat and another Mesolithic peat of 1m thickness in a total Holocene sequence that was 8.5m thick to the immediate north of the Polden Hills, while the sequence examined by Godwin (1941) at Shapwick railway station was >10m thick. The upper peat (*sensu* Wilkinson 1999) of the Somerset Levels is well known for its association with and preservation of Neolithic trackways (Coles and Coles 1988), while the lower peat both incorporates and covers Mesolithic activity areas on the edge of Burtle Bed islands (Wilkinson and Bond 2001). The deposits of the Somerset Levels Formation reviewed above sit on a Charmouth Mudstone Formation (Early Jurassic) basement, except in the extreme north where they sit on MMG. Rocks of the Charmouth Mudstone Formation overlie the undifferentiated Langport and Charmouth Members and the Blue Lias Formation in the Woolavington area, while rocks of the MMG underlie all the strata discussed above.

1.2.5 *Lox Yeo valley*: The cable route exits the Brue valley adjacent to the M5 motorway and enters the Mendip Hills via the Lox Yeo valley. After running beneath the valley floor (+10m OD) for 1km it then climbs the eastern flanks of the valley (to c. +15m OD), before recrossing the valley south of Banwell. The tunnelled cable then enters the Mendips 500m south of Banwell Plain hillfort and 4.5km after entering the Lox Yeo valley. The route is mapped by the BGS as lying to the east of the intertidal/alluvial fill of the Lox Yeo valley, except where it crosses the valley south of Banwell. It does, however, cut across deposits recorded as Head to the immediate west of Barton. The BGS uses the term 'Head' to describe all Quaternary deposits forming as a result of colluvial processes (BGS 2013b), but in practice most Head deposits are periglacial solifluction deposits (mostly dating to the Devensian Late Glacial). The cable tunnel cuts through MMG strata elsewhere in the Lox Yeo valley, while this unit also lies beneath the Tidal Flat and Head deposits. To the authors' knowledge the Lox Yeo valley has not previously been geoarchaeologically studied and therefore little was known prior to the works described below on the nature of Holocene intertidal and freshwater stratigraphy.

1.2.6 *Mendip Hills*: The cable tunnel passes across the watershed between the Lox Yeo river and the Towerhead Brook 500m to the west of Sandford, and then follows the latter stream until it emerges on the surface on the southern side of the North Somerset Levels 1.2km north-west of Sandford. The total length of this Mendip section of the route is 2.8km, while the ground surface attains a maximum elevation of +35m OD on the south-eastern slopes of Banwell Plain hillfort. The tunnel passes through Head deposits on the southern flanks for the Towerhead Brook and on the northern fringes of the North Somerset Levels, and crosses the Tidal Flat deposits infilling the lower valley of the Towerhead Brook. However, elsewhere the tunnel cuts through MMG.

1.2.7 *North Somerset Levels*: The cable route emerges onto the surface to the north-west of Sandford. It progresses northwards across the River Yeo and then north-eastwards across the low, level ground (+5 to +6m OD) of the North Somerset Levels for 13.5km before entering the Gordano Hills at Batch. The southernmost 9km of this stretch are entirely across Tidal Flat deposits, but to the south-east of Kenn the route cuts through surficial peats. The geoarchaeology of the uppermost part of the Somerset Levels Formation on the North Somerset Levels is reasonably well known through the work of Stephen Rippon during the 1990s (summarised in Rippon 2000). Romano-British activity of a variety of different types (e.g. settlement, salt production, cattle husbandry) took place on a stable ground surface following the construction of coastal defences. However, the pre-Roman Holocene stratigraphy is much less well understood, while the peats mapped by the BGS have not previously been studied − to the authors' knowledge. The Holocene Tidal Flat deposits and peat sit on a basement of MMG.

1.2.8 *Gordano Hills*: The cable route enters the Gordano Hills at Batch and then passes up a dry valley in a north-westerly and then northerly direction to attain an altitude of +140m to the north-east of Chummock Wood. Thereafter it descends the steep north-western flank of Caswell Hill to cross the M5 motorway and enter the Avonmouth Levels 1km south-west of Portbury. The total length of the Gordano Hills section of the cable route is therefore 4.5km, but comprises an ascent and then descent of 134m. Superficial (i.e. Quaternary) strata are not recorded by the BGS for this part of the cable route, but unmapped colluvium might be expected in the dry valley to the north of Batch. The solid geology comprises MMG (outcropping in the valleys and on the lower flanks of the hills). However, the 'upland' rocks project through the MMG and comprise Middle Carboniferous limestones of the Clifton Down Limestone Formation, Goblin Coombe Oolite Formation and Gully Oolite Formation, and mudstones of the Clifton Down Mudstone Formation on the south-west flanks of West Hill. The rocks of Naish and Caswell Hills are of an Upper Carboniferous age and comprise sandstones of the Pennant Sandstone and Portishead Formations and limestones of the Black Rock Limestone Sub-group and Avon Group.

1.2.9 *Avonmouth Levels*: The northernmost 11.5km of the cable route are across the Avonmouth Levels, an area of flat and low-lying ground between +6 and +9m OD that is now mostly occupied by industrial buildings and associated infrastructure. As noted in Section 1.1.1 the cable route divides as it emerges from the Gordano Hills, one strand passing underground in a northwards loop towards Portbury and then north-west and west to rejoin the second surficial strand 700m north-west of Lodway. The reunited cable route then crosses the River Avon c. 300m north of the present M5 bridge, loops west around the town of Avonmouth and then follows the western side of the M49 motorway as far as Hallen Marsh. The final 1.3km of the route is across Crook's Marsh to Seabank power station. With the exception of the most south-westerly part of the segment, which crosses Head strata emanating from Caswell and Naish Hills, and a 500m stretch to the north of Sheepway where a Pleistocene river terrace is mapped ('River Terrace Deposits, 1'), the entire Avonmouth Levels section is across Tidal Flat deposits. As a consequence of the considerable later 20th and early 21st century construction in the area (e.g. English Approaches to the Second Severn Crossing [Gardiner *et al.* 2002, Allen and Scaife 2009, Allen *et al.* 2010)], the Pucklechurch to Seabank Pipeline [Carter *et al.* 2003] and a planned composting facility at Hallen [Wilkinson *et al.* 2013]), the stratigraphy of the 'Tidal Flat' deposits is relatively well known to geoarchaeologists. Archaeological sites of later prehistoric age have been found in the sequences, while palaeoenvironmental evidence records human manipulation of both the Levels themselves and the surrounding uplands. The bedrock basement of this part of the cable route is entirely comprised of MMG.

1.3 METHODOLOGY

1.3.1 As explained in Section 1.1.2 there were three elements to the geoarchaeological project: an examination of borehole records held by the BGS, a watching brief on geotechnical borehole drilling of the sub-surface part of the cable route in the Lox Yeo valley and Mendip sectors and the drilling of purposive geoarchaeological boreholes along most of the lowland part of the route. The methodology of each part of the work is outlined below.

Desktop study

1.3.2 A computer-aided design (CAD) version of the cable route (in AutoCAD DWG format) was obtained from TEP and this file read into ESRI ArcGIS 10.1 Geographic Information Systems (GIS) software. The central thread of the route (i.e. disregarding pylons and other associated infrastructure) was then distilled from the DWG file by manual tracing in ArcGIS. Segments were given attributes to distinguish between overland and sub-surface elements of the cable route and the tracings/database saved as an ESRI Shape file. ArcGIS was then used to construct a 500m wide buffer on either side of the central thread of the cable route and the buffered area saved as a second Shape file (Figure 1).

1.3.3 The Shape file containing the 500m buffer polygon around the cable route was then manually applied to boreholes from the BGS borehole database (BGS 2013a)[2]. Lithological (i.e. whether the recorded unit was clay, sand, peat, gravel, limestone, mudstone etc.), stratigraphic (the formal geological name for the unit, e.g. Somerset Levels Formation, Mercia Mudstone Group, Avon Group etc.) and positional (Ordnance Survey National Grid Coordinates [NGR] and Ordnance Datum [OD]) were then abstracted from the scans on the BGS borehole database and entered into a Microsoft Excel spreadsheet. Records that did not contain Ordnance Survey NGR's and/or OD's were rejected. The result was 275 boreholes that met the above criteria being incorporated within the Excel spreadsheet. These data were then imported into a RockWorks 15 database and the latter software package used to construct the cross-sections and single-deposit model used in Section 1.4 of this report.

1.3.4 It should be emphasised that the borehole data recovered from the BGS database do not have a uniform spatial coverage. Geotechnical boreholes are drilled principally where development takes place and they are therefore concentrated in the Avonmouth area, where the cable route approaches within 500m of the M5 motorway and to a lesser extent in the southern part of the Brue valley (at the former Royal Ordnance factory at Woolavington) (Figure 1). Consequently there are no boreholes in the BGS database for the central and northern part of the Brue valley, the upper Lox Yeo valley, the southern and northernmost sectors of the North Somerset Levels, and the central portion of the Gordano Hills, while only very few

[2] There is no facility in the BGS website to run automated queries of this nature

(e.g. 1 – 3 records) boreholes are found within 500m of the cable route in the King's Sedgemoor and Mendip sectors. As a result it is only in the Avonmouth area and the central sector of the North Somerset Levels that the BGS borehole records can provide a reliable indication of the sub-surface stratigraphy.

1.3.5 Furthermore, the lithological data included in the BGS borehole records are of a low resolution. That is to say that all fine-grained mineral deposits are recorded either as 'Silt' or 'Clay' or by using a combination of terms such as 'Silty clay', 'Sandy clay' etc., while organic strata are always recorded a 'Peat'. Of even greater significance is the lack of structural observations, e.g. whether deposits were laminated, normally or reverse bedded and the nature of their sorting properties. As a result it is only possible to infer the broadest depositional environments for the formation of the majority of the recorded strata. This constraint is particularly relevant to fine-grained mineral deposits recorded in the boreholes, deposits which may have formed in alluvial or intertidal environments, and in floodplain, levee, mudflat or channel environments. However, these depositional (sub-) environments cannot be differentiated in the BGS borehole records.

1.3.6 Logs of ARCA's geoarchaeological and geotechnical boreholes drilled under archaeological supervision as part of previous projects within and close to the buffered cable route have been added to the RockWorks database in order to address the resolution and precision problems with the BGS records. These former are in the Avonmouth geological zone.

Watching brief

1.3.7 The Written Scheme of Investigation (WSI) provided for a watching brief on the drilling of 62 geotechnical boreholes and 20 test pits that were to be drilled/excavated by Structural Soils Ltd along a sub-surface element of the route between Biddisham and Sandford (National Grid 2013). However, in practice only 34 boreholes were drilled of which 16 were monitored by ARCA[3]. The boreholes were drilled either as single isolated boreholes (e.g. SS BH C4) or as a set of four in close proximity wherever a road or river was crossed: two on either side of the obstacle (e.g. SS BH C2a to SS BH C2d). At the proposed location of the Sandford electricity substation three additional boreholes were drilled that were not included in the WSI (e.g. SS BH C-LD39).

[3] The remaining 18 are essentially duplicates of those observed, i.e. where a cluster of 2 – 4 boreholes was drilled at a location where the cable route passes across a road or beneath a rhyne.

1.3.8 Locations of the geotechnical boreholes were set out in advance by TEP staff and then recorded by Structural Soils staff using differential GPS. The boreholes were then drilled using a cable percussive drilling rig operated by a crew of two. Strata recovered in the gouge and bucket samplers employed by the device were logged by a Structural Soils geologist, while an ARCA geoarchaeologist recorded the same strata alongside the former, but using standard geological criteria (Tucker 1982, Jones *et al*. 1999, Munsell Color 2000). Drilling progressed to rockhead after which a Comacchio rotary drilling rig was used to bore through the bedrock. The latter extension of the boreholes was not observed by the ARCA geoarchaeologist given that the rocks so penetrated date to the Mesozoic (i.e. 10s to 100s of millions of years before the evolution of hominins). The crude mechanical means by which cable percussive drilling proceeds means that depths and thicknesses of individual units are approximate (c. ± 0.2 − 0.5m, except where U4/100 samples were taken (e.g. at the base of the Holocene sequence in SS BH C2c).

1.3.9 Lithological descriptions obtained in the field were combined with positional information provided by Structural Soils within a RockWorks database (RockWare 2012). The RockWorks software was then used to plot the lithological cross-sections presented below. Borehole location coordinates and descriptions of lithological units identified during the watching brief are available electronically as Microsoft Excel spreadsheets.

Geoarchaeological boreholes

1.3.10 A total of 70 geoarchaeological boreholes was drilled using both manual (62) and mechanical means (8) at proposed pylon locations in the King's Sedgemoor, Brue valley, North Somerset and Avonmouth Levels sections of the route (Wilkinson 2013). The original intention had been to drill 5m deep manual boreholes at every pylon location within these areas and use the data collected to construct composite cross-sections that would then target suitable locations for 10m deep mechanical boreholes. In practice, however, it proved impossible to access all pylon locations[4].

1.3.11 The first stage of the borehole survey was desk-based. Borehole locations corresponding with proposed pylon positions were transferred from the ArcGIS project described in Section 1.3.2 to a Leica System 1200 RTK GPS equipped with Leica SmartNET. The

[4] The most significant problem was the absence of land owner permission at the time of the site visit. Also two borehole locations coincided with intersecting overhead power lines and were abandoned on Health and Safety grounds, while all bar seven of the Avonmouth Levels borehole locations could not be drilled because of either danger from unexploded ordnance or the presence of 20th-century rubbish.

latter device was then used to survey the borehole positions in the field and to record their position with respect to OS NGR and OD. A CAT scanner and genny were then employed at each borehole location to check for buried services after which the borehole was drilled.

1.3.12 Manual boreholes were drilled with 50mm diameter Edelmann and (whenever possible) 20 − 30mm diameter gouge augers, together with 1m long extension rods. The entire Holocene sequence or 5m depth (whichever was the lesser) was sampled at each borehole location using these devices. Sediment retained in the gouge auger heads was recorded using the Troels-Smith (1955) description system augmented with Munsell (2000) colour data and then the boreholes backfilled with the arisings immediately on completion. At the end of each day's fieldwork, borehole lithological descriptions were transcribed from the field notes and combined with positional information within a Microsoft Excel spreadsheet. At the end of the fieldwork the Excel file containing all the manual borehole data was then migrated to the same RockWorks 15 database housing the BGS and Structural Soils geotechnical borehole data.

1.3.13 As stated above, it had originally been intended to locate mechanical boreholes on the basis of composite cross-sections produced from the manual boreholes and according to the following criteria:

a. Where stratigraphy to 5m below ground level (BGL) is especially complex and requires laboratory study to disentangle depositional environments/sub-environments.

b. Where stratigraphy to 5m BGL is dominated by organic strata or other strata of high palaeoenvironmental/archaeological potential.

c. Where a 'type sequence' for the given landscape/topographic zone (or sub-zone) is likely to be achievable within the 10m BGL depth.

However, the issues outlined in Section 1.3.10 meant that a more expedient approach had to be taken. Therefore, positions for mechanical boreholes were chosen that fulfilled at least one of the criteria above, were evenly distributed along the King's Sedgemoor, Brue valley and North Somerset Levels part of the cable route[5], were accessible by 4x4 vehicle and for which land owner permission had been received.

1.3.14 Mechanical boreholes were located in the field, surveyed and CAT/genny scanned exactly as described for manual boreholes in Section 1.3.11 above. The boreholes were then drilled using an Atlas

[5] The risk of encountering unexploded ordnance was considered too great and permission to drill mechanical boreholes on the Avonmouth Levels was refused.

Cobra TT hammer powering a 50mm diameter Eijkelkamp core sampler. The latter was used to collect continuous 1m-long undisturbed cores to a maximum depth of 10m BGL. The cores were labelled and sealed on site and then transported to the laboratory for further study. Boreholes were backfilled with a mixture of arisings extracted within the cutting shoe and (inert) Bentonite pellets immediately upon completion of drilling.

1.3.15 In the laboratory the plastic tubes containing the mechanical borehole cores were cleaned and passed through a 60mm diameter Bartington MS2C core logging sensor attached to an MS2 magnetic susceptibility meter. Readings were taken at 30mm intervals to provide volume magnetic susceptibility measurements through the entire sampled sequence. The plastic tubes containing the cores were then cut open and a spatula/sharp knife used to cut the core in half along a longitudinal axis. One half of the core was labelled, wrapped in plastic film and has been placed in storage pending further study. The other half was carefully hand-cleaned using a sharp scalpel, photographed against an appropriate scale, and described using the same Troels-Smith (1955) scheme as utilised in the manual borehole study. The described cores were then also wrapped in plastic film and placed in storage pending decisions regarding further work. The positional, descriptional and magnetic data were then added to the project's RockWorks database.

Cone penetrometry

1.3.16 Cone penetrometry test (CPT) data acquired by Structural Soils at 35 pylon locations in June and July 2013 were passed to ARCA by TEP. The 17 CPT datasets that coincided with ARCA geoarchaeological boreholes were transferred to the project's RockWorks database. The CPT data coinciding with two ARCA mechanical boreholes in which the full Holocene sequence had been penetrated were then compared with the logged lithostratigraphy. As a result, a single criterion was established that best defined the boundary between Holocene (Somerset Levels Formation) and pre-Holocene deposits [termed 'Mudstone (CPT)' in the figures below]: the point at which a resistance reading of 4 MN/m^2 was reached and thereafter sustained for a vertical distance of at least 0.5m.

1.4 STRATIGRAPHY

1.4.1 The stratigraphy of those borehole logs held by the British Geological Survey that coincide with the 500m buffer plotted around the HPCC route (prefixed 'BH' in the text below), the geotechnical boreholes drilled by Structural Soils (prefixed 'SS BH'), the ARCA geoarchaeological boreholes ('ARCA BH' for manual and 'ARCA BH#M' for mechanical) and the Structural Soils CPT data is reviewed below in relation to the geological zones introduced in Sections 1.2.2 – 1.2.9. The text is arranged so that data acquired prior to the present project (i.e. the borehole logs obtained from the BGS) are reviewed first, after which the new stratigraphic and CPT records are presented and compared (except for the Polden and Gordano Hills where no additional field data have been obtained).

King's Sedgemoor

1.4.2 The BGS holds just a single record (BH Identifier ['BH'] 498457) from the buffered area within the King's Sedgemoor geological zone (Figure 2). BH 698457 was drilled adjacent to Little Sydenham Farm, Bawdrip during geotechnical works preceding construction of the M5 motorway. It records an 8.38m thick Holocene sequence of intertidal silts/fine sands and sands (4.2m) overlying peat (4.18m), which in turn sit on an MMG basement. Given the series of multiple interbedded peats and intertidal sediments known at the nearby Walpole Landfill site (Hollinrake and Hollinrake 2010), it is possible that the stratigraphic log made by the geotechnical engineers of BH 498457 is an oversimplification of reality. Nevertheless the stratigraphic data on the two sites are broadly comparable and would suggest that the peat strata are of Neolithic and Mesolithic age.

1.4.3 Four manual and one mechanical geoarchaeological boreholes were drilled in the King's Sedgemoor geological zone (Figure 2 and Figure 3), while these data are supplemented by two CPT datasets (Figure 4). The data collectively suggest that the southernmost margin of the HPCC route assessed in this study coincides with a bench in the MMG bedrock. South of ARCA BH1 (Pylon VQO-43R) the MMG outcrops at c. -2.2m OD, but in both ARCA BH1 and ARCA BH4M (Pylon C-ZGA3) the contact of the MMG with the Somerset Levels Formation is at c. +1.0m OD. The MMG was neither encountered in ARCA BH2 (Pylon C-ZGA1) nor in ARCA BH3 (Pylon C-ZGA2), both boreholes terminating in sands and gravels at +0.5 to +1.5m OD. The latter strata are probable channel fills and might, were such a channel to be bedrock-cut, explain the absence of the MMG at +1m OD in the case of ARCA BH2. From the contact with the MMG, deposits of the Somerset Levels Formation fine upwards in ARCA BH1–3 from sands/gravels (ARCA BH2–3), through laminated silts and sands (ARCA BH1 and ARCA BH3) to silts and clays (all boreholes). The fining upwards sequence is an indication of falling energy levels, and might in the present case be the result of the migration of a channel/creek away from the sampled sites and/or changes with respect to the tidal frame. It is notable that peat was not encountered in ARCA BH1–4; rather, strata of this type appear beyond the MMG bench and south of that part of the HPCC route that was the subject of the present study. These data suggest that the marsh in which the peat grew was constrained by the MMG slope between BH 698457 and ARCA BH1 (Figure 3).

1.4.4 ARCA BH4 and ARCA BH4M were drilled adjacent to one another through the northern bank of the King's Sedgemoor drain (Figure 2). Lithological data suggest that deposits of the Somerset Levels Formation outcrop between +1.5m OD (7.9m BGL), where they unconformably[6] overlie the MMG bedrock, and +5.7m OD (3.5m BGL), at which elevation they are conformably overlain by deliberately deposited bank material. However, the basal 1.5m silt/clay stratum of the Somerset Levels Formation has an elevated magnetic susceptibility, while CPT data indicate compaction to a similar level found at the top of the MMG (Figure 4). It is therefore possible that the basal bed of the Somerset Levels Formation at ARCA BH4/4M is at least partly fine-grained colluvium derived from slopes to the north. The uppermost part of the Somerset Levels Formation at +5.7 to +5.2m OD (4.0 − 3.5m BGL) in ARCA BH4/4M is an iron-stained silt/clay in which redox processes were once active. This bed must therefore have sat close to the ground surface prior to the construction of the bank. The latter seems to comprise grey silts and clays that have presumably been dug/dredged from the channel to the south since construction of King's Sedgemoor drain in the late 18th century. In addition to the absence of any bedding structures, the bank material can be distinguished from *in situ* intertidal/alluvial strata by the presence of granular fragments of ceramic building material (CBM) and charcoal. Indeed the presence of a ceramic clasts can also be seen in the single magnetic susceptibility spike at +6.4m OD (2.78 − 2.81m BGL) (Figure 5).

Polden Hills

1.4.5 There are no boreholes in the BGS database associated with the Polden Hills section of the HPCC route (Figure 2). As has been discussed in Section 1.2.3, soils have developed directly in the Triassic/Early Jurassic stratigraphy and are thin.

Brue valley

1.4.6 The BGS database only holds records for the southernmost part and extreme north of the Brue valley. For the former it contains five records from the former Royal Ordnance factory at Woolavington and three more 1.2km to the north-east at the Woolavington bridge over the Huntspill river (Figure 6 and Figure 7); for the latter 14 boreholes along the route of the M5 south of Loxton (Figure 8). There are no records in the BGS database for the central 11km portion of the valley through which the HPCC route will pass (Figure 6).

[6] In other words there is hiatus of deposition between the two units.

1.4.7 A composite cross-section plotted of boreholes at Woolavington shows the MMG bedrock basement sloping downwards in a northerly direction from -9.5m OD at the northern margin of the former Royal Ordnance factory to <-18m OD adjacent to the Huntspill River bridge (Figure 7). Nevertheless the outcrop height of the Holocene sediment stack is consistent despite the bedrock slope. Between 8 (north) and >10m of (presumably) intertidal silt/clays overlie the MMG, but these are overlain between +2 and 0m OD by a 1 to 2m thick peat. The latter appears to increase in thickness in a northerly direction. The peat is in turn overlain by a further 3m of intertidal silt/clay.

1.4.8 The five northernmost boreholes of the stratigraphic transect along the route of the M5 south of Loxton are located within the Brue valley as defined in Section 1.2.4 (Figure 8). However, with the exception of BH 384571, the boreholes have not been drilled to the pre-Quaternary basement, and demonstrate only the presence of >8−12m of intertidal/alluvial silt/clay. BH 384571 appears to have been located on an MMG island on which the bedrock outcrops at +2m OD, while it is probably no coincidence that this is also the only borehole in the group to contain a peat (at +7m OD). Indeed the elevation of the latter is significantly higher than peats reported from the southern Brue valley (c. +4 to -4m OD) and it is therefore possible that this stratum dates to the historic period.

