1EW02 Enabling Works – Area South

Project Plan for archaeological fieldwork at the Copthall cutting for the Affinity Water main diversion (route 1b)

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CSjv Review and Acceptance Decal

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☒	Code A. Accepted. Work may proceed.
☐	Code B. Not Accepted. Revise and resubmit. Work may proceed following incorporation of changes indicated.
☐	Code C. Not Accepted. Revise and resubmit. Work may not proceed.
☐	Code D. Received for information only. Receipt is confirmed.

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1 Introduction

1.1.1 **The final and full scope for the groundworks and a confirmed easement for the Affinity Water Main Diversion has not been finalised and is subject to revision by Affinity Water. This Archaeological Project Plan and attached trenching plan (1EW02-CSJ-EV-PLN-S002-000032) along with the LS-WSI (1EW02-CSJ-EV-PRO-S002-000003) are therefore provisional and will be subject to revision following final confirmation of the proposed groundworks and easement by Affinity Water.**

1.1.2 **The revisions to this Archaeological Project Plan and attached trenching plan (1EW02-CSJ-EV-PLN-S002-000032) along with the LS-WSI (1EW02-CSJ-EV-PRO-S002-000003) will reflect any subsequent changes to the Affinity ground works, method statement and easement. The trenching strategy is currently 3% with a 1% contingency should features of significant interest be encountered across the existing easement. Should the size of the easement increase, there will be a commensurate increase in the archaeological trenching strategy and associated works to reflect this increase in scope. This may require further approvals from HS2.**

1.1.3 This Project Plan (PP) details proposed methodologies, techniques and deliverables for archaeological trial trenching at Copthall cutting for the Affinity Water main diversion (route 1b) (Fig 1). The land is subject to an HS2 2017 construction land requirement CR00069 and lies within the following design elements:

- National Grid Harefield to Southall gas main (covered in PP: Harefield to Southall 1200NB HP Pipeline diversion, Ref: 1EW02-CSJ-EV-PLN-S002-000001)
- Affinity Water Copthall Cutting

1.1.4 The available area for evaluation is c.3 ha. The water main diversion (route 1b) connects with the original water main in fields to the west of Copthill Farm, south of Copthall Covert and extends eastwards to the south of Breakspear Farm. It passes below Breakspear Road South and extends northwards on the western side of Breakspear Road South across rough grassland adjacent to the River Pinn. The proposed route will be directionally drilled beneath the Chiltern Line and its crossing beneath the Breakspear Road South, and then continue across fields to the west of Breakspear Road South before reconnecting with the existing water main to the west of the existing Pumping Station. (Fig. 1).

1.1.5 The Ground Investigations (GI), haul road and compound works proposals were assessed and it was determined that there was no requirement for archaeological investigation of these development components.

1.1.6 The archaeological evaluation is required to assess the archaeological potential of the route, as the water main would have the potential to truncate known archaeological sites within the River Pinn valley and/or remove any archaeological remains which may be present within its footprint. The results of the archaeological evaluation will inform any required further

mitigation (archaeological excavation and/or construction integrated recording alongside the main groundworks).

1.1.7 The trial trenching will identify the location, extent, survival and significance of any heritage assets within the Site and it will contribute to the following specific objectives:

- KC5: Identifying settlement location and developing models for settlement patterns for the Mesolithic, Neolithic and Early Bronze Age.
- KC11: Does the high density of prehistoric settlement evidence in the Colne Valley reflect a genuine focus of activity or does it reflect a bias in the archaeological record?
- KC14: Enhance existing understanding of the Late Upper Palaeolithic - Early Mesolithic transition through investigation of Sites in the Colne Valley and other locations along the route.
- KC19: The Romano-British period saw the beginning of a more established infrastructure network. Can we investigate the development of these routes, trackways and roads and the influence they had on landscape change?
- KC34: Undertake research and investigation into medieval manorial complexes. What was their origin, development and impact on the landscape?

1.1.8 The purpose of this Project Plan is to:

- define the scope of work for evaluation trenching;
- outline the aims of the investigation and how they will contribute to the specific objectives of the GWSI: HERDS;
- describe the methodology to be employed; and
- set out the proposed deliverables and reporting mechanisms.