1.4.9 ARCA drilled 30 boreholes at pylon locations within the Brue valley, of which three mechanically (Figure 9). The data are supplemented by eight CPT datasets, one of which coincides with a mechanical borehole (ARCA BH5M). None of the hand-drilled boreholes extended to pre-Holocene stratigraphy, while of the mechanical boreholes, only ARCA BH5M (Pylon C-ZGA11) encountered Pleistocene Head. The remaining two mechanical holes (ARCA BH24M and ARCA BH34M) were drilled through strata of the Somerset Levels Formation to 10m BGL. Therefore the CPT records are particularly useful for the Brue valley given that only one geoarchaeological borehole and two in the BGS database penetrate below the Somerset Levels Formation. The CPT data show that the base of the Holocene sequence lies between -9.4m OD (14.3m BGL) at ARCA BH7 (Pylon C-ZGA13) and -8.3m OD (13m BGL) at ARCA BH13 (Pylon C-LD6) (Figure 10 and Figure 11). The outcrop thickness of the Somerset Levels Formation then increases to 19.1m (-14.3m OD) in ARCA BH17 (Pylon C-LD19), before returning to a 13−14m thickness range in ARCA BH21 (Pylon C-LD14), ARCA BH27 (C-LD20) and ARCA BH30 (C-LD23) (Figure 9). As is described below, the Structural Soils cable percussion and BGS-held boreholes then trace the upward slope of the MMG in the northern part of the Brue basin from -11m OD (17m BGL) in SS BHC1c

(Pylon C-LD36) to -8.8m OD (15.3m BGL) in BH 384569 at the extreme northern margin of the valley (Figure 9). Collectively these data demonstrate that the thickness of the Somerset Levels Formation within that part of the Brue valley crossed by the HPCC varies between 8 and 19m, with the entire 11km cross-section between ARCA BH7 (C-ZGA13) and SS BHC1c (C-LD36) being filled by 13 to 17m of such strata.

1.4.10 As noted above, the only pre-Holocene deposits in the geoarchaeological boreholes from the Brue valley were retrieved below -3m OD (7.9m BGL) in ARCA BH5M (Figure 9). These comprised poorly sorted, sub-angular limestone gravels derived from the Polden Hills to the south, and most likely deposited as periglacial solifluction (Head) during the last cold stage[7]. It is likely that an apron of such Head deposits lies on the lower slopes of the Polden Hills and at the break of slope where the uplands meet the Brue basin.

1.4.11 The nature of the lower parts of the Somerset Levels Formation within the Brue valley below 5m BGL is only known in outline to 10m BGL from the three mechanical boreholes, and barely at all below this depth (i.e. only where geotechnical borehole records held by the BGS or drilled by Structural Soils in the present project occur at the margins of the basin). Unfortunately CPT data do not allow the discrimination of the different facies/beds of the Formation. It would appear that several intertidal and/or freshwater facies exist below 5m BGL, while there might be a fining upwards trend, i.e. sands giving way to silts and clays [ARCA BH24M (Pylon C-LD17) and SS BHC1c (C-LD36)]. Such a pattern would indicate a reduction in transport energy, perhaps reflecting channel movements or relative elevation of the sample point with respect to the tidal frame. There is also evidence for the presence of peats in strata below 5m BGL, most notably at c. -6 to -7m OD in the northernmost part of the Brue valley at BH 384569, but also at -2.2m OD (7.1m BGL) in ARCA BH5M. The latter is a wood peat and must therefore have formed in a freshwater marsh. It coincides with a CPT peak, suggesting the presence of large wood fragments, while elevated magnetic susceptibility readings (to 780 SI units $x10^{-8} m^3$) occur in mineral strata immediately above (Figure 12). The latter may reflect the presence of iron sulphides and therefore the activities of bacterial decomposition of organic material in seawater (Kattenberg and Aalbersberg 2004: 234). An alternative explanation given the proximity of the uplands to the south and the absence of such magnetic susceptibility peaks in the cores from the other two

[7] In other words the Devensian 'glacial', 11,500-120,000 BP, although it is most probable that deposition here was in the Late Glacial phase, i.e. c. 18,000-11,500 BP

mechanical boreholes (Figure 12), is that the peaks reflect burning of the emergent marsh and mudflat during the Mesolithic. Lower magnitude magnetic susceptibility peaks (350-150 SI units x10^{-8} m^3) are also found at -1 to -1.7m OD (6.2 − 6.8m BGL) in ARCA BH24M and -0.8 to -3.5m OD (5.7 − 8.7m BGL) in ARCA BH34M (Figure 12) within the lower stratigraphy of the Somerset Levels Formation. Although these elevated readings may reflect the bacterial oxidation of sulphates discussed above, it is notable that the magnitude and focus of the enhancement peak declines from ARCA BH5M through BH24M to BH34M. This pattern may indicate a spread of ash/burnt material from the Poldens and marsh edge to the south. In summary, while the depositional environment of the lower parts of the Somerset Levels Formation is presently known only in broad detail, it would nevertheless appear that channel, mudflat and freshwater marsh all existed at various times and in different loci, while secondary evidence of human activity is possibly seen in the magnetic susceptibility record. As will be demonstrated below, these lower strata are all of Early to Middle Holocene date.

1.4.12 The upper part of the Somerset Levels Formation in the transect taken by the HPCC across the Brue valley has been characterised in reasonable detail by the geoarchaeological boreholes. A 2m thick peat outcrops across at c. 0 to +2m OD almost the entire southern part of the basin between ARCA BH5M (Pylon C-ZGA11) and ARCA BH33 (C-LD26) (Figure 9). The peat is absent from only 4 of the 26 boreholes in this section, most likely because it has been removed by subsequent channelling. The picture is less clear north of ARCA BH34M (Pylon C-LD27) as access was not possible at the time of the survey to Pylon locations C-LD28 − 35 inclusive. However, it is notable that peat was not found in ARCA BH43/44 (Pylons C-LD36-37) and SS BHC1c (C-LD38), i.e. in the vicinity of the present River Axe. Indeed the presence of sands in all three of these boreholes suggests deposition in a channel, and it is therefore possible that such a feature (or features) truncated any peat stratum once present. The 0 − +2m OD peat stratum rapidly trends upwards from a herbaceous to wood peat and then more slowly back to a herbaceous unit. These changes reflect the relationship of the marshes in which the peat formed to relative rises in sea level, the herbaceous parts forming when the marsh was only just above the tidal frame and the wood peat when the marsh was at a greater relative elevation. The magnetic susceptibility of the 0 to +2m OD peat contrasts with that of the earlier peat seen in ARCA BH5M in that values are extremely low or even negative, while there are no peaks of high magnetic susceptibility in the overlying mineral silts and clays (Figure 12). Following on from the previous paragraph, these data suggest either that bacteria were not breaking down sulphates in marine waters, or that there was no or very limited human activity leading to burning of the surrounding marsh and uplands. The 0 to +2.0m OD peat is a well-known phenomenon both in the Brue valley and in estuaries/embayments in southern Britain generally, where it is linked to a late Middle Holocene episode of estuary contraction linked in turn to a slowdown in relative sea level rise (Long 1995). In the upper parts of the Brue valley this unit was the stratum exploited by peat-cutting companies prior to the 1980s. As a result, many archaeological investigations have been carried out of the 'upper peat' (*sensu* Wilkinson 1999), most notably by the Somerset Levels Project (summarised in Coles and Coles 1988), and large numbers of later prehistoric trackways and other features found as a result. These archaeological and other geoarchaeological projects mean that the upper peat is relatively well dated in the upper part of the valley, dating between c. 4600 and 2000 cal. BC (see Wilkinson and Straker 2008 for a review of the chronology). However, given the position of the HPCC in the lower valley, both peat growth initiation and termination are likely to be earlier. Indeed at the Walpole Landfill site to the immediate east of the Polden ridge suggest that the upper peat only began forming around 3520-3080 cal. BC (Jones 2004 cited in Wilkinson and Straker 2008).

1.4.13 Given the likely late prehistoric date of the 'upper' (0 to +2m) peat, the overlying strata in the Brue valley will be of Iron Age and historic date. Indeed, assuming that construction of coastal defences in the Romano-British period prevented or reduced tidal ingress, most strata, except within the lea of river and stream channels, are probably of Romano-British and Iron Age date. The deposits are 3.– 3.5m thick and comprise c. 1.5 – 2m of grey mineral silts and clays, overlain by c. 1m of yellow-brown, iron-stained silt and clay (Figure 9). The latter is, however, just a diagenetically modified version of the former and therefore formed in an identical mudflat/floodplain environment. The yellow-brown colour and the presence of iron oxide particles are the result of redox processes (fluctuations of the water table within the stratigraphic body), i.e. post-depositional modification of primary sediment characteristics. There is no evidence from the boreholes for stable terrestrial layers (e.g. palaeosols) within the 'upper' silt/clay stratum, although a thin (20 – 150mm thick) intercalated peat is present at c. +3.4m OD (1.4m BGL) in ARCA BH5/5M and ARCA BH7 (Pylon C-ZGA13) in the southern margins of the basin. This latter peat probably reflects a relatively brief episode when the southern slopes of the valley emerged from the tidally inundated area to the north. A mineral stratum blackened by finely divided charcoal was also found within the upper silt/clay at +3.4m OD (1.3m BGL) in ARCA BH9 (C-LD2), perhaps indicating human activity (Figure 9). The present soil, which, given the inferred stability since the Romano-British period may have been developing for 1500 years, has formed within the top of the mineral silt/clay succession.

1.4.14 The Brue valley sequences discussed above are rather different to those better known examples previously reported from the upper part of the valley, for example at Shapwick Burtle 7km to the south-east, in which peat forms the majority of the c. 9m Holocene sequence (e.g. Wilkinson 1999). However, the difference is predictable, given that in the lower sectors of intertidal river valleys (in this case the route of the HPCC) the stratigraphy both thickens and becomes increasingly dominated by mineral sediments when compared to the middle reaches (Shapwick) (Reineck and Singh 1980).

Lox Yeo valley and Mendip Hills

1.4.15 The borehole transect discussed in Section 1.4.6 and 1.4.8 continues northwards along the Lox Yeo valley (Figure 13). As with the northern part of the Brue Valley, all seven boreholes recorded in the Lox Yeo valley in the BGS database were drilled along the route of the M5 motorway. However, given the route of that road, the boreholes do not follow the valley in a linear fashion, but rather the southernmost two boreholes (BH 384568 and BH 384566) are in the valley centre, the next two (BH 384564 and BH 384594) at increasingly high elevations on the valley sides, while two further boreholes (BH 384593 and BH 384590) were drilled in the central part of the upper valley and the last (BH 384589) in the valley head. In contrast to the situation for the northern part of the Brue valley, all except BH 384594 extend down to the MMG basement, the outcrop of which varies from -1m OD (at BH 384566) in the centre of the lower portion of the valley to +8m OD (at BH 384565) on the eastern flanks. Again with the exception of BH 384394, the 1 − 11m thick Holocene deposits that overlie the MMG are comprised of alluvial and/or intertidal silts and clays, and peats. The latter become increasingly dominant in the upper parts of the valley and directly overlie the MMG in the valley head.

1.4.16 The 34 boreholes of the geotechnical study provide further stratigraphic coverage of the Lox Yeo and Mendip geological zone, although the same factors of movement of the cable route within the different topographic zones of the Lox Yeo valley make interpretation difficult. Therefore, although brown compact fine sandy clay of the MMG was found at the base of all the geotechnical borehole sequences, depths to rockhead vary depending on topographic location. In general, the further from the high ground of the Mendip Hills the deeper is the MMG. In SS BH C2c it is recorded at c. -

13.8m OD (19.5m BGL) compared to c. +31.7m OD (0.5m BGL) in SS BH C11 (Figure 14).

1.4.17 The cable route's passage through the Mendip Hills is to be entirely within the tunnel as outlined for the Lox Yeo valley above. The BGS borehole database only contains three records within the 500m buffer around the route, all of which are from the village of Sandford (Figure 13). Only one of the boreholes extends to the MMG basement (BH 386373 at 2m below surface [+38.5m OD]), while the remaining two (BH 386371 and BH 386372) penetrate 5m of weathered MMG(-derived) colluvium but are then abandoned. These data suggest that a Head outcrop in the southern and western part of Sandford actually extends northwards of the location mapped by the BGS.

1.4.18 The watching brief on geotechnical boreholes demonstrates that in SS BHC-LD39 in the Sandford area (Mendips geological zone), MMG is unconformably overlain by 0.25m of Head. This stratum is a greyish brown poorly sorted silt/clay containing frequent pebble- to cobble-sized sub-angular limestone clasts. The coarse clastic content is probably derived from the Carboniferous limestones of the Mendip Hills. The Sandford stretch of the Structural Soils geotechnical survey was the only locality where it has been possible to separate Head from Holocene colluvium, while the attribution is only tentative and resulting from the BGS mapping Head as present immediately north of the relevant boreholes. In contrast, boreholes SS BH C3d, SS BH4, SS BH5, SS BH7, SS BH8a and b, SS BH9b, SS BH12c, SS BH12d and SS BH13 are all recorded as containing colluvium (i.e. Head and/or Holocene colluvium). The colluvium is derived from the weathering of the MMG and comprises a reddish brown silt/clay with the occasional granular to pebble-sized sub-angular limestone and/or sandstone inclusion. The distinction between *in situ* weathered MMG and colluvium is problematic and may only be resolved by the recognition within the deposit of allochthonous clastic material such as charcoal, bone or rock fragments. Colluvium and Head are found as spreads on the lower parts of hillsides and valley bottoms. Collectively these data suggest that the HPCC route is characterised by colluvial deposits along the Lox Yeo and Towerhead Brook valley side and that such strata form thin (max. 1m thick), locally extensive drapes. The deposits are intimately associated with the underlying MMG bedrock from which they are derived and thin with increasing hill slope angle. On steep hill slopes, for example SS BH C11, Towerhead, there is no colluvium and instead MMG bedrock is found very close to the surface (less than 0.5m BGL). It would be expected that the drape morphology is wedge-shaped in section along the slope dip and fan-shaped or linear in strike (at right angles to the dip).

1.4.19 Boreholes SS BH C1a to 1d and SS BH C2a to 2d were drilled into the Somerset Levels Formation in the vicinity of the River Axe at Crab Hole (Figure 14). In close proximity are two BGS borehole records, BH 384670 and BH 384671, and a third (BH 384590), two kilometres north in the middle of the Lox Yeo floodplain. The alluvial and intertidal strata of the Somerset Levels Formation display a very broad tendency in these boreholes to fine upwards. At its base are cobble-sized gravels and these give way to sands, which in turn are replaced by silts and clays. The size of the particles in any one stratum is indicative of the energy possessed by the intertidal/fluvial system that deposited them. Thus over time, high-energy channel/creek deposits have given way to intertidal mudflat/floodplain alluvium, the latter forming the majority of the sequence.

1.4.20 South of the Mendip Hills, the Somerset Levels Formation develops over probable Pleistocene gravels that lie unconformably on the MMG at a depth of c. -12m OD (c. 20m BGL) (SS BH SS C2b, see Figure 14). The subsurface topography of the MMG rises to meet the Mendip Hills. Consequently the Somerset Levels Formation thins out northwards along the Lox Yeo river valley, where borehole BH 384590 records only 8m of intertidal/alluvial deposits overlying the bedrock. The greater thickness of the Formation in the south does not correspond with a greater number of peat units, as can be seen from their absence in the stratigraphy of boreholes BH 384671 and BH 384670, the southernmost boreholes in the Lox Yeo geological zone (Figure 14). In contrast, two peats − the lower one over 2m thick − developed in the relatively shallow intertidal/alluvial strata within the Lox Yeo valley (BH 384590) (Figure 14). These data demonstrate the marginal nature of the Lox Yeo valley to the former tidal embayment that was the Brue and Axe valley. In contrast, the cyclical nature of stratigraphic development of the Somerset Levels Formation is well illustrated in SS BH C2c on the Axe floodplain, where c. 19.5m of Holocene strata are preserved including four intercalated peats.

1.4.21 The peat recovered from boreholes in the northern part of the Brue valley and the Lox Yeo valley is a sedge or reed peat. It grows as a result of an impermeable substratum of clay combined with sufficient rainfall and a limestone catchment creating a poorly drained and alkaline waterlogged environment. Its state of preservation is a factor of the dissolved oxygen in the sediment, be it anaerobic (0% O_2) or tending to hypoxic (1 − 30% O_2), and varies from black (Munsell Color [2000]: 10 YR 2.5/1 Black) organic mud in which there are no visible organic plant fragments and black humic acids mark the end of the humification process, to a 5 YR 4/3 Reddish brown deposit where reed stems and leaves are preserved intact. On occasion, wood is found in the form of millimetre-sized twigs to fragments some 100mm large, and their preservation is often excellent (for example, SS BH C2d). A succession from reed peat to wood peat (an alder carr) would be expected in the sequence; however, the crude nature of the recovery of the cable percussive samples recovered during the watching brief precluded any such distinction being made. It is even more difficult to estimate the age of these peats on the basis of elevation and relationships with other lithological units than is the case in the major river valleys (e.g. the Brue and Avon), and the Lox Yeo examples might date from anywhere in the Mesolithic to medieval period.

1.4.22 The uppermost stratum in the Somerset Levels Formation recorded in the Structural Soils geotechnical boreholes is an iron-stained silt/clay – the iron staining recording the level of the water table rather than any sedimentological property *per se*. Redox reactions oxidise iron minerals in the clays, producing fine-grained and insoluble nodules of orange iron oxide. Below the water table the clays are shades of blue-grey as a result of the presence of hydrated iron phosphate (vivianite).

North Somerset Levels

1.4.23 The only records in the BGS database for the North Somerset Levels cover 3.7km of the cable route to the north, west and south of the Yatton 'suburb' of Horsecastle (Ham, see below) (Figure 15). Lengths of the cable route extending 5km to the south and the same to the north-east are therefore not associated with existing stratigraphic records. The boreholes in the Horsecastle area comprise four drilled along the route of the M5 motorway and seven that are located as a north-south line 900m to the east (Figure 15 and Figure 16). The latter collectively form a transect across an 'island' formed of Head and associated with the present settlement of Horsecastle and its northerly satellite, North End (the island is termed 'Ham' in the North Somerset HER [Vince Russett, personal communication, 2013]). Intertidal deposits *apparently* of 23m thickness are found to the south of the island in BH 386475, which also includes a peat logged at +13m OD in BH 386478. However, both the elevation and thickness of these records are suspect given that the surface elevation in both these locations is recorded on the Ordnance Survey topographic maps as c. +6m OD, while the total thickness of Holocene sediment elsewhere in the Horsecastle area does not exceed 10.5m. It would therefore seem that these two boreholes were recorded in feet and with respect to feet OD – despite the logging sheet indicating that metric units were used. Correcting for this mistake produces a more believable 7m of Holocene sediment and a 0.3m-thick peat at +4m OD. The Horsecastle/Ham island appears in the two central boreholes (BH 386484 and BH 386483) as >5m of Head overlying MMG bedrock. It is also notable that there is no evidence from the borehole logs for intertidal or freshwater deposits in this location. The MMG bedrock appears north of the island at +6 to +8m OD and is overlain by 5 to 6m of (presumably) intertidal deposits.

1.4.24 In total, 23 manual and four mechanical boreholes were drilled by ARCA during the present geoarchaeological borehole survey. Unfortunately the borehole coverage was not uniform and the areas to the west-south-west and north of Horsecastle/Ham are poorly represented (Figure 15). However, as geotechnical records held by the BGS coincide with these gaps (see previous paragraph), the lacunae are not as significant as they might otherwise have been. In addition to the BGS borehole records that extend to bedrock, two of the mechanical and five of the manual geoarchaeological boreholes penetrated to pre-Holocene strata (see Figure 17), while the base of the Somerset Levels Formation could also be estimated at six pylons from CPT records (Figure 18). As a result the cross-sectional shape of the North Somerset Levels basin along the line of the HPCC route can be estimated with some confidence. At the northernmost borehole of the Mendips geological zone (SSBHC-LD39) the MMG is at +5.8m OD (1.1m BGL), while there is only a thin veneer of colluvium (probably Head) and silts/clays of the Somerset Levels Formation. However, 1.5km north of this location the surface of the MMG has dropped to -8.2m OD (12m BGL) according to CPT data associated with ARCA BH51 (Pylon C-LD44) (Figure 17 and Figure 18). CPT data associated with ARCA BH58/58M (C-LD51) and ARCA BH66 (C-LD59) might be interpreted as suggesting that the surface of the MMG undulates to the north between -4.4m and -7.9m OD (Figure 17). Nevertheless, as was discussed in Section 1.4.23, the BGS-held geotechnical logs demonstrate a rapid rise of the MMG surface to +2.2m OD (3.7m BGL) (e.g. BH 386482) towards the Horsecastle/Ham island. Unfortunately, however, because of the absence of geoarchaeological boreholes between C-LD61 and C-LD66, it is unclear whether the Horsecastle/Ham island forms a continuous elevated surface conjoining with a second MMG high to the south of Kenn village [as exemplified by BH 18831608 in which the MMG outcrops at +3.6m OD (2.5m BGL)] (Figure 15 and Figure 17). Where stratigraphic data are available again to the north-west of Horncastle/Ham at ARCA BH74M (C-LD67) and ARCA BH75 (C-LD68), they demonstrate that the surface of the MMG has dropped once more to -5.9m OD (11.5m BGL). Thereafter the MMG surface rises to the north-east to reach -4.4m OD (8.4m BGL) at ARCA BH80 (C-LD73) and +3.1m OD (1.4m BGL) in ARCA BH85 (C-LD77). Where boreholes penetrated the Holocene sequence in ARCA

BH78M (C-LD71) and the zone to the north, it is notable that colluvial deposits overlie the MMG surface (Figure 17). These latter comprise Dark reddish grey (5 YR 4/2) coarse/medium sands and silts derived from the MMG, and are best explained as an apron of Head forming at the break of slope with the 'uplands' to the east. ARCA BH58M (C-LD51) also penetrated the Somerset Levels Formation to encounter Head deposits at -0.3m OD (5.1m BGL), which CPT data suggest are c. 4m thick (Figure 17 and Figure 18). However, given the distance of ARCA BH58M from any slope in the present landscape, it is difficult to determine where the Head is derived from. It might therefore be, as the CPT data reviewed above suggest, that the area sampled in ARCA BH58M was part of a local topographic high prior to the deposition of the sediments of the Somerset Levels Formation.

1.4.25 The discussion above demonstrates that, except in the vicinity of Horncastle/Ham and at its southern (C-LD39) and northern margins (C-LD76−77), the basin of the North Somerset Levels extends upwards from between -7.9 and -4.4m OD. The infilling sediments are comprised entirely of intertidal/alluvial silt/clays and peats of the Somerset Levels Formation, between 10 and 13m in thickness (less where Head deposits outcrop – see below). As well as being generally thinner than the infilling deposits of the Brue valley, the surface elevation of the Somerset Levels Formation in the North Somerset Levels varies along the HPCC route and therefore the thickness of the unit is less constant. The most obvious difference is between high elevations (+5 to 6m OD) in the valley centre [ARCA BH58 (C-LD51) to ARCA BH77 (C-LD70)], and lower (+3.9 to +4.5m OD) at the edge [ARCA BH50 (C-LD43) to ARCA BH57 (C-LD60) and ARCA BH78/78M (C-LD71) to ARCA BH84 (C-LD76)]. Another difference with the stratigraphy of the Brue valley is the lack of evidence in the available stratigraphic record for a continuous +2 to 0m OD peat stratum across the basin. Thus the Somerset Levels Formation is less conveniently sub-divided, and in part because of this the stratigraphy is more complex. Nevertheless the stratigraphy of boreholes in the range ARCA BH50 to ARCA BH78/78M (here termed 'southern-central area') is broadly similar, with ARCA BH78M providing the linking lynchpin with the second stratigraphic zone ('northern area') comprising boreholes ARCA BH79 (C-LD72) to ARCA BH84 (Figure 17). This latter area forms the lowest element of the HPCC scheme (+3.9 to 4.2m OD), while its sub-surface stratigraphy is, uniquely for the scheme, dominated by peat.

1.4.26 The nature of the Somerset Levels Formation strata outcropping below -0.5m OD in the southern-central area of the North Somerset Levels is largely unknown as there are no geotechnical data for any part of this stretch (other than in the vicinity of the Horncastle/Ham island), while only two mechanical boreholes (ARCA BH74M and ARCA BH78M) penetrated below this depth in the north of the area. However, as discussed above, the presence of Head deposits at -0.3m OD in ARCA BH58M and the Horncastle/Ham island noted in the BGS data suggest that the pre-Holocene topography of the North Somerset Levels was more complex than now, and that a continuous 10 to 13m outcrop is unlikely to be present across the whole southern-central area. Increased resistance in the CPT record might be interpreted as suggesting the presence of bands of sands between -6 and -8m OD in ARCA BH51 (C-LD44) and at -6.5m OD in ARCA BH68 (C-LD61), but otherwise the only other information on the lower strata comes from ARCA BH74M and ARCA BH78M. In these a wood peat overlying a reed peat outcrops immediately above Head deposits in the latter at -3.7m OD (7.65m BGL) and probably correlates with a reed peat at -4.7m OD (9.87m BGL) in ARCA BH74M (Figure 17). These properties suggest that the peat is likely to have developed beyond tidal reach and latterly in a freshwater marsh in the Early to Middle Holocene (see below), but it is uncertain how far this 'lower' peat extends to the south. Mineral silt/clays then overlie the lower peat and extend upwards to -1.5m OD (5.5m BGL) in ARCA BH78 and -0.6m OD (5.8m BGL) in ARCA BH74M, at which point a second peat outcrops. Just as in the Brue valley, magnetic susceptibility data from these mudflat deposits may indicate Mesolithic burning at the basin edge (but see Section 1.4.11 for an alternative explanation) at the valley edge. The most notable magnetic susceptibility peaks are to c. 180 SI units $x10^{-8}$ m^3 at -1.7 to -1.1m OD (6.8 to 6.3m BGL) in ARCA BH74M, while lower values were recorded in ARCA BH78M (Figure 19).

1.4.27 The peat outcropping at -1.5 to +2.85m OD in 10 of the boreholes from the southern-central area is most likely the equivalent of the 'upper' peat of the Brue valley (see Section 1.4.12). However, unlike the Brue valley the upper peat of the North Somerset Levels has not been the subject of previous archaeological/geoarchaeological study and its chronology is presently unknown. Still, given a similar outcrop height to the upper peat in the Brue valley and the fact that most estuaries in southern Britain appear to have undergone their most significant contraction in the Neolithic and Bronze Age, it can be hypothesised that the North Somerset Levels upper peat also dates to this period. The entire thickness of the peat was only penetrated in three mechanical boreholes (ARCA BH58M, BH74M and BH78M; BH65M had to be terminated within the peat on hitting a large piece of wood), in which the same reed-wood-reed peat stratigraphic succession occurs as seen in the Brue valley. It is, however, notable that reed peat dominates over wood peat in ARCA BH74M, while the reverse applies to ARCA BH58M, suggesting that the latter location was at a higher position within the marsh than the former. As was the case with the Brue valley, magnetic susceptibility readings from the upper peat of the North Somerset Levels are extremely low and suggest the absence of marine sulphates and human activity causing the deposition of burnt particles (Figure 19). The upper peat was not encountered in seven ARCA boreholes, all of which were manually drilled. Therefore given the 5m maximum depth of the manual boreholes, the apparent absence of the peat in four cases (ARCA BH66-67, ARCA BH75–77) can be because the boreholes did not penetrate to a sufficient depth. However, the absence of the upper peat in ARCA BH51 (C-LD44) and possibly in ARCA BH50 (C-LD43) appears to be real, and might reflect the development of channel or creek systems in the northern lee of the Mendips. These processes will have led to an environment that was unsuitable for peat growth if predating peat formation, or might have removed any prior peat if occurring afterwards.

1.4.28 The upper peat is overlain by variable thicknesses (1.7 to 4.9m) of mineral silt/clay strata, the variability a product of both differences in the surface outcrop elevation of the upper peat and the undulating nature of the present ground surface (Figure 17). The silt/clays have greater variability than those of the Brue valley, but they follow the same general pattern in comprising a lower grey (5 Y 5/1) stratum of c. 2 – 2.5m thickness overlain by a 1m thick greyish brown (10 YR 5/2) to brown layer in which the modern soil has developed. As was discussed for the Brue valley, the greyish brown/brown strata formed in an identical mud flat/alluvial floodplain environment as the lower grey sediments, but whereas the latter have retained their primary sediment characteristics, the former have undergone redox diagenesis as a result of water table movements. A number of thin (0.10 to 0.15m) peats are present as lenticular beds within the mineral silt/clay strata (e.g. ARCA BH64, ARCA BH65M and ARCA BH74M), and probably reflect short-lived emergence of the sampled area above the tidal frame. The chronology of the upper mineral and associated units is rather better understood in the North Somerset Levels than in the Brue valley as a result of work carried out by Stephen Rippon at Puxton and Kenn (summarised in Rippon 2000; 2006). Rippon (2000) notes that Romano-British features have been buried by intertidal/alluvial silt/clays, but to a depth of <1m, while features associated with medieval ridge and furrow agriculture are present at the ground surface. He therefore argues that coastal defences built during the Romano-British period in order to 'reclaim' land for pasture prevented further tidal ingress, and led to a significant reduction in sedimentation. As has been outlined above, construction of flood defences in the medieval period will have further reduced deposition.

1.4.29 As outlined in Section 1.4.25, the stratigraphy of the northern area of the North Somerset Levels between ARCA BH79 (Pylon C-LD72) and ARCA BH84 (C-LD76) is rather different from that to the south. Whereas in the latter area, deposition is dominated by mineral strata that reflect a domination of intertidal (probably mudflat) environments, in the former, organic strata developed in probable freshwater marsh. Indeed peat is the sole stratum in ARCA BH79−80 (C-LD72-73) and ARCA BH82−84 (C-LD75−77), while an intertidal incursion is evident in the largely mineral silt/clay strata of ARCA BH81 (C-LD74) (Figure 17). The peat itself is comprised of both reed and wood facies, suggesting that the properties of the marsh changed over time with respect to the position of the tidal frame. A key reason for the difference of the northern from the southern and central area is the position of pylons C-LD70 to C-LD77 in the former at the foot of hills on which Nailsea now sits. As has been discussed above, Head has accumulated at the marsh edge as a discontinuous apron and has likely formed both a barrier that prevented inundation from tidal waters from the west and a number of localised 'bowls' in which freshwater marsh could develop. Peats developing in these marshes outcrop at higher elevations than peats forming in the basin to the south (i.e. to +4.2m OD), while because of their isolation the chronological model discussed for the southern and central area does not apply. Indeed the absence of prior investigation in the northern area means that the chronology of the peat in ARCA BH79−84 cannot be estimated, it being quite possible that peat development here began earlier and continued later than for any peat stratum previously described.

Gordano Hills

1.4.30 There are three records in the BGS borehole database from the southernmost flanks of the Gordano Hills, but none from the central part (Figure 20). The stratigraphy of the boreholes is of variable composition, reflecting the different topographic position of the three locations. The westernmost, BH 386622, clearly sampled the (unmapped) margin of the North Somerset Levels as c. 1.5m of intertidal/alluvial silt/clays are recorded as overlying MMG bedrock at +6m OD. The remaining two boreholes (BH 386623 and BH 386624) record thin (<0.3m) Holocene silt/clays overlying (in reality probably soils developing within) limestone (Clifton Down Limestone Formation). Forty-five boreholes in the BGS database are from the north-western fringes of the Gordano Hills, all bar one of which were drilled along the course of the M5 motorway (Figure 20). In a similar manner to the southern margins, all except the north-westernmost (e.g. BH 18949232) record thin Holocene soils developed within conglomerate or sandstone facies of the MMG. Those boreholes (e.g. BH 18949232 and BH 18844777) at the north-western margin of the Gordano Hills coincide with an apron of Head deposits that emanates from the uplands. These records are then likely to comprise colluvial deposits of various facies derived from the Triassic and Carboniferous rocks to the east.

Avonmouth Levels

1.4.31 Although only representing 21% of the HPCC route, there are 166 records in the BGS borehole database for the Avonmouth Levels (61% of the total) (Figure 21). As noted in Section 1.3.4, the relatively high resolution of the borehole record is a product of the quantity of construction in this geological zone. Many possible composite transects could be constructed through the Avonmouth levels using the BGS borehole database, but for brevity's sake only three are discussed here: one along the eastern fringes of the area (including the western periphery of the Gordano Hills) (Figure 22), a second at right angles across the northern margins of the area (Figure 23), and the last – also at right angles to the first, but across the central part of the zone (Figure 24). A single deposit model has also been constructed for the central part of the Avonmouth Levels showing the thickness of the Holocene sequence (Figure 25).

1.4.32 Although the deposit model of the thickness of the Somerset Levels Formation in the Avonmouth area is crude and its accuracy cannot be relied upon at the margins of the area defined by the BGS boreholes, it nevertheless reveals some general patterns in the Holocene infill of this former embayment. The total thickness of the Holocene sediment stack appears to increase south- and westwards from around 8m in the lea of the Gordano Hills to approximately 17m in the vicinity of Seabank power station (but see Section 1.4.32 below) and 25m at Portbury Wharf (but see Section 1.4.33) (Figure 25). These patterns make sense in the context of models of estuary sedimentation, i.e. deposition is more extensive towards the estuary centre and mouth (Reineck and Singh 1980). They suggest that the topography of the valley has varied through the Holocene and that palaeosurfaces are at a variety of depths and slope angles.

1.4.33 The borehole transect along the eastern part of the Avonmouth Levels demonstrates that 4 to 13m of Holocene deposits overlie mudstone and marl facies of the MMG in the lea of the Gordano Hills (Figure 22). The strata are mostly intertidal silts and clays, but also comprise peats and, more rarely, sands. The variable detail of the borehole logs incorporated within the BGS database, the inherent complexity of sedimentation along a longitudinal transect through an estuary and variations in sea level during the Holocene make recognising outcrop patterns difficult. However, it would appear that peats are more likely to outcrop in the immediate lea of the Gordano Hills where the stratigraphy is thinnest (e.g. BH 388423 and BH 388427), while sands are found in thicker sequences further away from high ground (e.g. BH 388312). These observations are in accordance with standard models for estuary sedimentation where peat formation takes place in freshwater marshes at the estuary margins and on salt marshes to their front, while sands are found in channel areas (Reineck and Singh 1980).

1.4.34 The north-west to south-west stratigraphy in the northern part of the Avonmouth Levels as shown in the cross-section of Figure 23 disagrees with the modelled thickness of the Somerset Levels Formation (Figure 25). Whereas the latter indicates that Holocene sediments increase in thickness from 13m in the east to 17m in the west across this transect, the former shows a 17m thick sequence of intertidal silt/clays and peats in BH 389448 in the east. The sequence thickens westwards to 20m at BH 389529, but then thins in the immediate vicinity of Seabank power station to 5m at BH 389405 and 12m at BH 389421. These latter data suggest that there is a bedrock 'island' 0.5 to 1km east of the present bank of the River Severn in the Seabank area, although the 'island' would have been inundated by tidal waters from the Late Mesolithic onwards and invisible from the Neolithic/Bronze Age periods and later. The thickest sediment sequences in the northern transect are therefore to the east of the island, where they comprise a mixture of intertidal silts and clays (mud flats), sands (channels and creeks) and peats (salt and freshwater marsh) (e.g. as in BH 389399).

1.4.35 A transect plotted from borehole records in the central part of the Avonmouth Levels geological zone (Figure 24) also suggests variation from the generalised model of Somerset Levels Formation thickness. The latter suggests an even greater gradient for increasing Holocene sediment thickness than areas to the north, but the composite transect suggests that there is an MMG surface at 0 to +4m OD across the area occupied by Royal Portbury dock buried by 3 to 8m of Holocene intertidal silt/clays and peat (Figure 24). Approximately 500m to the west of the docks and 750m south of the present Severn channel, the MMG rises to +7m OD (at BH 386580), before falling steeply way to the west to -9 to -12m OD (in BH 386599 and BH 386598). Holocene deposits in this western part of the transect comprise intertidal muds and sands overlying peat, the outcrop height of which suggests that it is of Mesolithic date.

1.4.36 The seven manual boreholes drilled by ARCA as part of the present project provide further detail only for the upper part of the sequence in that part of the Avonmouth Levels study area between M5 Junction 18 (Pylon C-LD114) and the southern end of Hallen Marsh (C-LD121) (Figure 26). None penetrated to the base of the Holocene sequence, which geotechnical boreholes in the BGS database and previous studies carried out by ARCA at Hallen suggest lies between -10 and -11m OD (C. 16m BGL). Boreholes ARCA BH94−98 (Pylons C-LD114−118) form a parallel line running 320m to the north of the M5 motorway and c. 1km north of the Shirehampton 'uplands' (Figure 26). All of these except ARCA BH95 encounter a reed peat at their base that outcrops at c. +2.0m OD (4m BGL), while it is also possible that ARCA BH95 did not extend to a sufficient depth to encounter the unit (Figure 26). The same +2m OD peat is also present only 110m north-west of ARCA BH96 in BGS borehole log BH 388324, where the peat is 0.2m thick and overlies intertidal sands. ARCA BH91−93 (C-LD119-121) lie progressively further north of the M5 and further out into the basin. Perhaps as a result of their more distal location, the +2m peat is not observed, rather the entire stratigraphy is comprised of grey (5 Y 5/1) laminated fine sands/silts overlain by grey and iron-stained silt/clays. Likewise the strata overlying the +2m OD peat in ARCA BH94−98 comprise sediments of a similar character, albeit overlain by Made Ground in the case of ARCA BH98. Strata with the properties discussed above are well known from the Avonmouth Levels where they have been described from a number of sites [e.g. Seabank to Pucklechurch pipeline (Carter *et al.* 2003), the Second Severn Crossing English Approaches (Allen and Scaife 2009, Allen *et al.* 2010) and Willow Farm, Hallen (Wilkinson *et al.* 2012)], and attributed to accumulation on saltmarsh and mudflats (Reineck and Singh 1980, 432−40; Wilkinson *et al.* 2012).

1.4.37 A chronology for deposition of intertidal deposits the Somerset Levels Formation is provided by ^{14}C dates on peat strata encountered in geoarchaeological and geotechnical boreholes in the Second Severn Crossing, Seabank to Pucklechurch pipeline and at Willow Farm, Hallen, although that recently produced for the latter site is the most detailed (Wilkinson *et al.* 2012, 2013). Terrestrial and freshwater deposits dating to 7300 − 7000 cal. BC were found at -9.8m OD (16.2m BGL), while four separate peats were encountered at -9.6m OD (16.1m BGL, 7310 − 6250 cal. BC), -2.5m OD (-9.1m BGL, 5630 − 5490 cal. BC), -0.8m OD (-7.3m BGL, 5210 − 4940 cal. BC) and +1.4m OD (5.1m BGL, 3870 − 2700 cal. BC) (Wilkinson *et al.* 2012), while a date of 2120 − 1890 cal. BC was obtained on an organic mud at +4.6m OD (1.9m BGL) (Wilkinson *et al.* 2013). In other words the majority of the Somerset Levels Formation on the Avonmouth Levels would seem to be of Mesolithic date, while the +2m OD peat is likely to be of Middle Neolithic age and the top 2m of deposits date between the Late Neolithic and Romano-British period.

1.5 ASSESSMENT

1.5.1 The stratigraphic data described in Sections 1.2, 1.4 and 1.5 are assessed in terms of their archaeological and palaeoenvironmental potential in the text below. 'Archaeological potential' is defined in the present case as a combination of a. the likelihood that cultural artefacts and/or features will be impacted by pylon construction or tunnel excavation and b. the probable preservational state of such remains. Given that laboratory bioarchaeological assessment has not been a part of the present project, 'Palaeoenvironmental potential' reflects the likely derivation and taphonomy (i.e. origin/catchment, subsequent movement and preservational status) of biological proxies that might be utilised to reconstruct past human environments. Artefacts, features and biological proxies are assumed to have archaeological relevance if they predate AD 1800.

1.5.2 Four pylons are to be constructed in the *King's Sedgemoor* area. The single BGS record suggests that approximately 8.4m of intertidal silts, sands and (probable) freshwater peats overlie the MMG basement 500m to the south-west of the southernmost pylon of the scheme examined in this study. However, the geoarchaeological borehole data and CPT records demonstrate that the latter pylon (VQ0-43R) coincides with a bench in the Mercia Mudstone Group bedrock, over which c. 5m of Somerset Levels Formation strata sit. This bench then continues northwards until the Polden Hills, cut only by the 1791 – 1795 channel of King's Sedgemoor Drain. Given that peat strata of probable Mesolithic to Bronze/Iron Age date lie below the bench to the south of VQ0-43R and that these most likely formed at the edge of the late Middle Holocene floodplain/intertidal embayment, the fine-grained mineral layers of the Somerset Levels Formation between pylons VQ0-43R and C-ZGA3 are likely to be of later prehistoric and historic date. Deposition appears to have been initially in the relatively high-energy environment of a tidal creek/stream channel, but later on a floodplain or on intertidal mudflats. Although archaeological investigations at the nearby Walpole Landfill site demonstrate that there was Neolithic to Bronze Age archaeological activity associated with palaeochannels (Hollinrake and Hollinrake 2010), such features are considered unlikely in the present case given the shallow nature of the channels and the high energies inferred from the infilling sediments. Similarly there are no indications of stabilisation in the later mudflat/floodplain sediments, excepting at C-ZGA3 immediately prior to construction of the northern bank of King's Sedgemoor Drain. It is therefore unlikely that these fine-grained deposits contain evidence of settlement, although evidence of ephemeral non-settlement activity dating from the Iron Age to early historic period might be present. For all these reasons, that part of **the HPCC**

route within the King's Sedgemoor geological zone covered by the present study is assessed as having LOW archaeological potential. As noted above the geoarchaeological study has demonstrated that peat is absent from the VQ0-43R and C-ZGA3 area, while the mineral strata of the Somerset Levels Formation that are present comprise channel sands and gravels, and overbank alluvium/intertidal mudflats. Few organic remains were noted in these strata in either field or laboratory descriptions, while the derivation of microfossils in such deposits are also uncertain. Therefore **the strata of the King's Sedgemoor geological zone examined as part of the present project are also assessed as having a LOW palaeoenvironmental potential**.

1.5.3 Seven pylons of the HPCC route coincide with the *Polden Hills* geological zone. Thanks to the Shapwick (Aston and Gerrard 2007) and other smaller archaeological projects, the archaeology of the Polden Hills is relatively well known. The Quaternary stratigraphy of the geological zone is thin, while archaeological features and artefacts from the entire Holocene have been found (often as a palimpsest[8] where strata are at their thinnest) as a result of surface survey, geophysics and excavation (Aston and Gerrard 2007). Clearly then **the Polden Hills have HIGH archaeological potential**. However, those same investigations have demonstrated that biological preservation (particularly of botanical remains) is relatively poor (i.e. waterlogging only occurs within some negative archaeological features). Therefore **the palaeoenvironmental potential of the area is assessed as being LOW to MODERATE**. Given the thinness of Holocene soils and the success of surface survey, geophysics and evaluation-style trenching on the Shapwick Project, these 'conventional' archaeological methods are considered more appropriate means of further refining the archaeological potential than the drilling of boreholes.

1.5.4 The *Brue valley* is the single widest geological zone of the entire HPCC route, representing 33% of the total length and containing 38 of the 150 pylons (as noted in Section 1.2.4, in the northernmost 1.5km of the zone the cable will pass through a tunnel). The geoarchaeological borehole study reported here has provided a relatively high-resolution stratigraphic framework for the upper 5m of the Somerset Levels Formation across the central and southern part of the Brue valley, and a somewhat lower-resolution picture of the same stratigraphy in the northern zone. Stratigraphy below 5m BGL has been examined in three mechanical boreholes, of which one on the southern margin of the Brue valley was penetrated to the pre-Holocene stratum. While CPT records have enabled the pre-

[8] Multiple sites of different periods in the same place and undifferentiated in the stratigraphic record

Holocene morphology and consequently the thickness of the Somerset Levels Formation to be determined across that part of the valley through which the HPCC is to run (an 8 to 19m range, with the majority of the valley covered by 13 to 17m of the unit), the same data do not allow the lower strata of the Formation to be characterised. Nevertheless, the three geoarchaeological mechanical borehole records and two geotechnical boreholes that sampled the lower parts of the Somerset Levels Formation do enable a broad characterisation of the stratigraphy. These data demonstrate that channel, mudflat/floodplain and freshwater marsh were all present at different stages of the Early and Middle Holocene (Mesolithic)[9], while the mosaic of environments present at any one time was probably more diverse than in the Neolithic and later periods. Volume magnetic susceptibility data from the three mechanical geoarchaeological boreholes can be tentatively interpreted as providing secondary evidence for burning on the southern valley margins during the Mesolithic, an activity that does not seem to have been repeated in the Neolithic or later, judging from the absence of similar magnetic susceptibility peaks higher in the sequence. It is notable in this respect that many Mesolithic artefact scatters have been found in the surrounding 'uplands' and at the interface with the marsh, suggesting that Mesolithic people exploited this ecotonal environment (see review in Wilkinson and Bond 2001). **The 'lower'[10] strata of the Somerset Levels Formation in the Brue valley are assessed as having a HIGH palaeoenvironmental potential and a MODERATE archaeological potential**. This assessment is made on the basis of the Mesolithic age (a period for which there is limited evidence within the Brue valley itself) of the strata, the evidence of human manipulation of the environment that may be contained within the sedimentary record and the relatively large number of Mesolithic sites known on the periphery of the Brue valley. The lower designation for archaeological potential is on the basis that the marsh/intertidal environments of the valley are unlikely to have been the location of base camps, and the lesser visibility of/greater difficulty in detecting more ephemeral site types.

1.5.5 As outlined above, the upper part of the Somerset Levels Formation is relatively well characterised by the present study and comprises a 2m thick peat at c. 0 to +2m OD (the 'upper' peat *sensu* Wilkinson 1999) and overlying mineral silts and clays. The former formed mostly in freshwater alder carr during a period of estuary contraction in the Neolithic to Iron Age, and the latter mostly in

[9] The Mesolithic age is inferred from the Late Mesolithic/Early Neolithic age of the overlying 0 to +2m OD peat and Middle Holocene ages for a lower peat at Shapwick (Tinsley 2007).

[10] 'Lower' being defined as strata that are stratigraphically below the 0 to +2m peat.

intertidal environments in the Iron Age and Romano-British period. Deposition within the Brue valley probably slowed dramatically following construction of coastal defences in the Romano-British period and then all but ceased following the building of river embankments in the medieval period. Therefore where they exist, archaeological sites of the post-Romano British period should exist at or near the surface (i.e. within 1m BGL). Such surface archaeology has been the subject of conventional archaeological investigation by other contractors (magnetometry and electromagnetic surveys, and excavation of evaluation trenches) and its potential is not considered further in this report. Nevertheless, as highlighted in Section 1.2.4, there is an extensive and extremely important Neolithic to Iron Age archaeological record associated with the upper part of the Somerset Levels Formation sequence and which is more deeply buried (Coles and Coles 1988). The vast majority of these known sites are located in peat in the upper parts of the Brue valley, largely as a result of the activities of the Somerset Levels Project in advance of peat cutting. However, because previous archaeological works are so few, very little is known of later prehistoric and Romano-British human activity in the lower parts of the valley that are to be crossed by the HPCC. Nevertheless it is likely that people – at least in the Neolithic and Bronze Age – did utilise the lower valley at times when the sea level was lower (i.e. when the upper peat was forming), in other words when the lower valley was further from the sea. This presumption, together with the likely anoxic preservation conditions, mean that **the 0 to +2m OD peat of the Brue valley geological zone is assessed as having HIGH archaeological and palaeoenvironmental potential**. Given the environment in which they accreted, the overlying mineral silts/clays are less likely to contain *in situ* archaeological materials. However, they may bury archaeological features constructed on lower surfaces and might contain ephemeral remains, while marsh (i.e. semi-terrestrial surface) developing on the southern margins of the valley may contain *in situ* archaeological remains. For these reasons, **the mineral silt/clays overlying the upper peat of the Brue valley are assessed as having MODERATE archaeological and palaeoenvironmental potential**.

1.5.6 The cable route through the *Lox Yeo valley* is to be entirely within a tunnel. The impact of construction will therefore depend upon how deep it is to be. The prior stratigraphic information available for the valley was more detailed than for any other zone of the HPCC route, with the exception of the Avonmouth levels, thanks to the proximity of the M5 and the geoarchaeological watching brief carried out as part of the present project. However, geoarchaeological information predating the current project is lacking. The BGS borehole database suggests that peats have formed adjacent to the Lox Yeo stream on the western side of the valley and that they thicken towards the valley head. However, peat strata were not found within the Lox Yeo valley (*contra* the northern part of the Brue valley) during the geoarchaeological watching brief, demonstrating that the cable route passes east of floodplain depressions in which such deposits form. Indeed, Quaternary strata recovered in the Structural Soils geotechnical boreholes from the Lox Yeo valley are entirely colluvial. For these reasons, **that part of the Lox Yeo valley crossed by the HPCC route is assessed as having LOW palaeoenvironmental potential**. **The archaeological potential of the HPCC route in the Lox Yeo valley is assessed as being MODERATE**. Evidence of human activity might be present below and within the colluvium given its accumulation on a terrestrial surface, although no such evidence was found within the borehole stratigraphy.