2 Location and Site Background

2.1 Location

2.1.1 The Affinity Water main diversion (route 1b) (hereafter referred to as 'the Site') is located in CFA6: South Ruislip to Ickenham of Section 2 of the HS2 project and runs across archaeological character area (ACA) 4: Northolt to Newyears Green and ACA 5: Newyears Green to the River Colne. It crosses Archaeological Sub-Zone (ASZ) 8: Pynchester and Brackenbury and ASZ 9: Semi-rural west of Breakspear Road. The Site is located within agricultural land, predominantly pasture, on the urban edge of West Ruislip and Ickenham. The water main diversion (route 1b) extends for c. 1.1km north-south along South Breakspear Road and runs off to the west at the height of Copthall Road West (Fig 1).

2.2 Site Background

General

2.2.2 Detailed desk-based assessments (DDBAs) for the Colne Valley East (1D037-EDP-EV-REP-S000-000004) and the Colne Valley West (1D037-EDP-EV-REP-C000-000028) and Environmental Baseline assessments for CFA6 (CH-001-006, ES 3.5.2.6.4) have been completed for this area. A further Geoarchaeological Desk Based Assessment (HS2-HS2-PM-TEM-000-000004) and Palaeo-environmental Desk-based Assessment (1D037-EDP-EV-REP-000-000033) for the complete HS2 route has been prepared, covering the Colne Valley as Enhanced Study Area 1 (ECA1); the River Pinn, GCZ 4, is identified within the Geoarchaeological Desk Based Assessment as having moderate geoarchaeological potential.

2.2.3 The DDBAs outline that the underlying bedrock geology across the landscape in this area to the east of the Colne Valley consists of Palaeogene clays, silts and sands of the London Clay Formation and the Lambeth Group. Superficial deposits are mainly absent in this area apart from possible alluvial deposits further to the west towards the Rivers Colne and Pinn which could contain extensive superficial deposits of fluvial sands and gravels and fine grained alluvium of Pleistocene and Holocene date. The most western part of this area has been subject to significant quarrying and some of the superficial deposits may have been truncated.

2.2.4 The Geoarchaeological DBA indicates that deposit modelling of the Colne Valley (ESA1 was limited due to a small amount of boreholes in this area. The deposit model created by a transect of boreholes across the area gives some guidance as to the location of the floodplain and superficial deposits across the Colne Valley; alluvial areas and the edge of the floodplain are projected further to the west of the Site, but it corroborates the potential for some superficial deposits in the vicinity of the River Pinn.

2.2.5 The British Geological Survey (BGS) records the presence of alluvium within the valley of the River Pinn (DBBA, 63), although superficial deposits are largely absent across the Colne East area. If these deposits are present, they could have the potential to contain waterlogged material, archaeological remains and sources of palaeoenvironmental data.

2.2.6 Current land use of the Site varies from 20th century suburban expansion of Ruislip and Ickenham and some farmland. A large golf course is located to the north-east of the Site. The River Pinn runs east of the site and within the floodplain of the River Colne (ES, 3).

Prehistoric

2.2.7 Terrace gravels have been recorded in the Colne Valley area to the west of the Site and have produced numerous Palaeolithic to Mesolithic artefacts, deposits and evidence of human activity. Evidence for Neolithic activity has been found on the western slopes of the Colne valley and it is possible that further evidence can be found on its eastern slopes, which are in the vicinity of the Site. Late Bronze Age finds have been made in the Colne Valley area and near the River Pinn. These consist of Bronze Age cremations at Copthall Covert (RUI021) (Network Archaeology 2008, 339) on the edge of the Colne Valley, a looped bronze axe head near Harefield and thin walled flint tempered pottery near from Dewes Pit (CFA07) (DBBA, 6) . Furthermore, Neolithic to Bronze Age flint scatters and Bronze Age barrows have been found in the Colne Valley. The edge of a Romano-British settlement has been excavated during a watching brief for a pipeline, north of Newyears Green Lane. It is quite possible that this settlement has its origins in the Iron Age (DBBA, 6).

2.2.8 Further trenching by the Archaeological Contractor ahead of an 18 inch spur gas pipeline diversion at Dews Farm further (c. 1.1-1.3km to the west of the Site) revealed archaeological features and artefacts of possible Mesolithic and Iron Age date. The artefacts from the site included flint blades and Iron Age pottery (1EW02-CSJ-EV-REP-S002-000019).

Romano-British

2.2.9 There is little evidence for Romano-British activity in the area although the name 'Pynchester' (RUI001) may suggest a possible Roman settlement near the Pynchester moated site to the south-east of the Site.

Early medieval

2.2.10 There is scant evidence for early medieval occupation of the area although the nearby settlements of Ruislip (c.2.2km to the east) and Ickenham (c. 1.3km to the southeast) may have early medieval origins (DBBA, 6).