1.5.7 As is the case for the Lox Yeo valley, the cable route through the *Mendip Hills* is to be entirely within a tunnel and therefore the same qualifiers as outlined in Section 1.5.6 apply to this assessment. The three logs held in the BGS borehole database, the watching brief on the Structural Soils geotechnical boreholes, together with BGS mapping, suggest that the majority of the HPCC route within the Mendip Hills geological zone coincides with MMG-derived colluvium and weathered MMG (the two are extremely difficult to discriminate in the narrow window of a geotechnical auger). The depth of the colluvium may exceed 5m in places but is likely to be considerably thinner. There are no indications from the borehole record for the presence of palaeosols within the colluvial sequence, although evidence for such strata is difficult to detect in cable-percussive auger heads and would not be recorded in geotechnical logs. The Quaternary stratigraphy of the Mendip Hills geological zone is presently poorly discriminated, particularly given that Pleistocene cave infills might also be penetrated in the vicinity of Banwell Plain hillfort. It is therefore difficult to determine whether and at what depth archaeological materials/features might be buried. As a result **this zone is assessed as having an UNKNOWN archaeological potential**. However, the absence of organic strata within the borehole logs and the non-calcareous nature of much of the MMG, suggest that biological proxies are unlikely to be preserved within Quaternary deposits within the zone and therefore **the palaeoenvironmental potential is assessed as being LOW**.

1.5.8 The *North Somerset Levels* comprise 25% of the HPCC cable route and will be the site of 39 pylons. The geoarchaeological study reported here has divided the North Somerset Levels geological zone into two: a southern and central area encompassing Pylons C-LD 39B–71 (32 pylons) and a northern area comprising Pylons C-

LD72−78 (6 pylons). The stratigraphy of these two areas is assessed separately below.

1.5.9 The *southern and central area of the North Somerset Levels* has broadly similar topographic properties of that part of the Brue valley crossed by the HPCC. Thus deposits of the Somerset Levels Formation onlap against MMG strata forming the northern flanks of the Mendip Hills and thereafter thicken to the north, forming an intertidal and freshwater sequence that varies between 10 and 13m according to CPT data. Also similar to the Brue valley is the presence of a peat that divides the Somerset Levels Formation sequence in two, although the outcrop elevation of the peat is rather more variable (-1.5m to +2.9m OD) than in the Brue valley. However, there are also key differences, both topographic and in terms of the history of investigation, that mean assessment of the Somerset Levels Formation in the southern and central area of the North Somerset Levels cannot simply be the same as that for the Brue valley. Firstly a bedrock island is present in the Horsecastle/Ham area, as attested by the present settlement location, but also by strata recorded in BGS stratigraphic records. Secondly, as has been highlighted in Section 1.4.27, a particular problem in interpreting the stratigraphy of the Somerset Levels Formation in the North Somerset Levels is the lack of previous (geo)archaeological work. Although Rippon (2000, 2006) investigated the upper part of the unit in the Puxton and Kenn areas in detail, his focus was the Romano-British period, and therefore he did not carry out intensive stratigraphic investigations below 1.5m BGL. Due to the shortage of (geo)archaeological data from below the latter datum, the chronology of the underlying deposits is not presently known, while the nature of archaeological materials and features that may be preserved in the underlying deposits is even less well understood.

1.5.10 Given the problems highlighted above it is fortunate in respect of the present study that two parallel geotechnical borehole transects have previously been drilled through parts of the Horncastle/Ham island, thereby highlighting its palaeotopography. It would appear that the central part of the island has not been regularly flooded, is capped by Head and that the MMG bedrock forming the base of the feature slopes gently to the north, perhaps forming continuous 'upland' with a second island at Kenn. Both the BGS boreholes and those drilled as part of the present project suggest steeper slopes to the west and north-east, and perhaps also the south. Stratigraphic data indicate Head at -0.3m OD in ARCA BH58M and associated CPT results, suggesting an elevated MMG surface might indicate the presence of yet another 'island' in the vicinity of Pylon C-LD51. The overall picture would seem to be that sedimentation as a result of

Holocene sea level rise in the North Somerset Levels basin was onto an irregular surface. Thus islands would have formed within the bay on which human activity may have occurred (as on the Burtle and bedrock islands of the Brue and King's Sedgemoor geological zones) prior to their inundation. Given the presence of the upper peat above the Head in ARCA BH58M, the C-LD51 island will have been become marsh by the Neolithic. The HPCC route passes to the south, west and north of the Horncastle/Ham island, and as the upper peat is found in the only mechanical borehole from this part of the route (ARCA BH65M), it would seem that that part of the island impacted by the scheme was also flooded by the Neolithic. However, because geoarchaeological boreholes could not be drilled between C-LD61 and C-LD66, a question remains with regard to the status of the island in this part of the route, and in particular whether it joins with the Kenn island to the north. **The surfaces of these islands (i.e. the interface between the MMG or Head and the overlying strata of the Somerset Levels Formation) have HIGH archaeological and palaeoenvironmental potential,** given important archaeological discoveries in a similar stratigraphic position in the Brue and King's Sedgemoor area and their association with organic strata (e.g. Wilkinson and Bond 2001).

1.5.11 The lower strata of the Somerset Levels Formation (i.e. strata that are stratigraphically below the upper peat) in the North Somerset Levels are even more poorly understood than the Brue valley. CPT records have enabled the total thickness of deposits infilling the basin to be determined, but have only hinted at the character of some basal strata. The three mechanical boreholes that penetrate the Holocene sequence suggest that deposits below the upper peat are largely mineral silt/clays (mudflat or alluvial floodplain), but a lower peat is present in the two boreholes in the northern part of the area. It is tempting to equate this stratum with the lower peat of the Brue valley, although unlike the peat in that area, this -3.7 to -4.7m OD peat has not been previously investigated. Nevertheless it is probably of Mesolithic date, and may contain proxy evidence for human manipulation of the surrounding environment. Human impact in the Mesolithic might be evident in the enhanced magnetic susceptibility readings noted in mineral silt/clay strata below the upper peat in ARCA BH74M, but there is no direct evidence of such activity in the borehole data. In light of the preceding discussion, **the lower strata of the Somerset Levels Formation are assessed as having HIGH palaeoenvironmental and MODERATE archaeological potential**.

1.5.12 The upper stratigraphy of the Somerset Levels Formation in the North Somerset Levels is, as highlighted above, broadly similar to that of the Brue valley. The key difference, however, is the paucity of archaeological and palaeoenvironmental data from the upper peat. The boreholes drilled as part of the present project suggest that the upper peat has similar properties to the equivalent unit in the Brue valley, but that it is more deeply buried and has a more irregular topography. It is, however, just as likely to have been exploited by later prehistoric human populations, and will probably contain palaeoenvironmental proxies of similar quality and preservation. Indeed given the poverty of information presently available for this stratum it is arguably of even greater significance than the upper peat in the Brue valley. For these reasons **the upper peat in the North Somerset Levels is assessed as having HIGH archaeological and palaeoenvironmental potentials**. The overlying silt/clay strata probably accumulated in mudflat and/or floodplain environments, although the lenticular peats noted in three of the boreholes suggest that some areas were emergent for some of the time. Nevertheless, as with the Brue valley examples there is no evidence for stabilisation (in the form of the development of soils), and therefore evidence of *in situ* human settlement activity within these mineral deposits is considered unlikely (although evidence of craft and subsistence activities might be preserved). **The mineral silt/clay strata of the Somerset Levels Formation overlying the upper peat is therefore assessed as having MODERATE archaeological and palaeoenvironmental potentials**.

1.5.13 The *northern area of the North Somerset Levels* probably has a different Holocene depositional history to the rest of the basin. As has been highlighted in Section 1.4.27 above, it is likely that the area was isolated from the embayment to the west by virtue of a Head outcrop formed at the foot of the Nailsea uplands during the late Pleistocene. Holocene deposition seems to have taken place within pocket in and on the surface of the Head and was almost entirely of peat. As discussed in Section 1.4.27 this peat does not necessarily correlate with organic strata forming in the greater basin to the west, and might have a greater antiquity and more recent history. Indeed because the deposits have not previously been investigated, their chronology in unknown. By virtue of their likely sub-fossil preservation, their possible antiquity and the information they might provide on human manipulation of the surrounding landscape, **the peat strata of the northern area of the North Somerset Levels are assessed as having a HIGH palaeoenvironmental potential**. Given their limited distribution, unhospitable nature and the likelihood that the marsh in which they developed would be relatively easily circumnavigated, it is unlikely that *in situ* archaeological remains would be associated with the peats. However, it is possible that the area might have been used for secondary deposition of cultural material, and if so, preservation is likely to be good. Also the proximity of the stratum to the ground surface means that impact of pylon construction on it is likely to be great. **The peats of the northern area of the North Somerset Levels are assessed as having MODERATE to HIGH archaeological potential**.

1.5.14 Fifteen pylons are to be constructed in the *Gordano Hills* geological zone. However, despite the density of boreholes in the BGS database for the M5 motorway in the north-western margin of the zone there is only a low- resolution record for the southernmost extreme and no record at all for the centre. Given the complexity of the bedrock geology and topography of this geological zone (see Section 1.2.8), the records that do exist cannot be taken as typical for the zone as a whole. Nevertheless it is likely that only thin Holocene soils have developed within the limestone and mudstone rocks of the central and southern part of the zone. Archaeological sites are therefore likely to exist as upstanding features and as multiperiod palimpsest scatters at or near the surface, except where colluvial deposits have formed on the north-western slopes. As discussed for the Polden Hills above, circumstances such as the former are best investigated using conventional archaeological approaches, namely surface survey, geophysics and standard trenching. Biological proxies in the Gordano Hills are unlikely to survive in off-site sequences, but might be found within negative features on archaeological sites such as ditch fills. In these circumstances it will only be calcareous macro-fossils (e.g. mollusc shell) that survive.

1.5.15 Between 30 and 39 pylons are planned for the *Avonmouth Levels*. The area has been extensively drilled during past geotechnical investigations, while several geoarchaeological borehole surveys have also been carried out in the area. As a result the Holocene stratigraphy of the area is reasonably well known. The broad pattern is for deposit thickness to increase from approximately 8m in the east to 17m in the north-west and 25m in the south-west. However, this generality disguises many local variations, of which the presence of bedrock islands within 0.5 to 1km of the present river Severn is the most significant. The strata of the Avonmouth Levels comprise intertidal silt/clays, sands and peats, but unfortunately, for the reasons given in Sections 1.4.29 to 1.4.34, individual beds cannot easily be correlated without biostratigraphic work and ^{14}C dating. Recent work at Hallen suggests that the majority of deposition in the western part of the Avonmouth Levels dates to the Early Holocene, i.e. when sea levels were increasing at their most rapid rate (Wilkinson *et al.* 2012, 2013). Phases when sea level rise slowed, or when sedimentation outstripped the rise, are marked by peats (again mostly of Mesolithic date), which therefore occur at different stratigraphic positions and at variable elevations dependent on the position of the sample point with respect to the tidal frame. Certain peats have associated evidence for trampling by herd animals, while the intertidal sequence seals a terrestrial surface (associated with freshwater pools) dating to c. 7100 cal. BC (Wilkinson *et al*. 2013). Cultural materials have also been found associated with buried palaeochannels/creeks (although mainly on the western shore of the Severn) (e.g. Bell and Brown 2006). Other evidence for human activity on the Avonmouth Levels is indirect and in the form of biostratigraphic and magnetic data, suggesting human manipulation of the vegetation at different times (Gardiner *et al*. 2002, Carter *et al*. 2003, Wilkinson *et al*. 2013). It is clear that organic strata make up a much smaller proportion of the Holocene sediment stack in the Avonmouth Levels when compared to the North Somerset or Brue valley geological zones to the south, perhaps reflecting a position within a more open embayment during the Early and Middle Holocene. The multiple interruptions to intertidal deposition in the Mesolithic and Neolithic, represented by the thin peats that characterise the Avonmouth Levels, the demonstrable biological preservation and the presence of both direct and indirect evidence for Mesolithic and Neolithic cultural activity found by previous studies, suggest that **the Somerset Levels Formation below 1.5m BGL (c. +5m OD)** [11] can **be assessed as having HIGH palaeoenvironmental and MODERATE to HIGH archaeological potential. Strata above 1.5m BGL in which peats/organic muds and stabilisation features (palaeosols) have not been found are assessed as having LOW palaeoenvironmental and MODERATE archaeological potential**.

1.5.16 A further consideration with regard to the Avonmouth Levels is the sub-surface strand of the route that will pass in a loop east of Portbury. According to records from the BGS database, the maximum 2m deep trench that will be cut should not penetrate Pleistocene river terrace deposits in the Sheepway area. It is therefore unlikely that strata containing Palaeolithic archaeological remains will be encountered in the trenching.

1.6 ACKNOWLEDGEMENTS

1.6.1 ARCA would like to thank Helen Saunders and James Smith of TEP for providing logistical and Health and Safety support, Richard Gott (National Grid) and Tom Wilson (Stonebow Heritage). Vanessa Straker (English Heritage), Stephen Membery (Somerset County Council), Vince Russett (North Somerset Council), Robert Jones (Bristol City Council) and David Haigh (South Gloucestershire

[11] The minimum depth of the uppermost organic unit at Hallen and elsewhere where geoarchaeological (as opposed to geotechnical) boreholes have been drilled.

Council) are thanked for useful comments they made on an earlier version of this text.

1.6.2 David Ashby, Phil Marter, Nick Watson and Keith Wilkinson carried out the fieldwork that is reported in this report. David Ashby and Nick Watson undertook laboratory magnetic susceptibility and description of the mechanical borehole cores. Keith Wilkinson wrote the report, which was then copy edited by Myra Wilkinson-van Hoek. Claire Lorrain managed the logistics of the field project, while overall management of the geoarchaeological project was by Keith Wilkinson.

1.7 BIBLIOGRAPHY

Allen, J.R.L. and Rae, J.E. (1987) Late Flandrian shoreline oscillations in the Severn Estuary: a geomorphological and stratigraphical reconnaissance. *Philosophical Transactions of the Royal Society of London* **B315**, 185-230.

Allen, M.J. and Scaife, R.G. (2009) The physical evolution of the North Avon Levels: a review and summary of the archaeological implications. Wessex Archaeology internet report. http://www.wessexarch.co.uk/reports/35743/physical-evolution-north-avon-levels (accessed 12 April 2012).

Allen, M.J., Scaife, R.G. and Gardiner, J. (2010) The physical evolution of the North Avon Levels: summary results from the Second Severn Crossing English Approaches project. *Archaeology of the Severn Estuary* **21**, 1-8.

Bell, M.G. (2000) Environmental archaeology in the Severn Estuary: progress and prospects. *Archaeology in the Severn Estuary* 11, 69-104.

Bell, M.G. and Brown, A. (2006) Prehistoric activity in Peterstone Great Wharf palaeochannels: field survey 2005-6. *Archaeology in the Severn Estuary* 16, 85-97.

BGS (2013a) Borehole scans. http://www.bgs.ac.uk/data/boreholescans/ (accessed 1 May 2013).

BGS (2013b) Lexicon of named rock units. http://www.bgs.ac.uk/lexicon/home.html (accessed 15 June 2013).

Campbell, S., Hunt, C.O., Scourse, J.D., Keen, D.H. and Croot, D.G. (1999) Southwest England. In Bowen, D.Q. (Ed.) A revised correlation of Quaternary deposits in the British Isles. The Geological Society Special Report 23, Bath, 66-78.

Carter, S., Jones, J. and McGill, B. (2003) Pucklechurch-Seabank pipeline: sediment stratigraphic and palaeoenvironmental data from the Avonmouth levels. *Archaeology in the Severn Estuary* **14**, 69-86.

Coles, B. and Coles, J. (1988) Sweet Track to Glastonbury: Somerset Levels in prehistory. Thames and Hudson, London.

Gardiner, J., Allen, M.J., Hamilton-Dyer, S., Laidlaw, M. and Scaife, R.G. (2002) Making the most of it: late prehistoric pastoralism in the Avon Levels, Severn Estuary. *Proceedings of the Prehistoric Society* **68**, 1-40.

Gerrard, C.M. and Aston, M.A. (2007). *The Shapwick Project, Somerset. A rural landscape explored.* Society for Medieval Archaeology, Leeds.

Green, G.W. (1992) *British Regional Geology: Bristol and Gloucester region.* Third Edition. Her Majesty's Stationary Office, London.

Godwin, H. (1941) Studies in the Post-Glacial history of British vegetation IV: correlations in the Somerset Levels. *New Phytologist* 40, 108-132.

Hollinrake, N. and Hollinrake, C. (2010) Archaeology in the Severn Estuary.

Jones, A.P., Tucker, M.E. and Hart, J.K. (1999) Guidelines and recommendations. In Jones, A.P., Tucker, M.E. and Hart, J.K. (Eds.) *The description and analysis of Quaternary stratigraphic field sections*. Quaternary Research Association technical guide **7**, London, 27-76.

Kattenberg, A.E. and Aalbersberg, G. (2004) Archaeological Prospection of the Dutch Perimarine Landscape by Means of Magnetic Methods. *Archaeological Prospection* **11**, 227-235.

Long, A.J. (1995) Sea-level and cristal movements in the Thames estuary, Essex and East Kent. In Bridgland, D.R., Allen, P. and Haggart, B.A. (Eds.) *The Quaternary of the lower reaches of the Thames: Field guide*. Quaternary Research Association, Durham, 99-106.

Munsell Color (2000) *Munsell soil color charts*. Munsell Color, New Windsor (NY).

National Grid (2013) Hinkley Point C Connection: specification for geoarchaeological watching brief and assessment. Unpublished document, National Grid.

Reineck, H.-E. and Singh, I.B. (1980) *Depositional sedimentary environments*. Second Edition. Springer Verlag, Berlin.

Rippon, S. (2000) The Romano-British exploitation of coastal wetlands:: survey and excavation on the North Somerset Levels, 1993-7. *Britannia* 31, 69-200.

Rippon, S. (2006) *Landscape, community and colonisation: the North Somerset Levels during the 1st to 2nd Millennia AD*. CBA Research Report 152, Council for British Archaeology, York.

Rockware (2012) RockWorks v15. http://www.rockware.com (Accessed 7 February 2013).

Troels-Smith, J. (1955) Characterisation of unconsolidated sediments. *Danmmarks Geologiske Undersøgelse* Raekke IV **3,** 38-73.

Tucker, M.E. (2011) *Sedimentary rocks in the field*. Fourth Edition. Wiley, Chichester.

Wilkinson, K.N. (1999) An investigation of Holocene peat and intertidal stratigraphy on Shapwick Heath, Somerset: preliminary results. *Archaeology in the Severn Estuary* **9**, 77-90.

Wilkinson, K.N. (2013) Hinkley Point C Connection: Phase 2 geoarchaeological works. Written scheme of investigation. Unpublished document, ARCA, Department of Archaeology, University of Winchester.

Wilkinson, K.N. and Bond, C.J. (2001) Interpreting archaeological site distribution in dynamic sedimentary environments. *One land, many landscapes: papers from a session held at the European Association of Archaeologists fifth annual meeting in Bournemouth 1999* (ed. by T.C. Darvill and M. Gojda), pp 55-66. British Archaeological Reports International Series 987, Oxford.

Wilkinson, K.N., Batchelor, C.R., Young, D., Athersuch, J. and Cameron, N. (2013) Willow Farm, Hallen: geoarchaeological and palaeoenvironmental assessment. Unpublished report 1112-19, ARCA, Department of Archaeology, University of Winchester.

Wilkinson, K.N., Batchelor, C.R., Athersuch, J., Banerjea, R., Cameron, N. and Watson, N. (2013) Willow Farm, Hallen: geoarchaeological and palaeoenvironmental analysis. Unpublished report 1213-5, ARCA, Department of Archaeology, University of Winchester.

Wilkinson, K.N. and Straker, V. (2008) Neolithic and Early Bronze Age environments in South-west England. In Webster, C.J. (ed.) *The archaeology of South-west England. South-west Archaeological Research Frameworks: resource assessment and research agenda.* Somerset County Council, Taunton, 63-74.

1.8 FIGURES

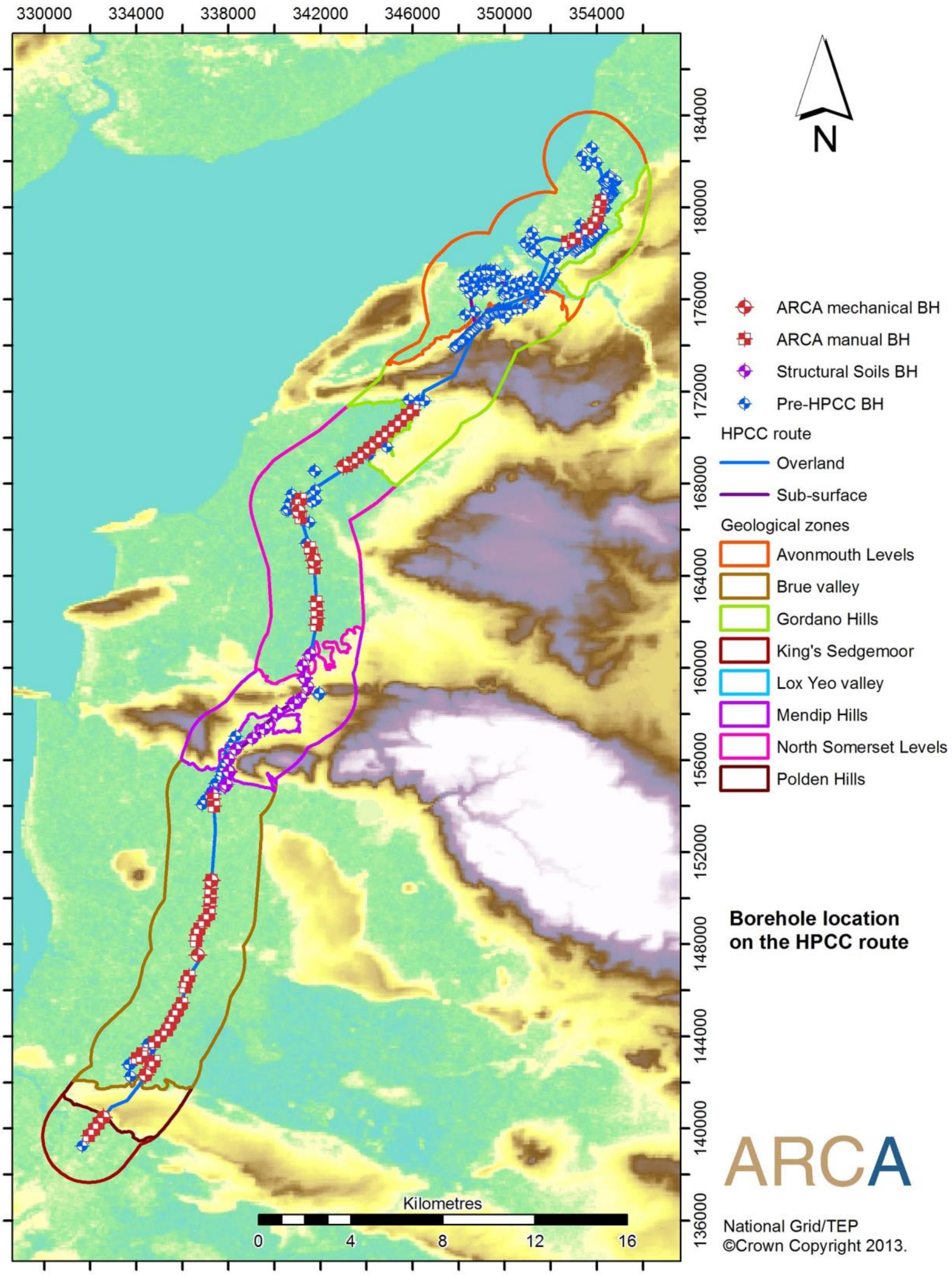

Figure 1. The HPCC route plotted against a Space shuttle Radar Tomography Mission (SRTM)-derived digital elevation model (DEM) showing the HPCC route, location of BGS boreholes and geological zones