Medieval

2.2.11 There are two medieval manorial moated sites located near the Site: Pynches r Farm (RUI001) and Brackenbury Farm (RUI002). The Affinity Water main diversion (rout 1b, run c.240m north-west of Pynchester Farm and c.130m from Brackenbury Farm.

2.2.12 Pynchester moated site is quadrangular with rounded corners situated in a meander of the River Pinn. Orientated roughly northeast to southwest, the central isl nd platform r easuring approximately 35m² is surrounded by a moat which varies betwee 2.5m t 4m wide. Excavations there between 1966 and 1969 revealed the remains of th dn t 's of a medieval building with a floor constructed of roof tiles with a 3m² hearth. A k hole oven and curing chamber were also found. A deed dating from 1531 appa e tly r rds the name 'Pynchester

Ferme' which has been associated with the site. The medieval pottery recovered from the site included Surrey Ware (DBBA, 44).

2.2.13 At the Brackenbury moated site, three sides of a quadrangular moat are extant and are fed by the nearby River Pinn. The southern and deepest part is 8m wide but narrows to 3m on the western side. The outer bank surrounds the moat on three sides and is most prominent on the northern side. The eastern side has been filled in the 20th century. Brackenbury Farmhouse is a 16th century farm house with a substantial 17th century timber framed building known as Brackenbury House adjoining. These are set within the moated area and to its east across the filled section of moat. The whole complex is set in a semi-rural landscape west of the conurbation of Ickenham (DBBA, 44).

Post-medieval

2.2.14 The landscape west of South Breakspear Road is largely one of post-medieval enclosures and roads which generally follow the alignment of medieval lanes, though Harvil Road has been straightened and the landscape has been impacted by the railway line and embankment which runs just north of the moated site. Despite the modern impacts, the moated site and farm can be understood within a semi-open rural landscape (DBBA, 44-5).

2.2.15 Along the route of the Affinity Water main, there are also some ridge and furrow (F07&F08) and a boundary marker (F09) visible on LiDAR surveys of the area, indicating the rural character of the landscape in medieval and post-medieval times.

2.2.16 In the post-medieval period the area is characterised by suburban and infrastructure developments. The Great Western, London and North Eastern and Great Central Joint Railways were constructed between 1899 and 1906. Airfields were established at Royal Air Force (RAF) Northolt (RUI010) and RAF West Ruislip (RUI011) during World War I, c. 3km to the southeast of the Site.

3 Aims and Objectives

3.1 Needs and aims

3.1.1 Trial trenching is required to determine, as far as reasonably possible, the nature of the archaeological resource within the Site.

3.1.2 The objective of the investigation is to obtain information about the archaeological resource along the route in order to provide an assessment of its character, extent, knowledge value and ability to contribute to Specific Objectives. The outcomes of the trial trenching will be used to inform the requirement and strategy of further archaeological investigation in the form of archaeological mitigation.

3.1.3 The aims of the trial trenching are to:

- assess the extent and nature of archaeological remains within the survey boundaries;
- characterise the nature of any archaeological remains within the survey boundaries;
- assess the significance of any archaeological remains within the survey boundaries;
- assess the change to the significance of the identified heritage assets as a result of the proposed scheme;
- suggest measures, if appropriate and feasible, for further archaeological investigation to mitigate identified significant impacts; and
- contribute to the delivery of GWSI: HERDS Specific Objectives as specified in Section 3.2;
- generate results that can be assessed in conjunction with archaeological works undertaken to the west of the River Colne and place the archaeology of the area within its wider landscape context.

3.1.4 The Colne Valley is an area with a high potential for buried archaeological remains as it lies in the vicinity of Terrace Gravels (RUI015) (of a type often linked with archaeological material culture and deposits) associated with the River Colne. The underlying geology of the Site itself consists of London Clay Formation with the presence of alluvium within the valley of the River Pinn, although superficial deposits are largely absent across the Colne East area.

3.1.5 If present, archaeological remains are likely to date from the Bronze Age through to the post-medieval period, although earlier prehistoric remains cannot be ruled out due to the presence of alluvial deposits present in the east of the route, adjacent to the River [illegible] due to its proximity to the River Colne and associated Thames Terrace Gravels to the west.

3.1.6 If Palaeolithic to Neolithic remains are discovered during the evaluation in this area, further archaeological work may be required in order to contribute to KC5: "Identifying settlement location and developing models for settlement patterns for the Mesolithic, Neolithic and Early Bronze Age", KC11: "Does the high density of prehistoric settlement evidence in the Colne Valley reflect a genuine focus of activity or does it reflect a bias in the archaeological record?" and KC14: Enhance existing understanding of the Late Upper Palaeolithic - Early Mesolithic transition through investigation of sites in the Colne Valley and other locations along the route.

3.1.7 There is moderate potential for Bronze Age cremation burials as some were found nearby at the Copthall Covert (Network Archaeology, 2007). If further archaeological works reveal an associated settlement this could contribute to addressing HERDS objectives KC15: "Can we identify regional patterns in the in the form and location of Late Bronze Age and Iron Age settlements across the route, and are there associated differences in landscape organisation and enclosure?" and KC17:" What evidence is there for regionality in the mortuary rites of the Late Bronze Age and Iron Age, and how does that alter over time?"

3.1.8 The land that comprises the Site may have previously been associated with one of the Manorial Farms (such as Brackenbury Farm - RUI002) in its vicinity. There is the potential to identify ridge and furrow in the context of medieval land use. Any agricultural features along with boundaries and ditches datable to the medieval-post-medieval period could have potential to contribute to HERDS objective KC34: Undertake research and investigation into medieval manorial complexes. What was their origin, development and impact on the landscape?"

3.2 Contribution to Specific Objectives

3.2.1 Through delivery of the works set out in Section 4 and through addressing the aims set out above (Section 3.1) the trial trenching will create knowledge and outputs that would contribute to the following specific objectives in the following ways:

Table 1 Contribution to Specific Objectives

Specific Objective	Contribution
KC5: Identifying settlement location and developing models for settlement patterns for the Mesolithic, Neolithic and Early Bronze Age.	Due to the potential for prehistoric settlement in the floodplain of the Colne on the western part of the Site as evidenced by CVA021 and CVA010, this trial trench evaluation may find evidence for prehistoric activity, which has potential to be modelled on the basis of further mitigation work. Data generated from the evaluation will also act as a point of comparison with results from the archaeological works at the west of the River Colne.
KC11: Does the high density of prehistoric settlement evidence in the Colne Valley reflect a genuine focus of activity or does it reflect a bias in the archaeological record?	The trial trench evaluation will clarify th l cati x+ nt, survival, condition and significance of an ritage ssets present on the Site. The resul , het er p. sitive or negative, will contribute to ir u. rstanding of prehistoric settlement . trib tion de sities and indicate if further archaeological coul ddress the question of

	bias in the archaeological record. The results will also be compared to those from archaeological works at the west of the River Colne to place any prehistoric settlement evidence in its wider landscape context.
KC14: Enhance existing understanding of the Late Upper Palaeolithic- Early Mesolithic transition through investigation of sites in the Colne Valley and other locations along the route.	The trial trench evaluation will provide a level of baseline data to assist in addressing this objective by identifying the potential of this area close to the river valley for Palaeolithic deposits, in formulating strategies for further investigation, and in refining the objective. Results from the evaluation will be assessed with reference to data generated by archaeological works at the west of the River Colne.
KC19: The Romano-British period saw the beginning of a more established infrastructure network. Can we investigate the development of these routes, trackways and roads and the influence they had on landscape change?	The trial trench evaluation has the potential to clarify the route of the Roman road from Verulamium to Lelham (heritage asset RUI012). The results, whether positive or negative, will contribute to our understanding of the Roman infrastructure network and the influence it had on the landscape.
KC34: Undertake research and investigation into medieval manorial complexes. What was their origin, development and impact on the landscape?	Several medieval manorial Farms are located within the ACAs (Dews Farm, Brackenbury Farm and Pynchester Farm); Land in the area may have belonged to the manorial complexes and ditches/boundaries dated to the medieval period could give an indication of enclosure or land division. The DDBA indicates that the area probably had a mixed agricultural use due to areas of dense ancient woodland used for pig keeping, fields for grazing and increasingly open land for cultivation. Ditches and field boundaries could give an indication of how a field system was developed and could potentially be related to the manorial complex system. Ditches with organic material have the potential to be sampled in order to find out how the Site was cultivated.

4 Scope and Methodology

4.1 Trial Trenching Scope

4.1.1 Trial trenching will be undertaken in accordance with specific guidance produced by HS2, namely the Technical Standard Specification for historic environment investigations (HS2-HS2-EV-STD-000-000035) and the Generic Written Scheme of Investigation: Historic Environment Research and Delivery Strategy (GWSI: HERDS) (HS2-HS2-EV-STR-000-000015).