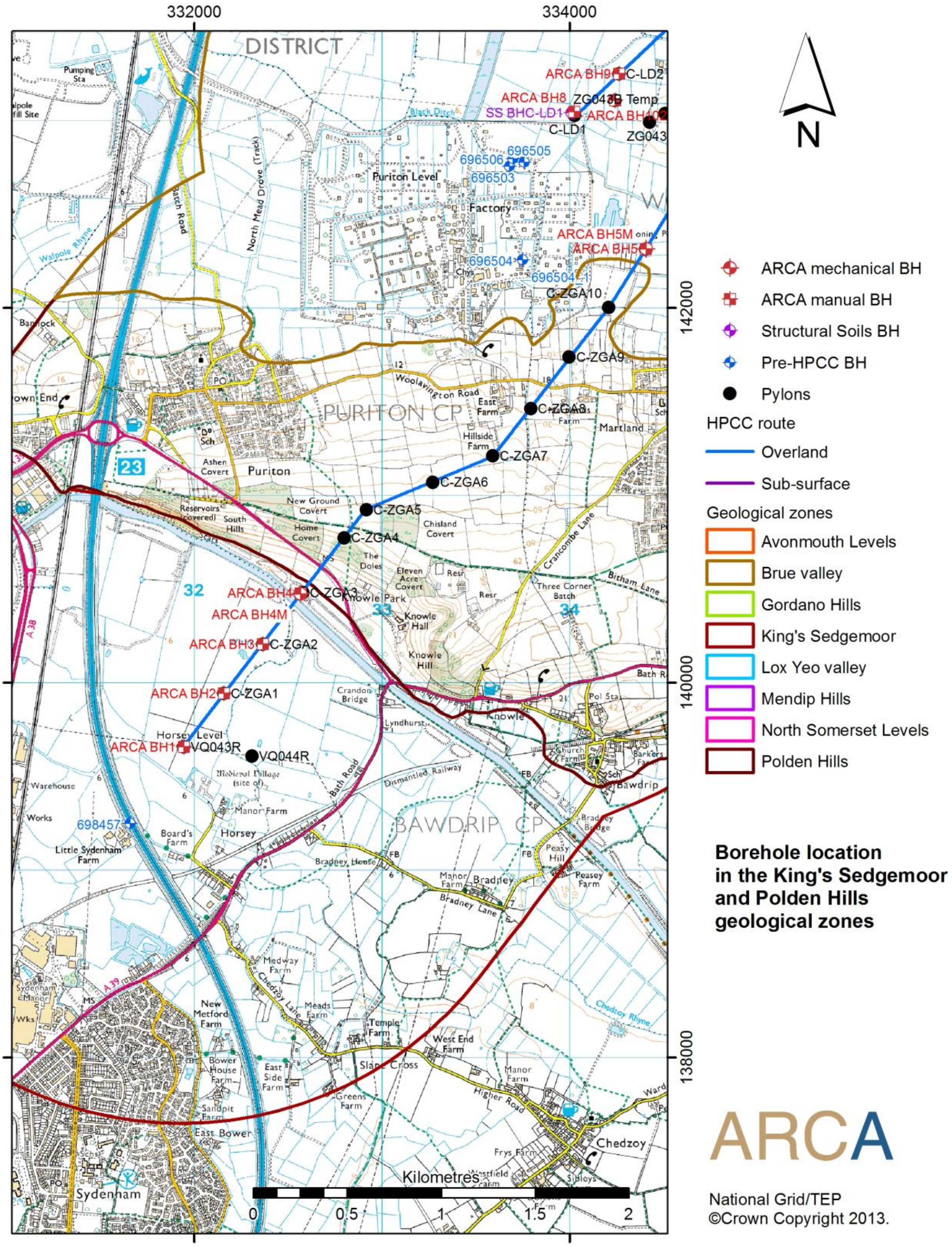

Figure 2. Location of ARCA and BGS-held boreholes in the King's Sedgemoor and Polden Hills geological zones

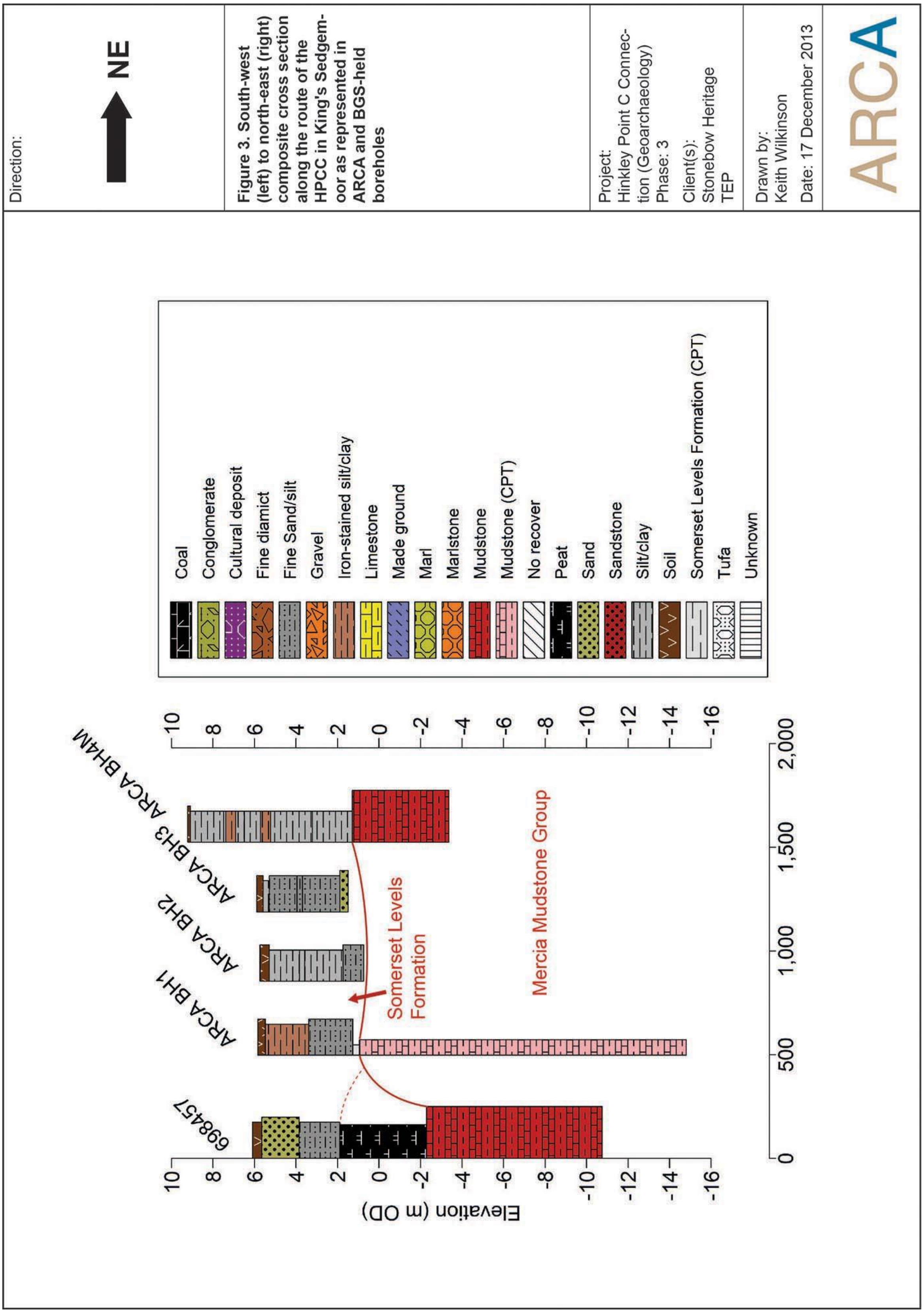

Figure 3. South-west (left) to north-east (right) composite cross section along the route of the HPCC in King's Sedgemoor as represented in ARCA and BGS-held boreholes

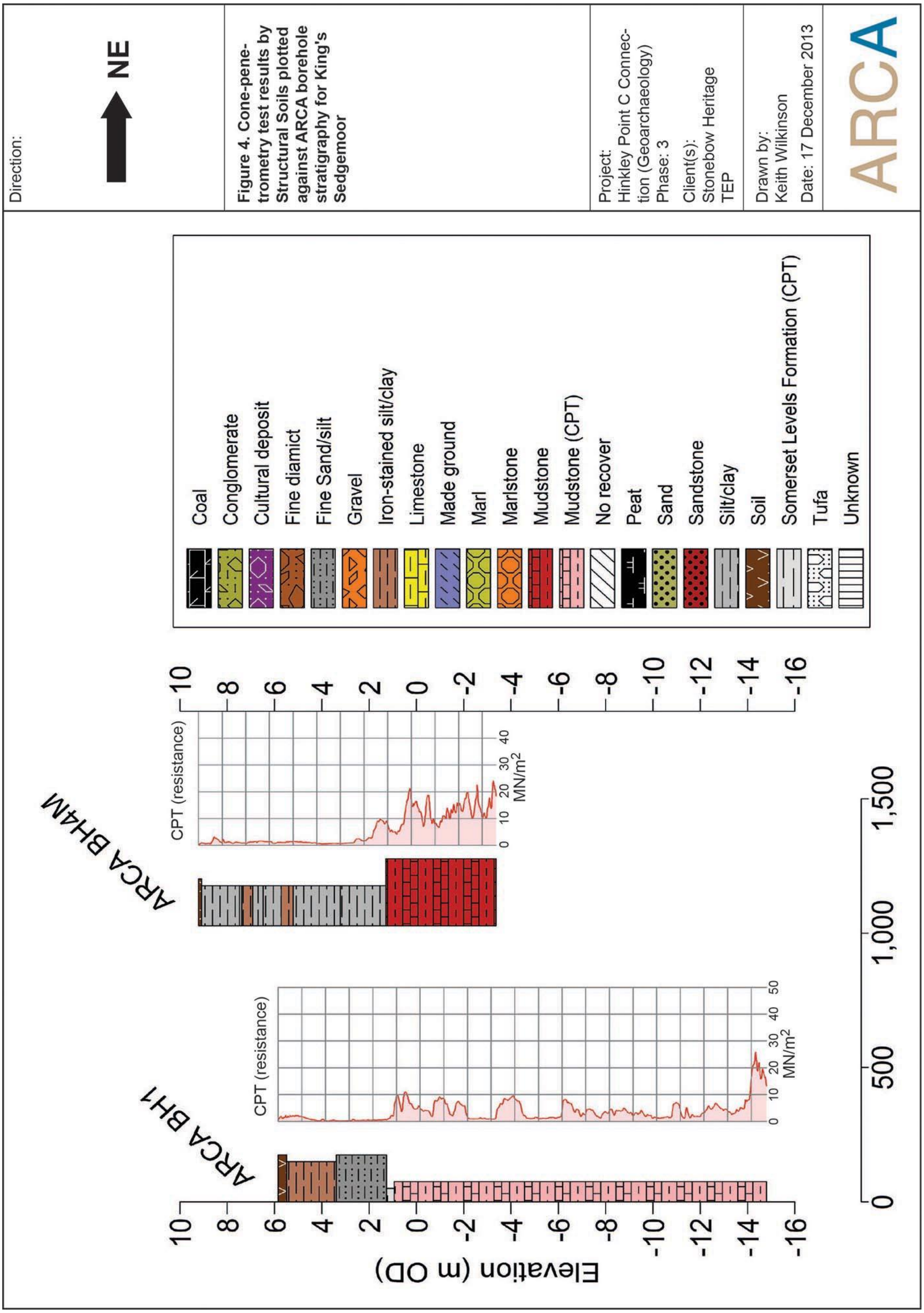

Figure 4. Cone-penetrometry test results by Structural Soils plotted against ARCA borehole stratigraphy for King's Sedgemoor

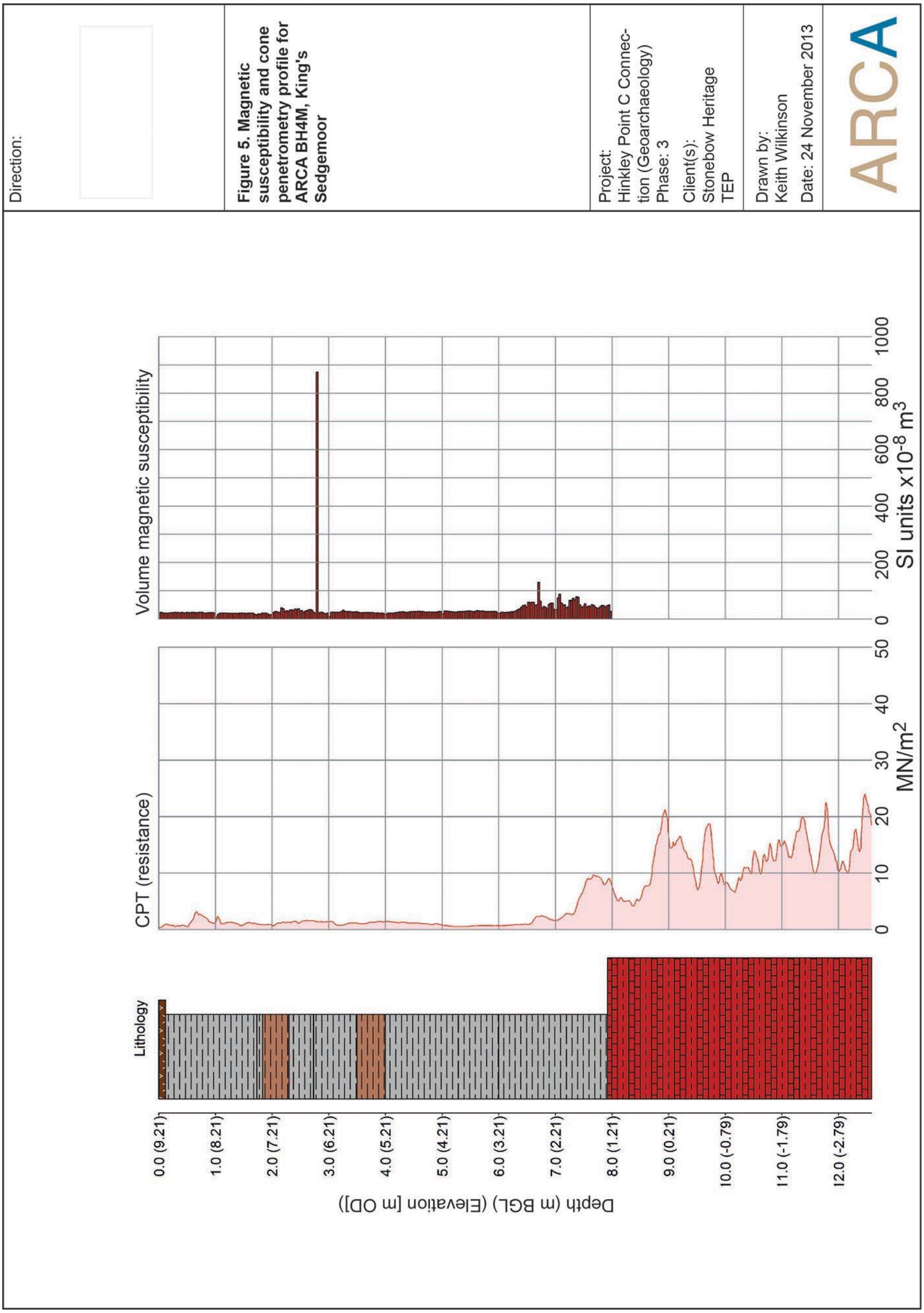

Figure 5. Magnetic susceptibility and cone penetrometry profile for ARCA BH4M, King's Sedgemoor

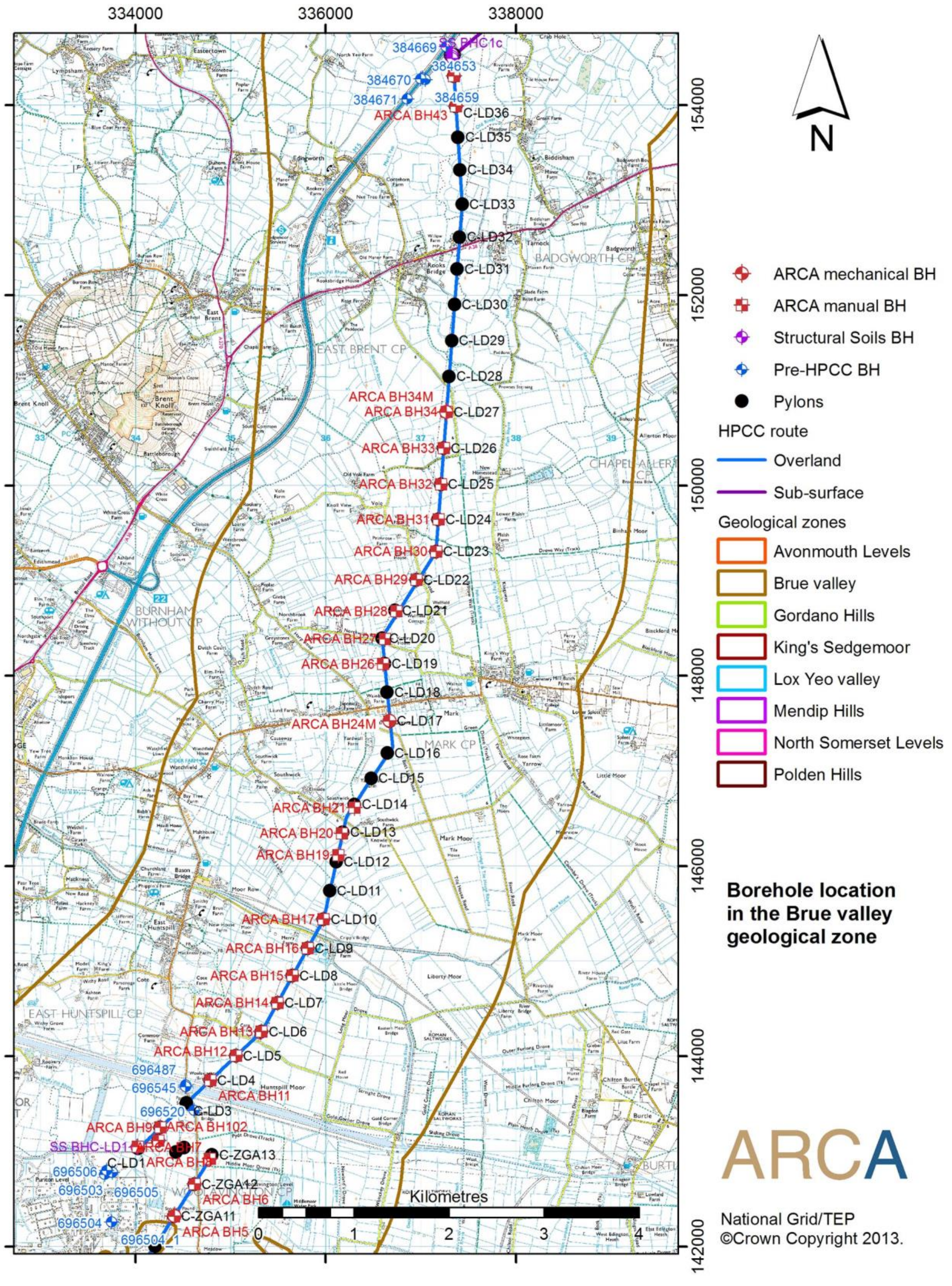

Figure 6. Location of ARCA, Structural Soils and BGS-held boreholes in the Brue valley geological zone

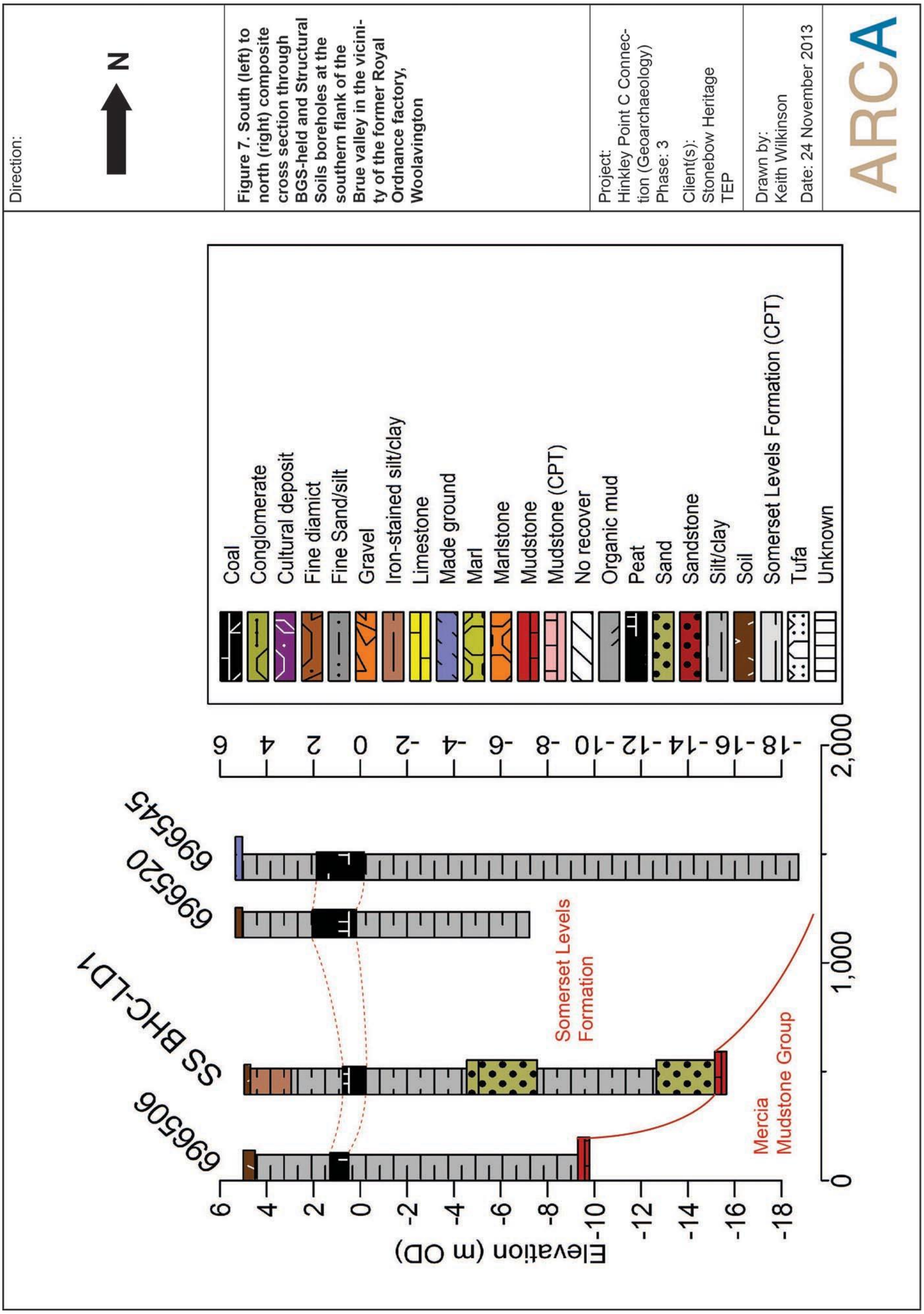

Figure 7. South (left) to north (right) composite cross section through BGS-held and Structural Soils boreholes at the southern flank of the Brue valley in the vicinity of the former Royal Ordnance factory, Woolavington

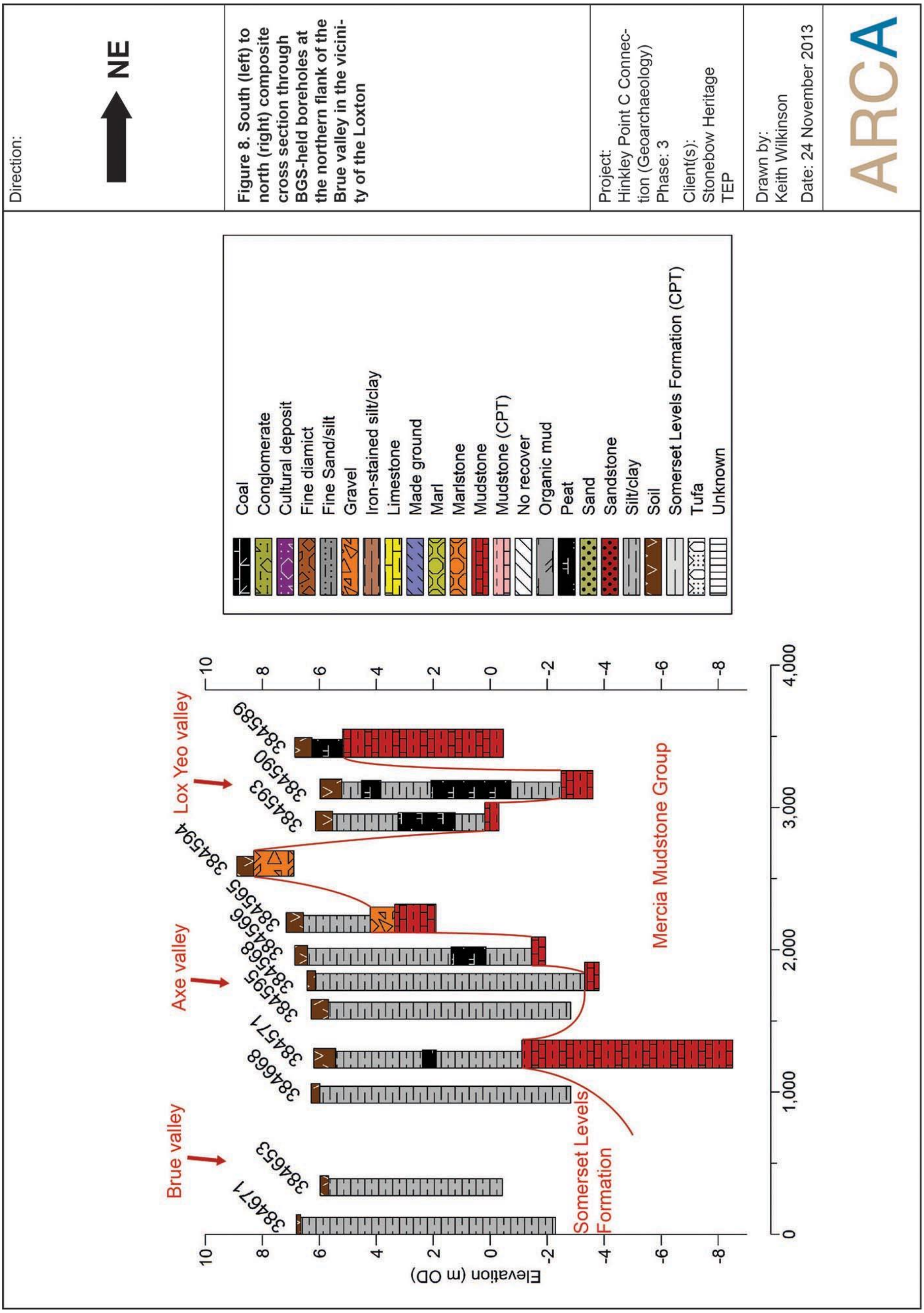

Figure 8. South (left) to north (right) composite cross section through BGS-held boreholes at the northern flank of the Brue valley in the vicinity of the Loxton

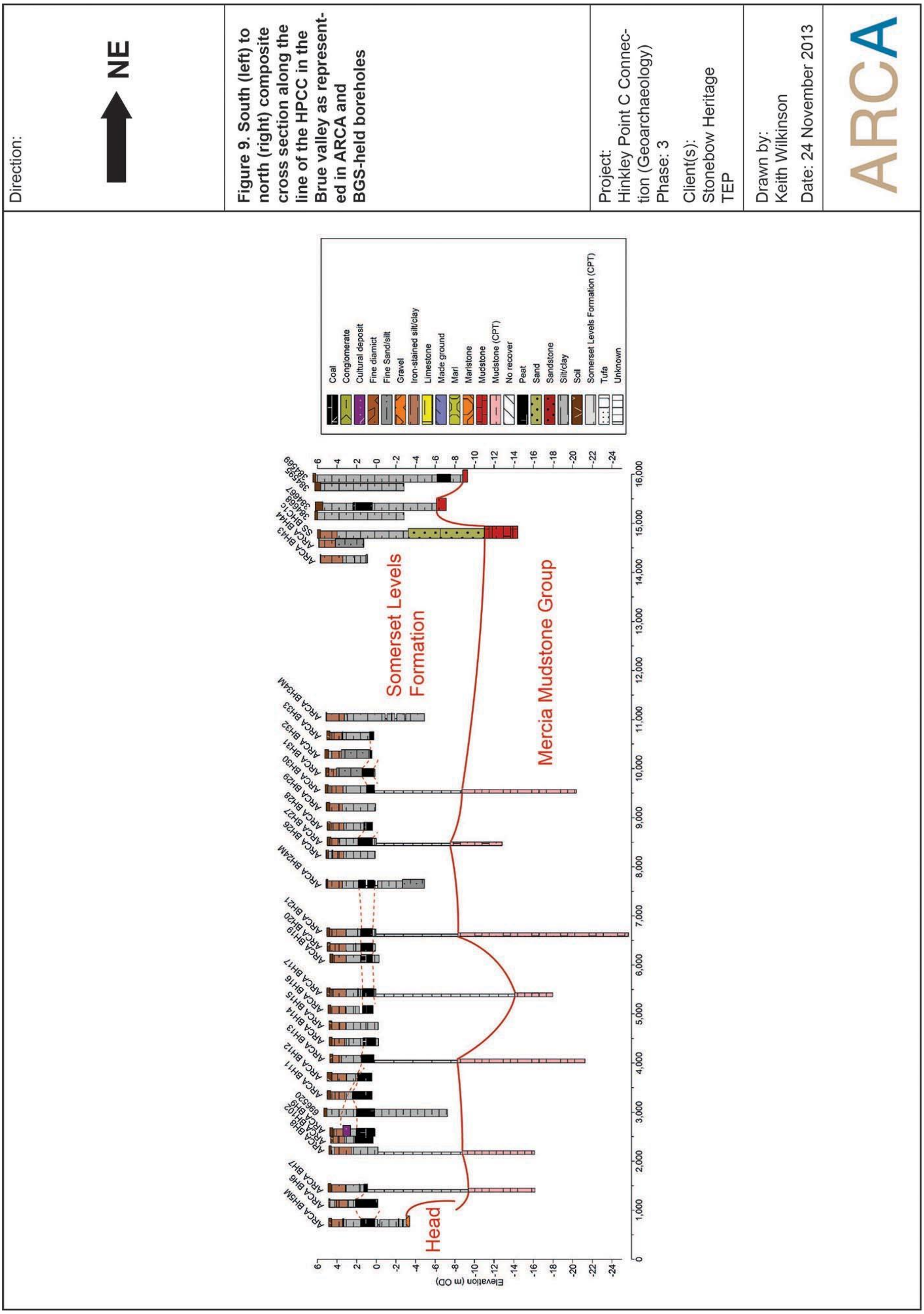

Figure 9. South (left) to north (right) composite cross section along the line of the HPCC in the Brue valley as represented in ARCA and BGS-held boreholes

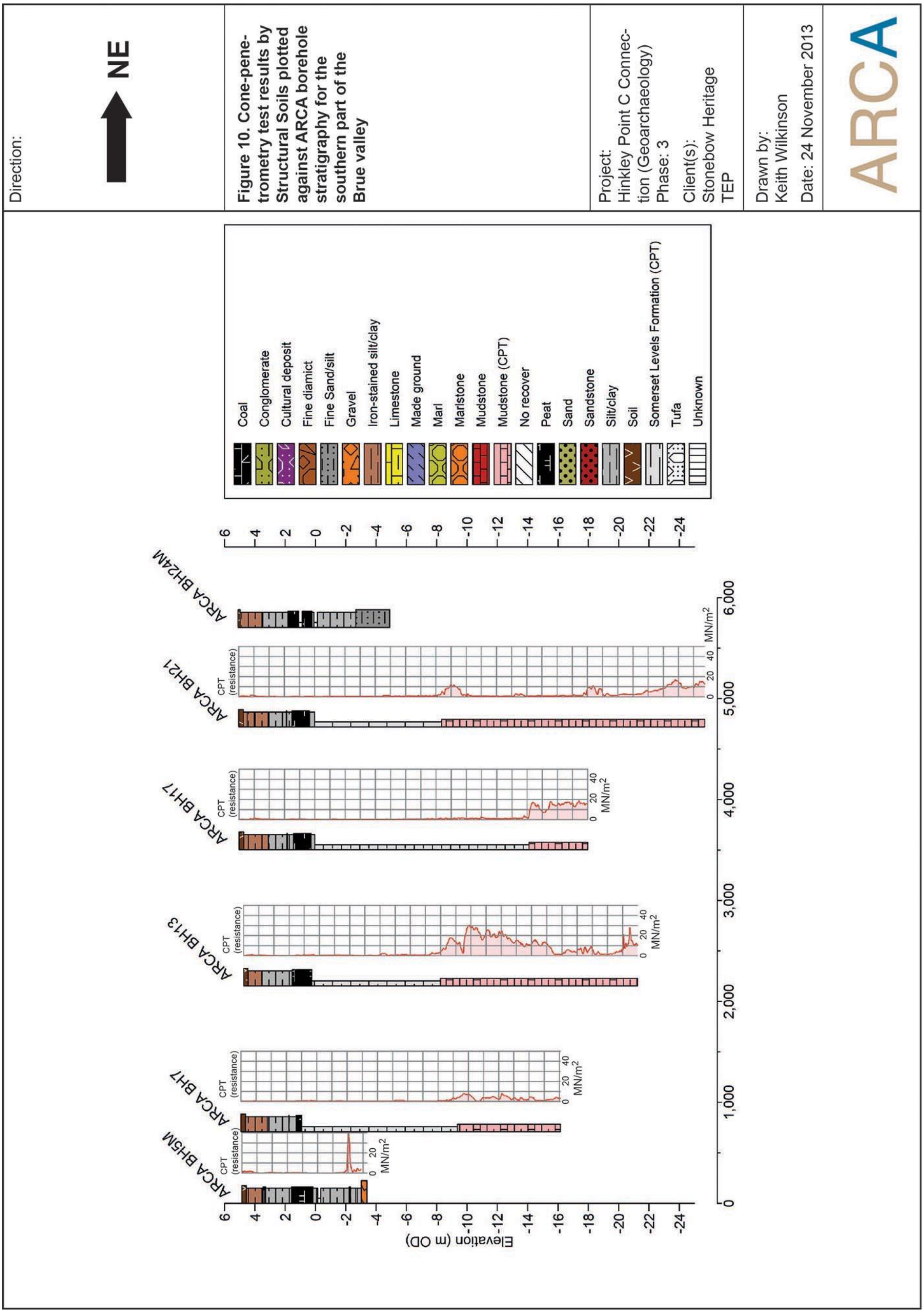

Figure 10. Cone-penetrometry test results by Structural Soils plotted against ARCA borehole stratigraphy for the southern part of the Brue valley

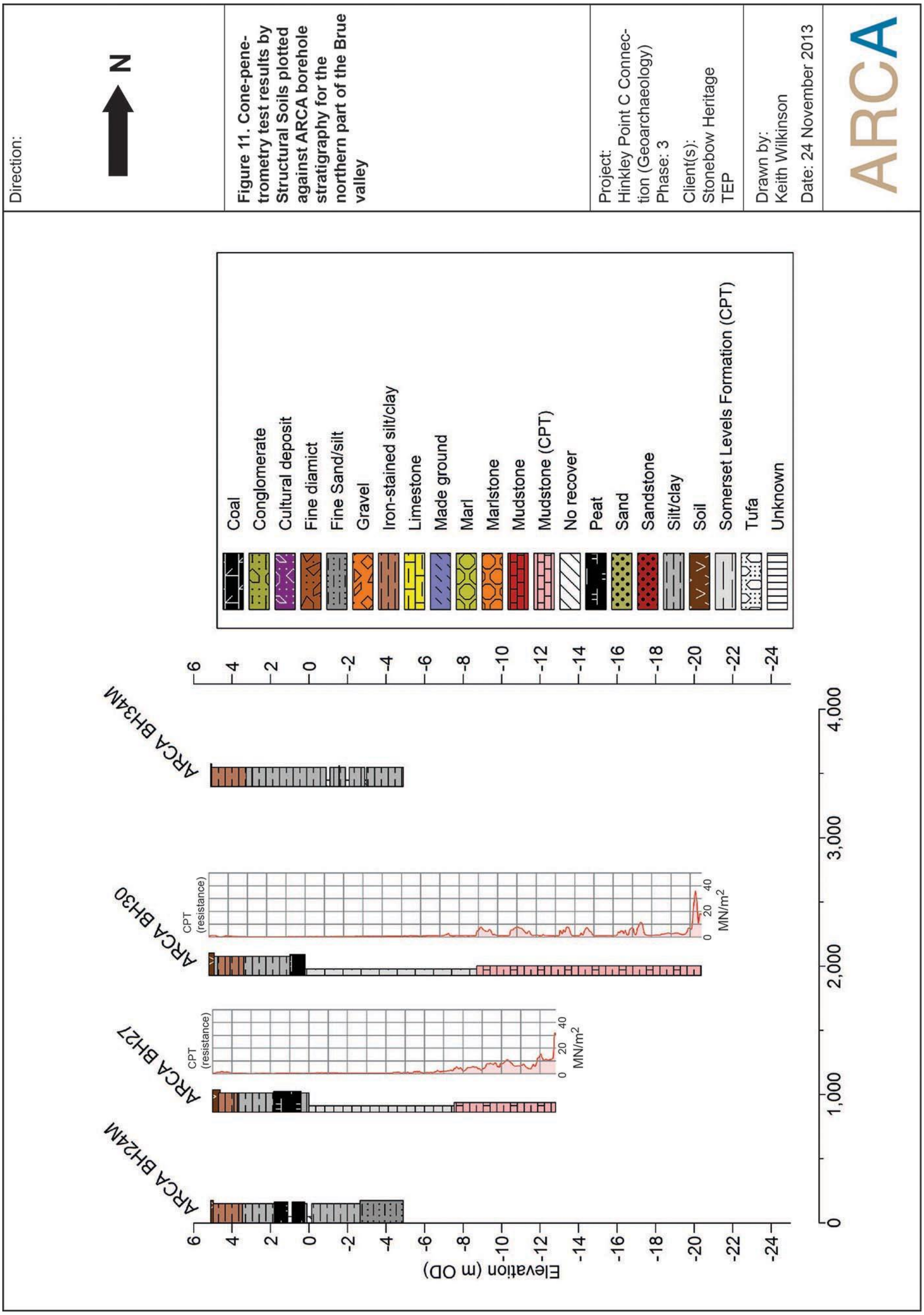

Figure 11. Cone-penetrometry test results by Structural Soils plotted against ARCA borehole stratigraphy for the northern part of the Brue valley

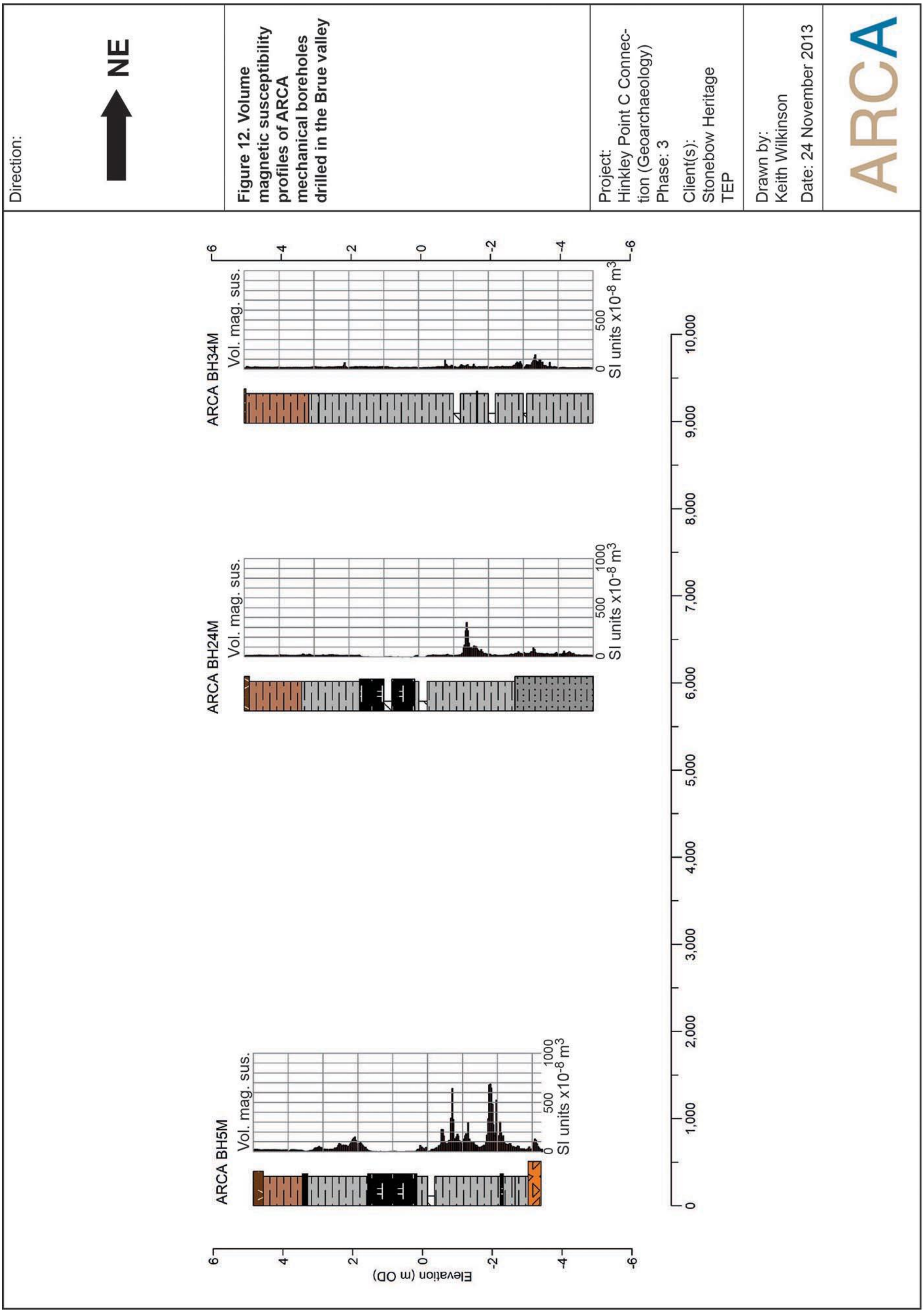

Figure 12. Volume magnetic susceptibility profiles of ARCA mechanical boreholes drilled in the Brue valley

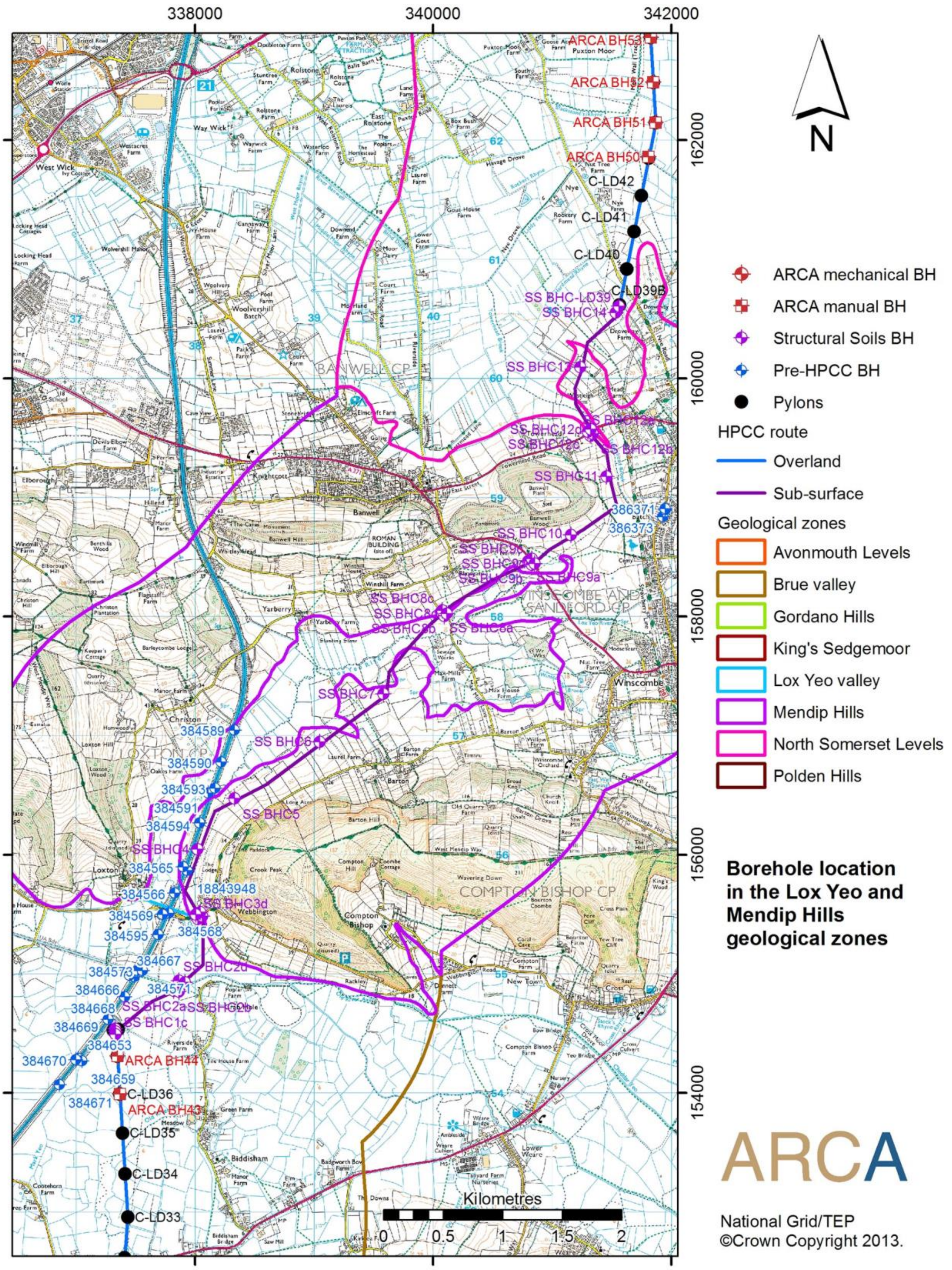

Figure 13. Location of Structural Soils and BGS-held boreholes in the Lox Yeo valley and Mendip Hills geological zones

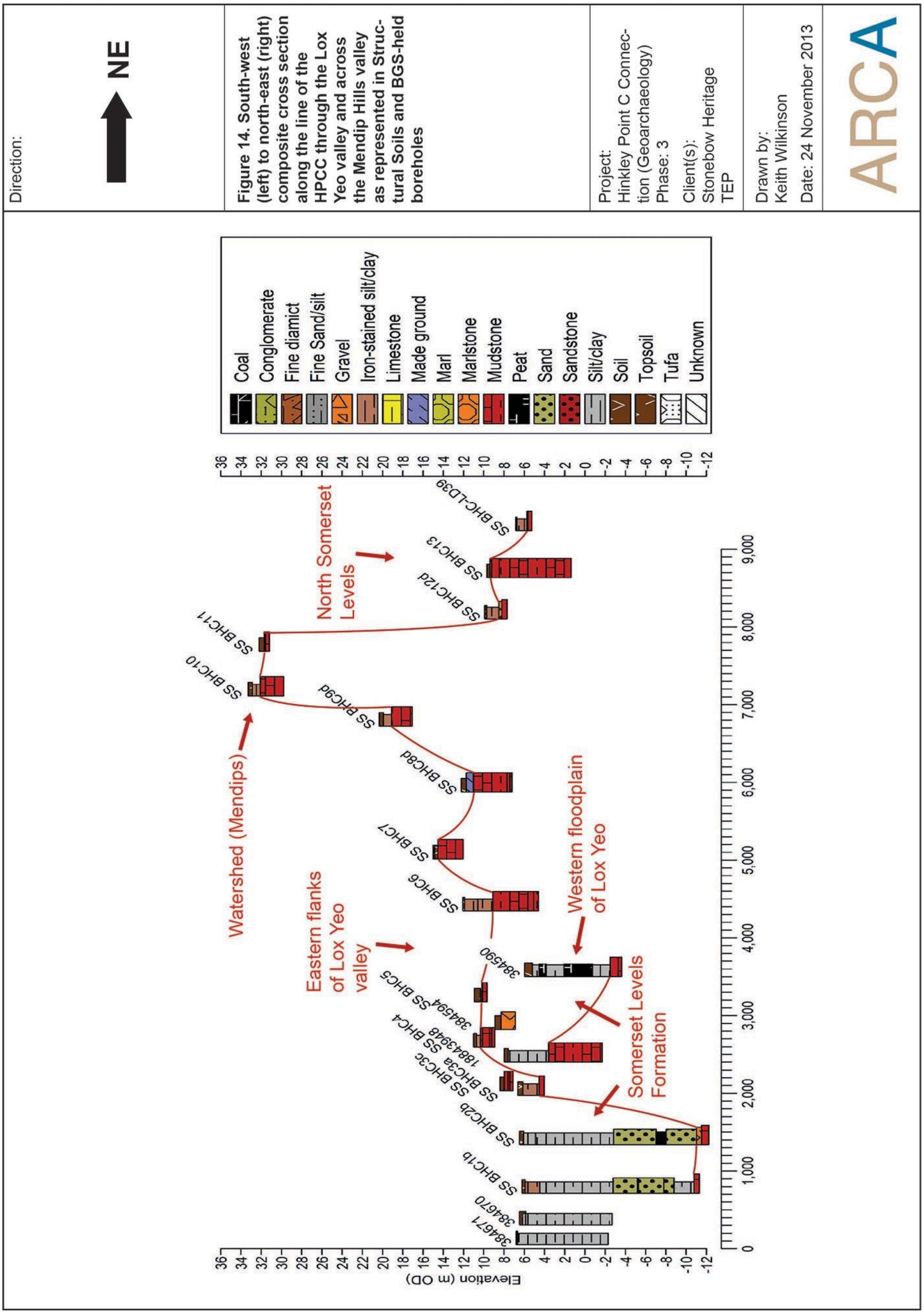

Figure 14. South-west (left) to north-east (right) composite cross section along the line of the HPCC through the Lox Yeo valley and across the Mendip Hills valley as represented in Structural Soils and BGS-held boreholes

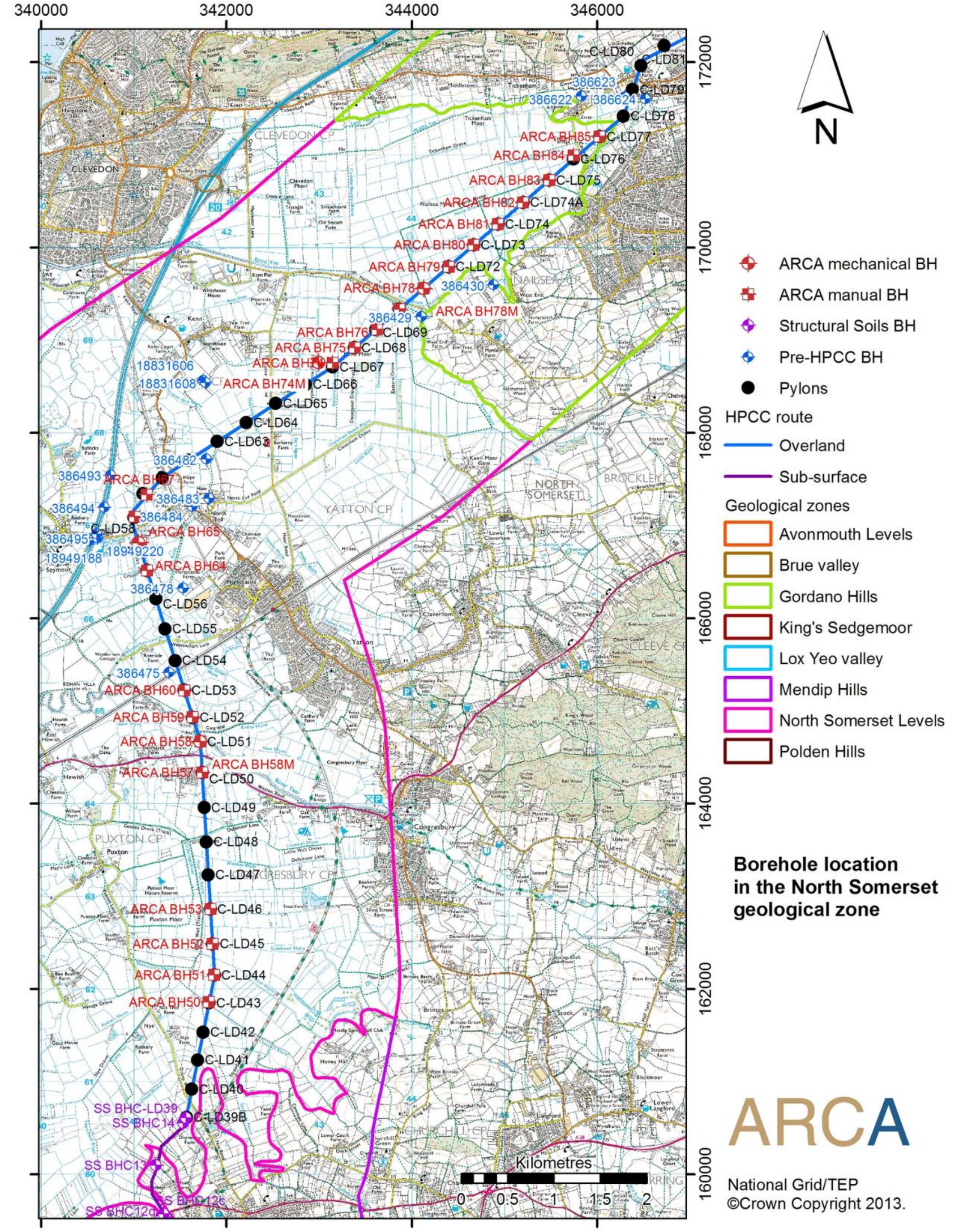

Figure 15. Location of ARCA, Structural Soils and BGS-held boreholes in the North Somerset Levels geological zone

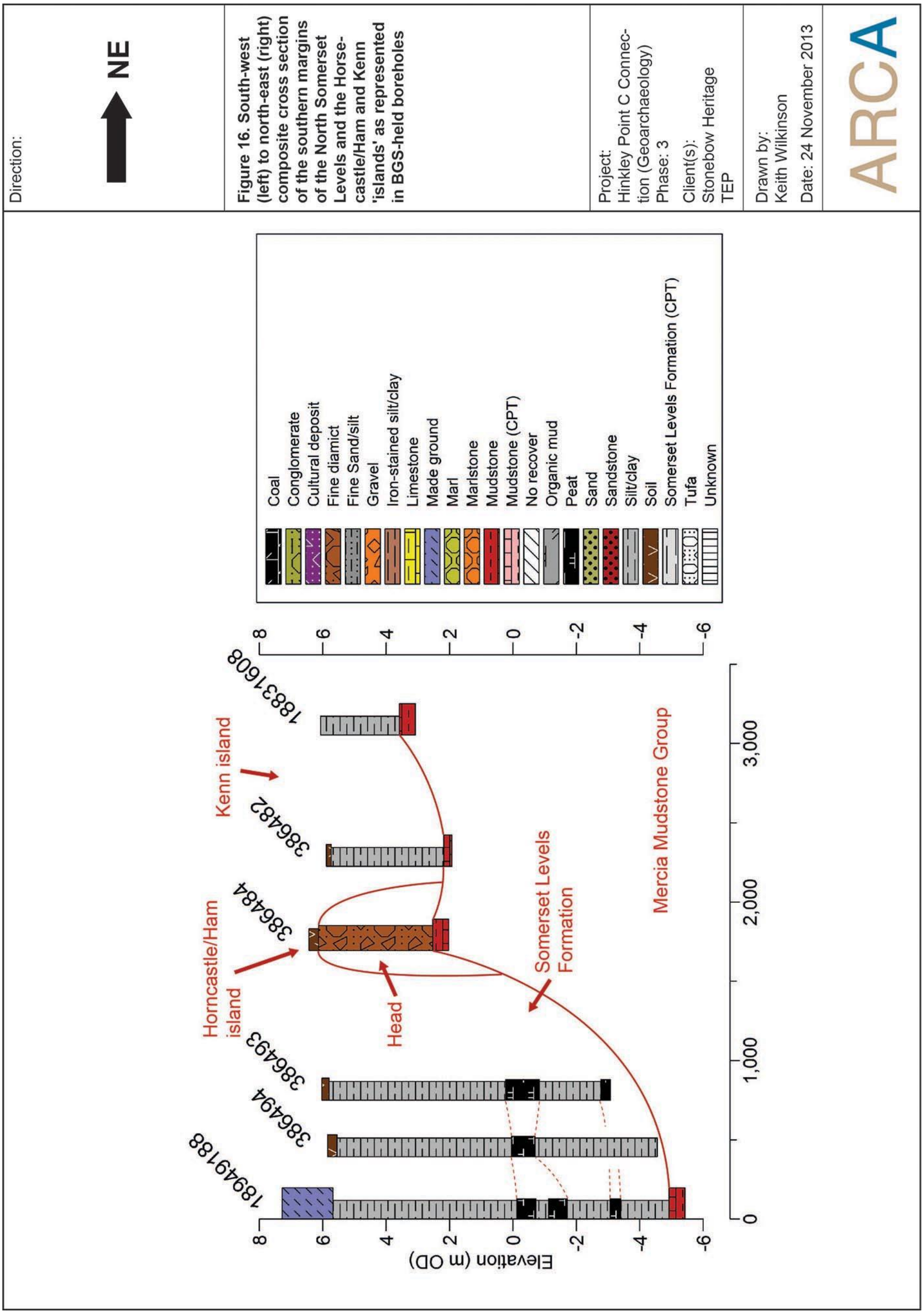

Figure 16. South-west (left) to north-east (right) composite cross section of the southern margins of the North Somerset Levels and the Horsecastle/Ham and Kenn 'islands' as represented in BGS-held boreholes

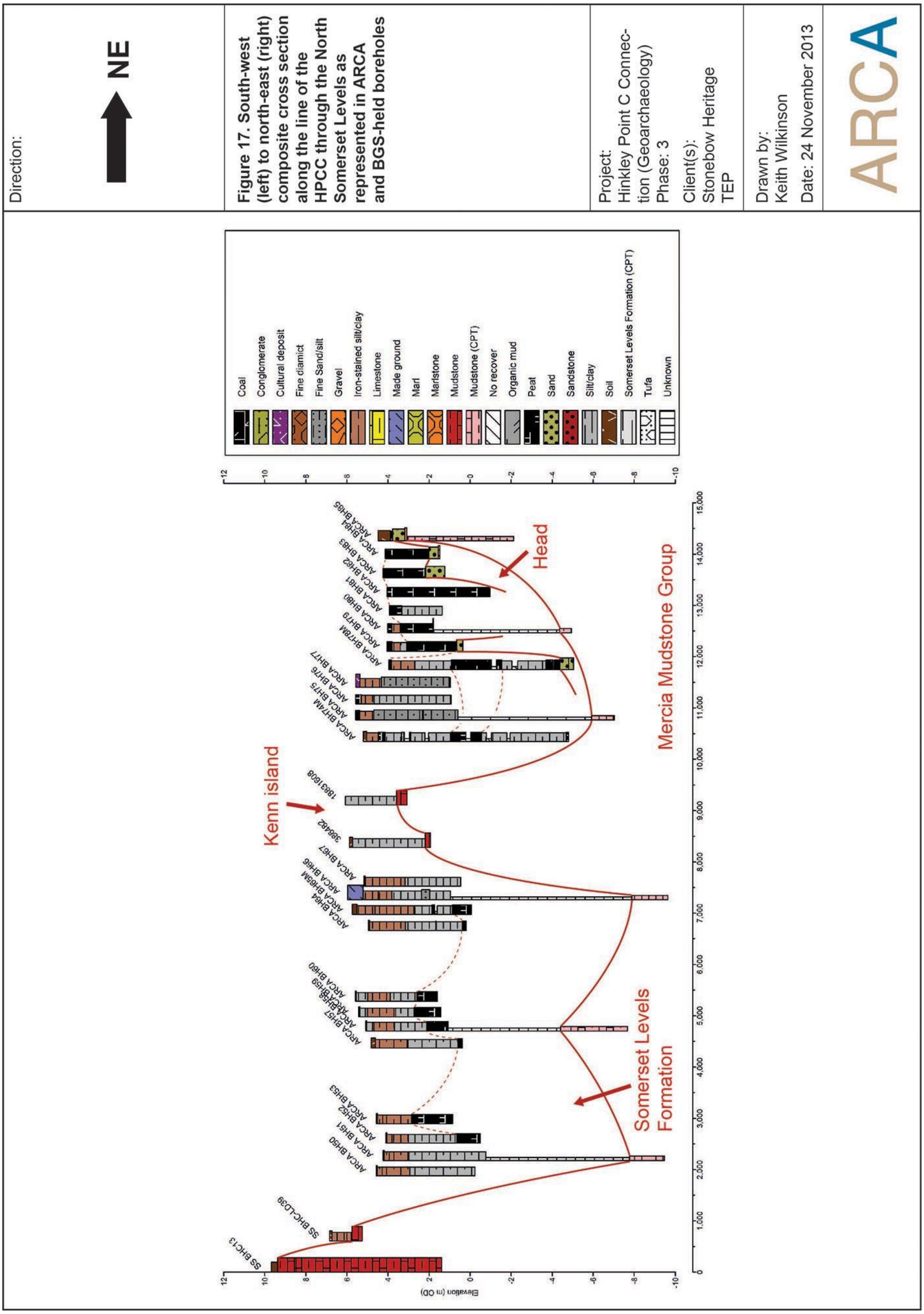

Figure 17. South-west (left) to north-east (right) composite cross section along the line of the HPCC through the North Somerset Levels as represented in ARCA and BGS-held boreholes

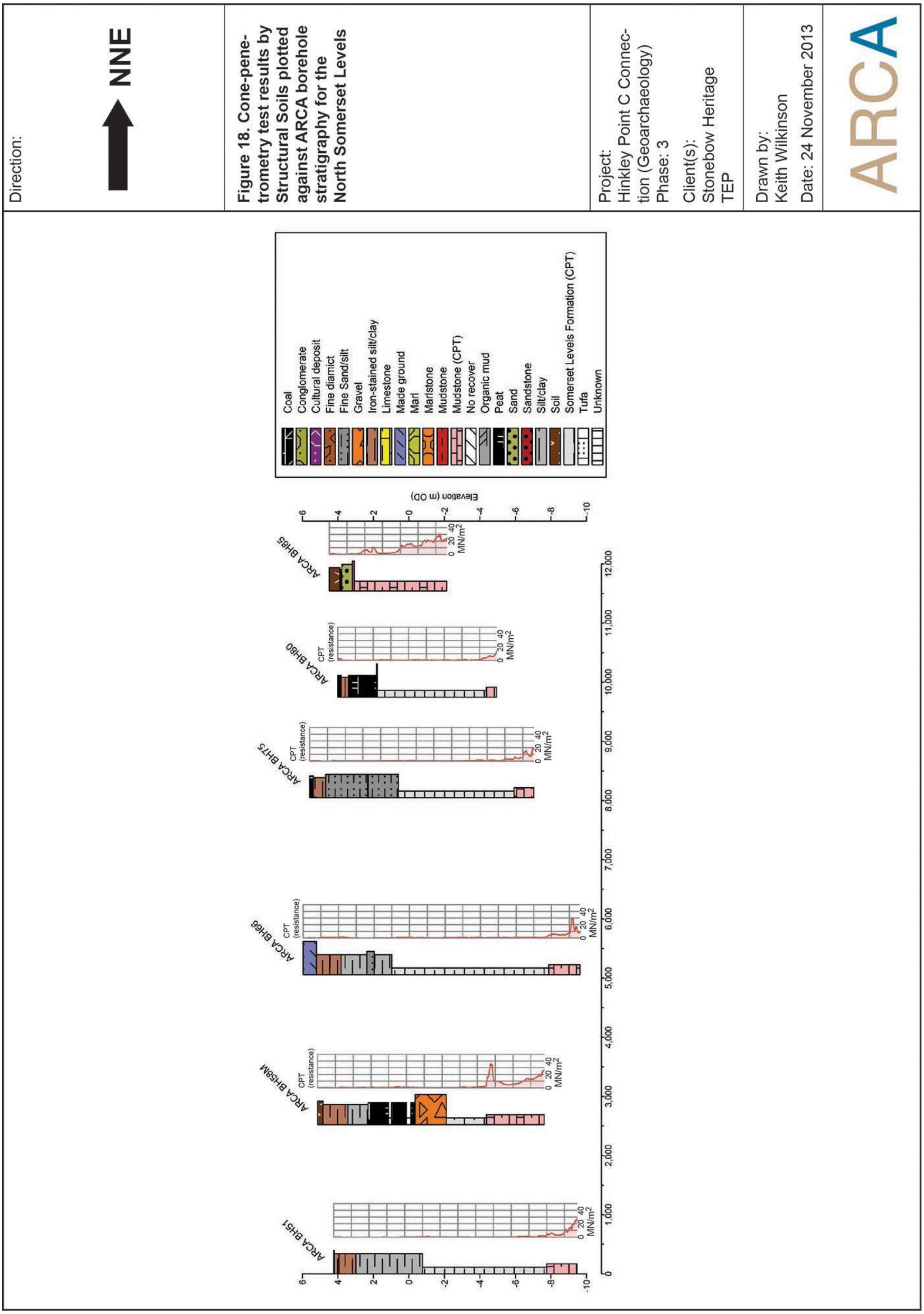

Figure 18. Cone-penetrometry test results by Structural Soils plotted against ARCA borehole stratigraphy for the North Somerset Levels

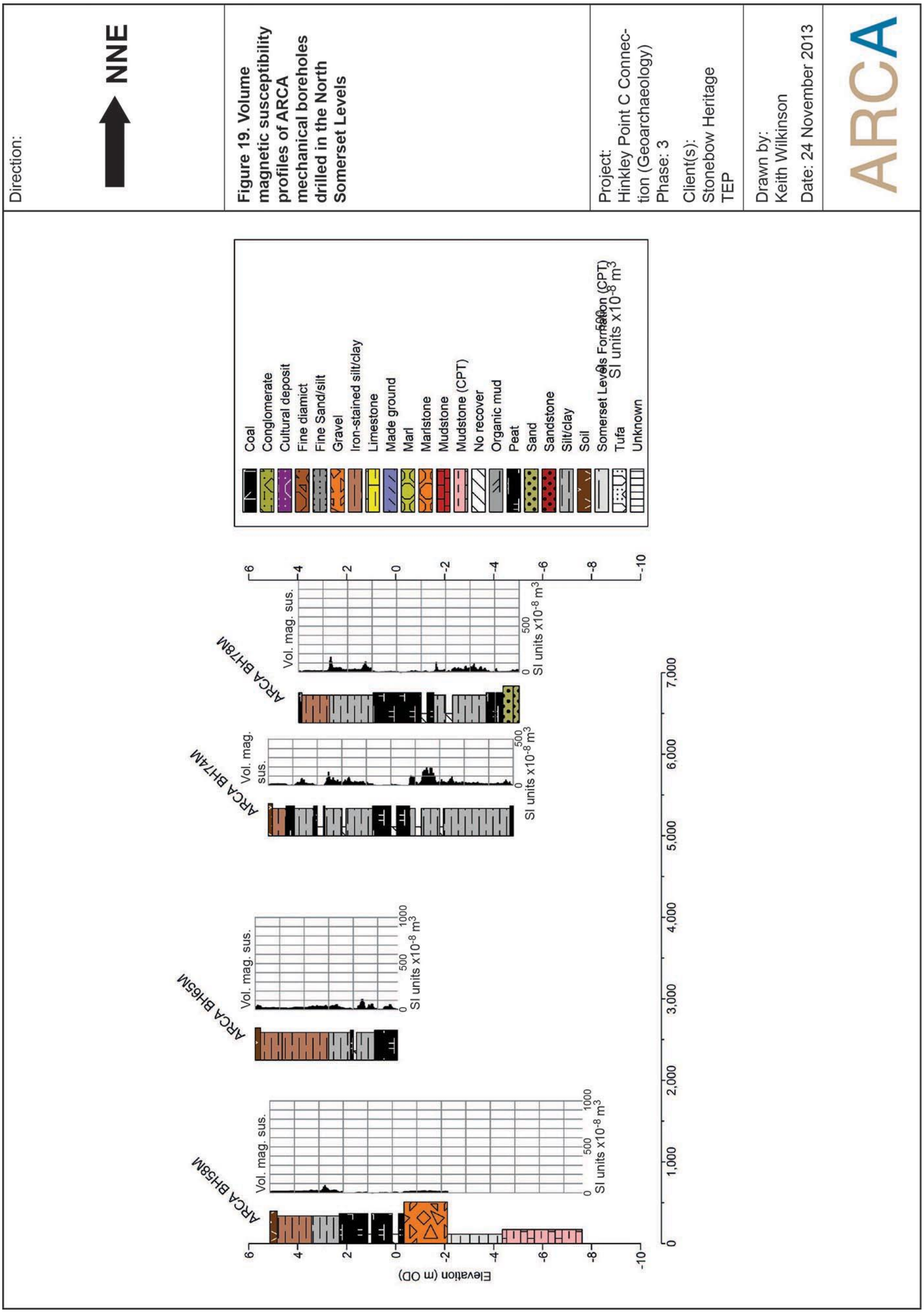

Figure 19. Volume magnetic susceptibility profiles of ARCA mechanical boreholes drilled in the North Somerset Levels

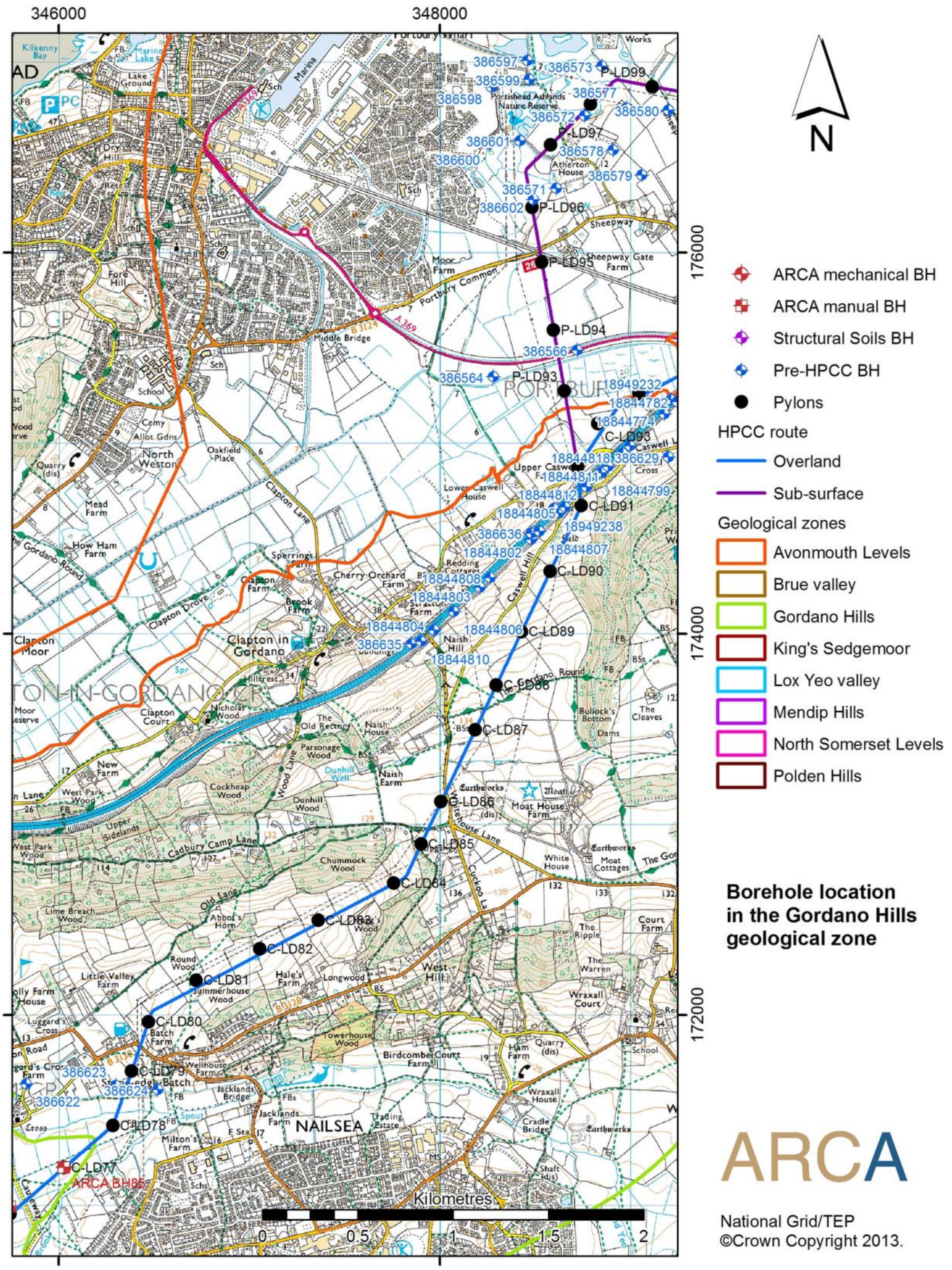

Figure 20. Location of Structural Soils and BGS-held boreholes in the Gordano Hills geological zone

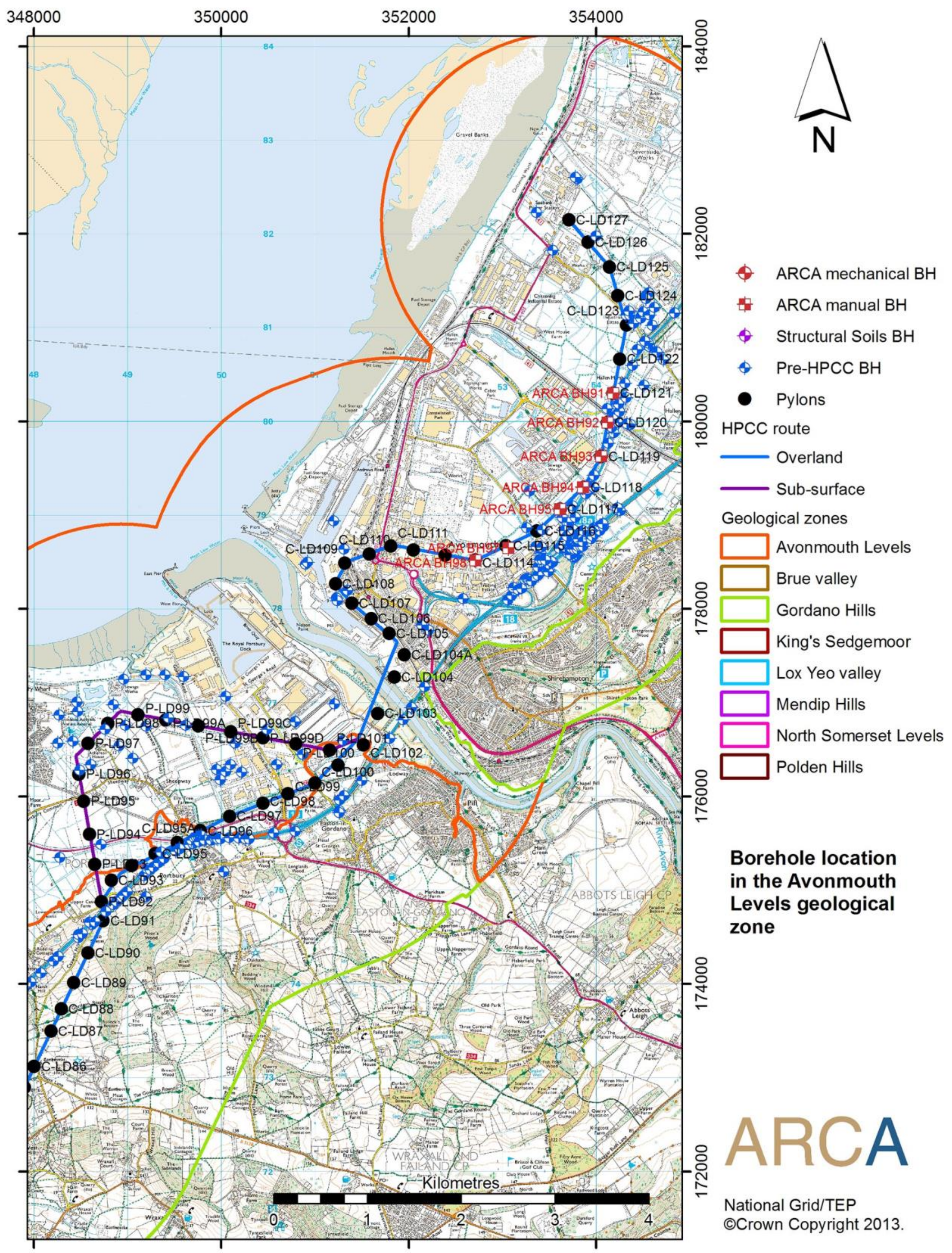

Figure 21. Location of ARCA and BGS-held boreholes in the Avonmouth Levels geological zone

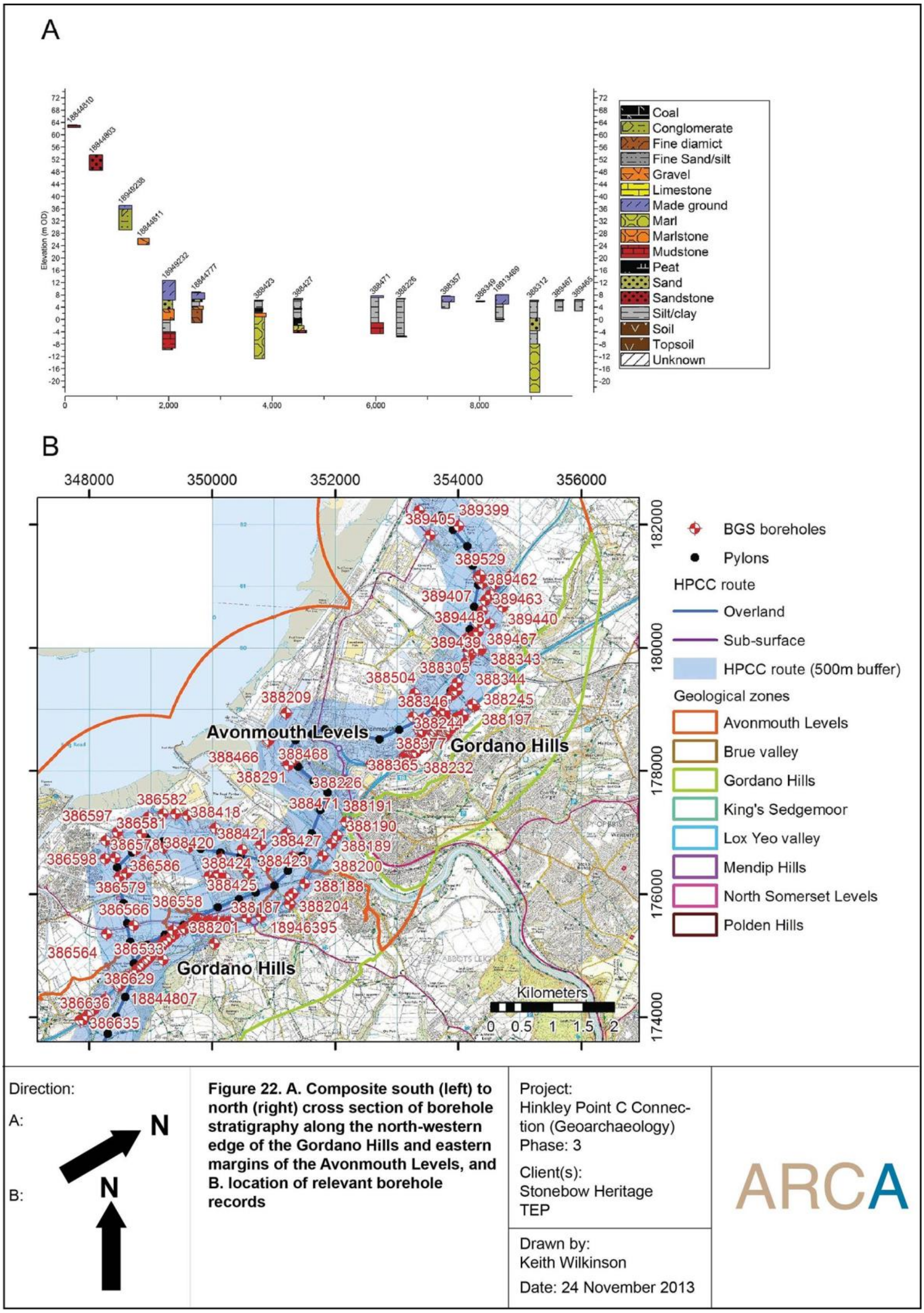

Figure 22. a. Composite south-west (left) to north-east (right) cross section of borehole stratigraphy along the north-western edge of the Gordano Hills and eastern margins of the Avonmouth Levels, and b. location of relevant borehole records

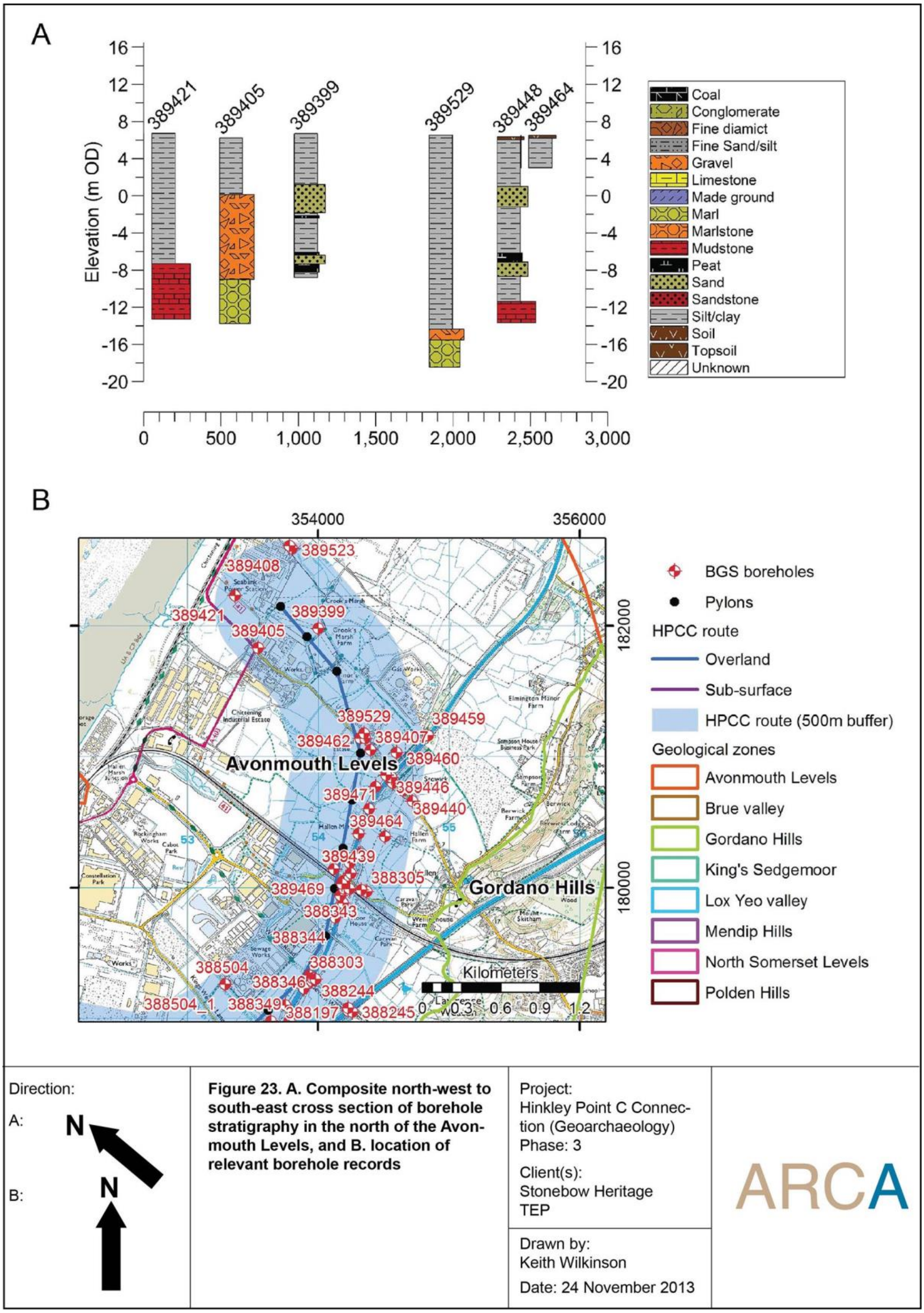

Figure 23. A. Composite north-west to south-east cross section of borehole stratigraphy in the north of the Avonmouth Levels, and B. location of relevant borehole records

Figure 23. a. Composite north-west to south-east cross section of borehole stratigraphy in the north of the Avonmouth Levels, and b. location of relevant borehole records

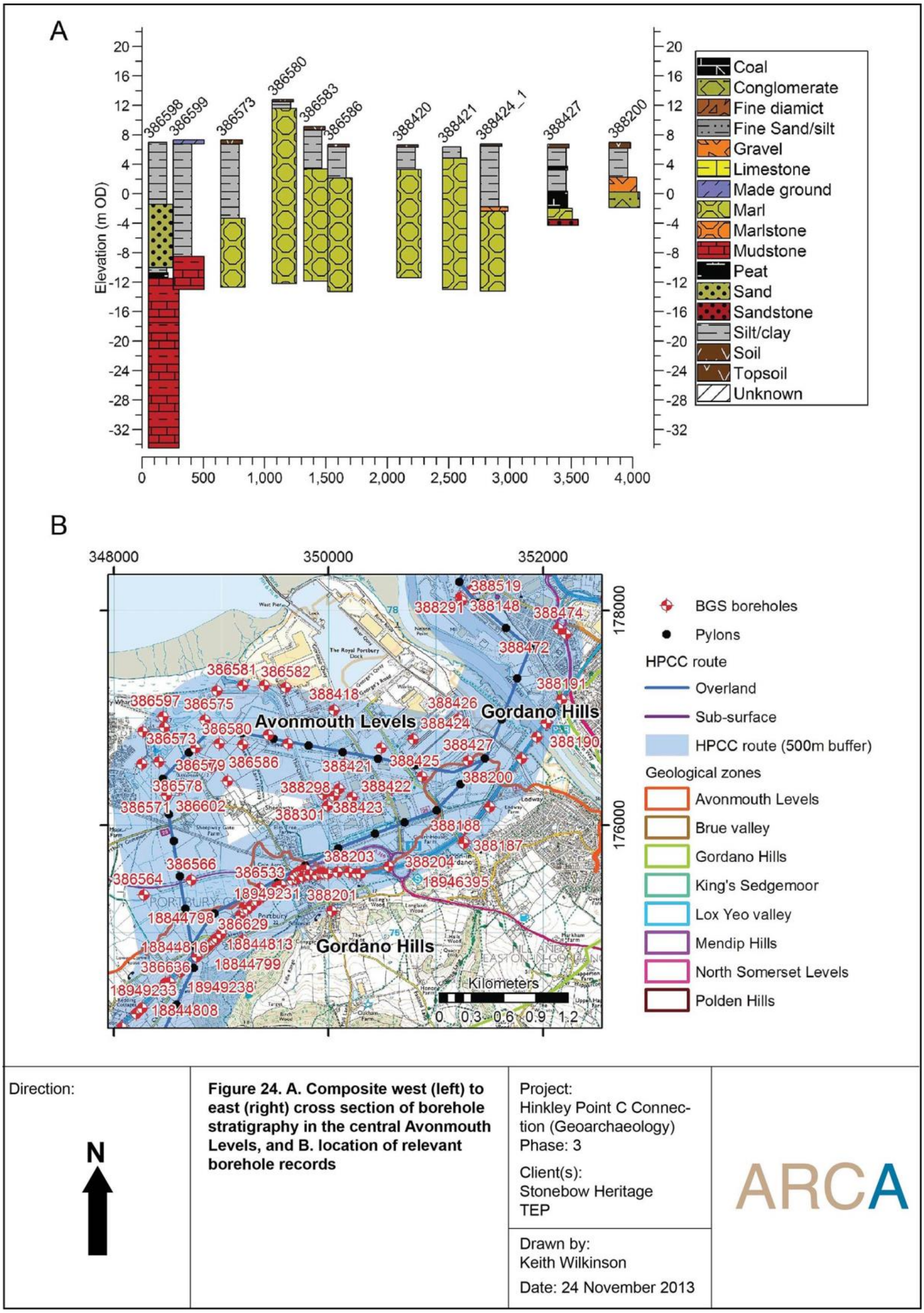

Figure 24. a. Composite west (left) to east (right) cross section of borehole stratigraphy in the central Avonmouth Levels, and b. location of relevant borehole records

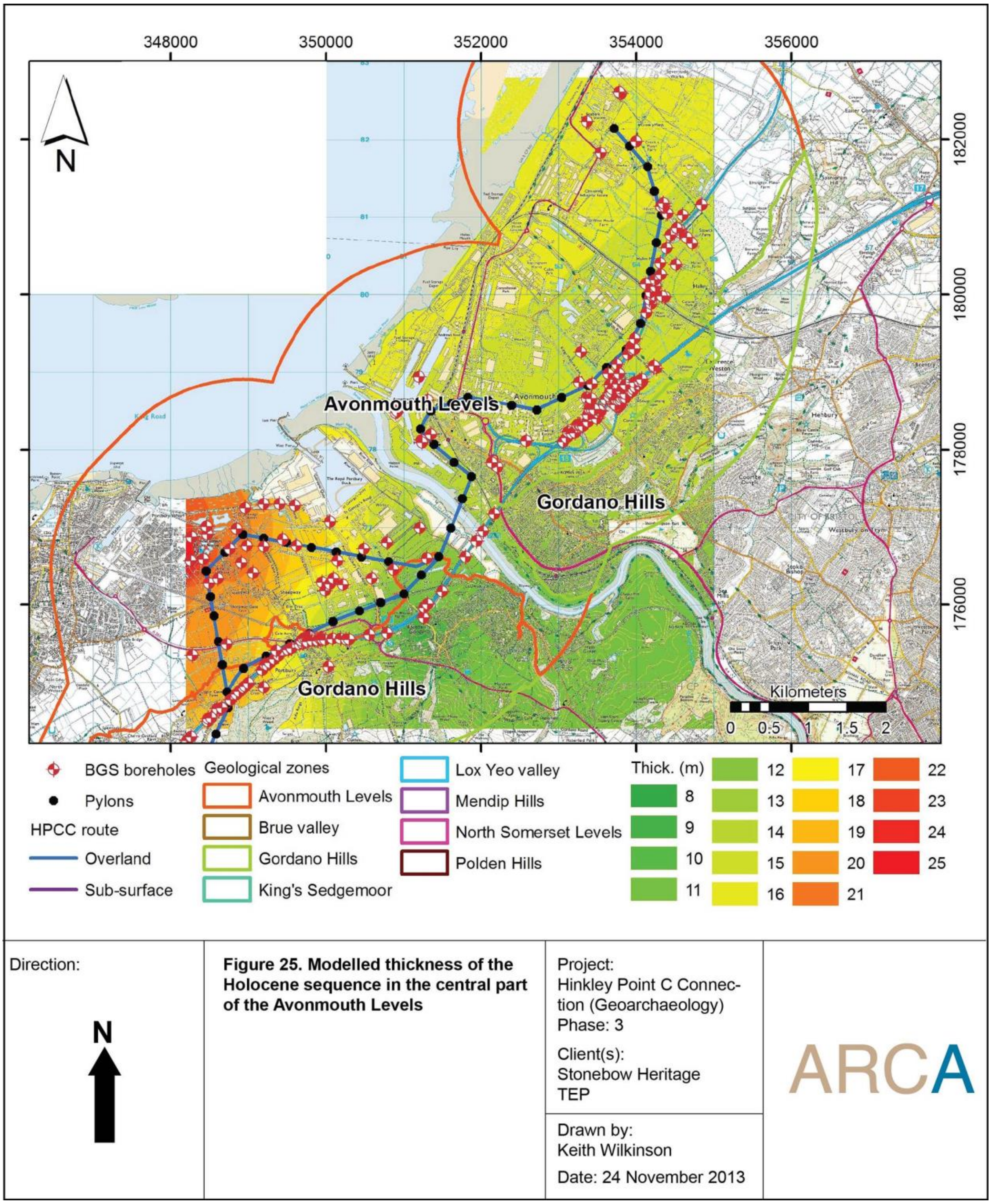

Figure 25. Modelled thickness of the Holocene sequence in the central part of the Avonmouth Levels

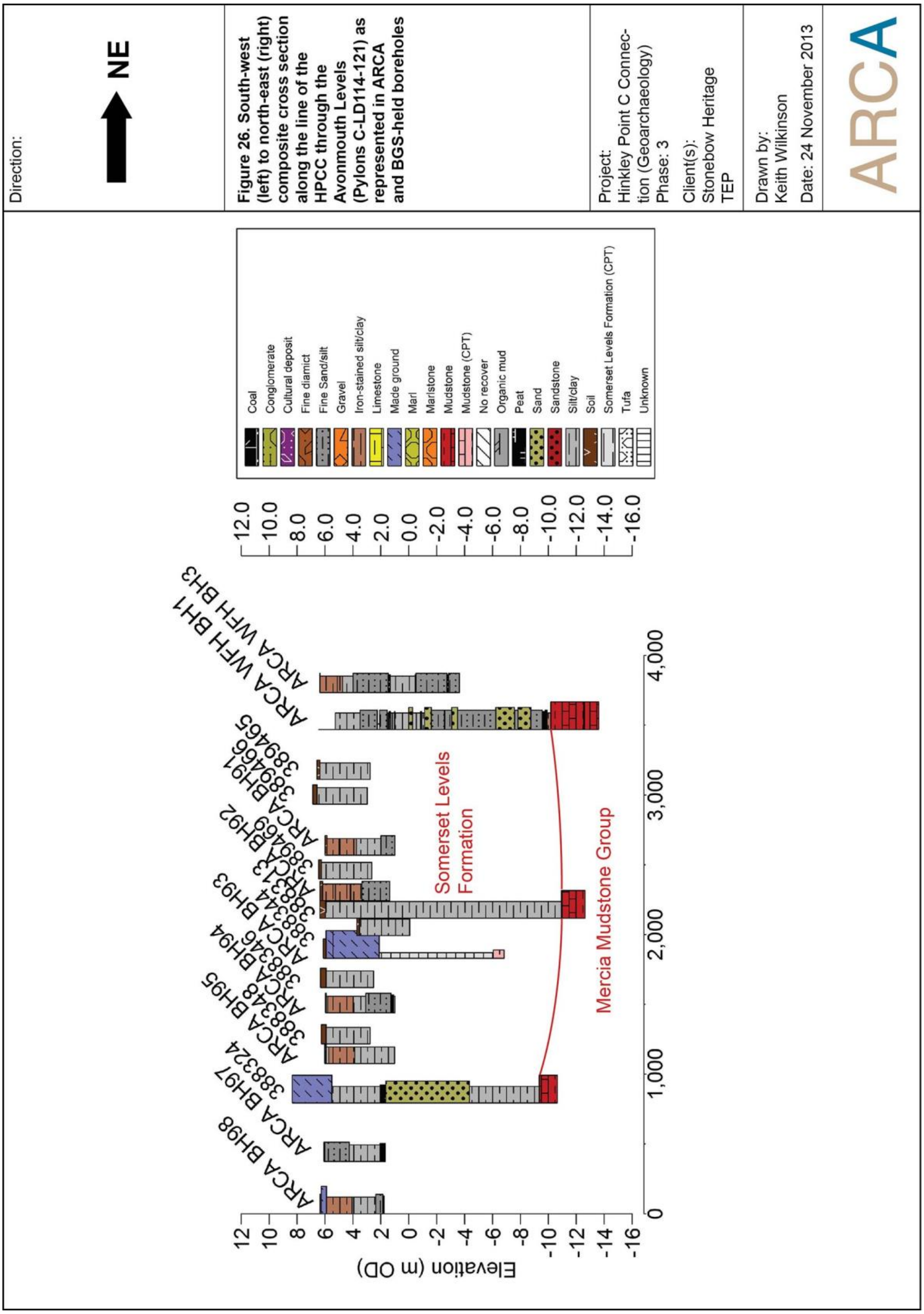

Figure 26. South-west (left) to north-east (right) composite cross section along the line of the HPCC through the Avonmouth Levels (Pylons C-LD114-121) as represented in ARCA and BGS-held boreholes