4.1.2 All trial trenches will be between 1.8 and 2.1m in width. For the purposes of preparing this document, the easement has been estimated as 15m at either side of the line of the water main diversion. The evaluation will comprise excavation of 21 (no.) of 30m long trenches across the extent of the easement of the proposed pipeline (Fig 1). This represents an approximate 3% sample of the available area, adequate to address the project objectives without prior geophysical survey (Figure 3). An additional 1% sample will be used as contingency in order to investigate further areas of archaeological remains.

4.1.3 The location of 20 of the 21 trenches is known (see Figs 3 and 4). A further trench which was removed from the original trench design due to land access issues (Trench 14) will be excavated between Trenches 9 and 10. Trench 14 will be excavated across an area which will be subject to deep excavation for the purposes of a drill shaft, the exact location of which has not yet been defined. The exact location of this trench will be determined in the field by Affinity in conjunction with CSjv Barhale and the Archaeological Contractor. No activity to excavate this trench will take place without consultation between all parties.

4.1.4 All trenches are listed in Table 2. All trenches have been assigned a unique ID in accordance with the Employer's Asset Information Management System (AIMS). Trenches have been positioned to provide a representative sample of the available areas; there is no pre-existing information on potential archaeological remains on which to target trenches.

4.1.5 It is expected that the Site will be ready for excavation from April 2018.

Table 2 Schedule of Trial Trenches

AIM ID	Tr. No	Tr. Length	Tr. Width	Max Tr. Depth
	Tr001	30.00	1.80m-2.0m	To geological horizon
	Tr002	30.00	1.80m-2.0m	To geological horizon
	Tr003	30.00	1.80m-2.0m	To geological horizon
	Tr004	30.00	1.80m-2.0m	To geological horizon

AIM ID	Tr. No	Tr. Length	Tr. Width	Max Tr. Depth
	Tr005	30.00	1.80m-2.0m	To geological horizon
	Tr006	30.00	1.80m-2.0m	To geological horizon
	Tr007	30.00	1.80m-2.0m	To geological horizon
	Tr008	30.00	1.80m-2.0m	To geological horizon
	Tr009	30.00	1.80m-2.0m	To geological horizon
	Tr010	30.00	1.80m-2.0m	To geological horizon
	Tr011	30.00	1.80m-2.0m	To geological horizon
	Tr012	30.00	1.80m-2.0m	To geological horizon
	Tr013	30.00	1.80m-2.0m	To geological horizon
	Tr014	30.00	1.80m-2.0m	To geological horizon Location TBC
	Tr015	30.00	1.80m-2.0m	To geological horizon
	Tr016	30.00	1.80m-2.0m	To geological horizon
	Tr017	30.00	1.80m-2.0m	To geological horizon
	Tr018	30.00	1.80m-2.0m	To geological horizon
	Tr019	30.00	1.80m-2.0m	To geological horizon
	Tr020	30.00	1.80m-2.0m	To geological horizon
	Tr021	30.00	1.8m-2.0m	To geological horizon

4.2 Methodology

4.2.1 Tasks and activities that will be undertaken include:

Trench Location

4.2.2 The trench location as shown on Figures 3 and 4 is indicative and the site team will locate the trenches as closely to the design as possible while allowing for any alterations to the setting as necessitated by local conditions, services or ecological concerns. The location of Trench 14 will be defined during the fieldwork (see 4.1.3). All spatial setting out and recording shall be in accordance with The Ordnance Survey National Grid and Ordnance Survey Newlyn Datum (ODN) as defined by the OS Active GNSS network and use of a Virtual reference system. A minimum of three Permanent Ground Markers (PGM) shall be created using this system for each trench or group of geographically related trenches.

4.2.3 Trenches shall be located to a horizontal accuracy of +/-500mm. The corner points of each trench location shall be set out with Real Time Kinematic (RTK) Global Navigation Satellite System (GNSS) equipment or other suitable automated equipment referenced from the PGMs.

4.2.4 Surface heights shall be recorded using RTK GNSS and related to PGMs. Ordnance Survey Bench Marks (OSBM) are not to be used. Levelling accuracy shall be within 10 mmÖk: where 'k' is the total distance levelled in kilometres.

4.2.5 The Archaeological Contractor shall ensure that all trench or excavation limits, and significant archaeology detail are surveyed 'as dug' in relation to the project grid before leaving the Site. Ground level height data shall be recorded for each trench. Survey methodology and a detailed survey record shall be provided to HS2 Ltd within the survey report.

Mechanical excavation

4.2.6 Trial trenches and test pits shall be excavated to the first archaeological level or to naturally occurring geological horizons, whichever is encountered first. Excavation will be undertaken using a mechanical excavator with toothless ditching bucket.

4.2.7 Machining shall be carried out under the constant supervision of the Archaeological Contractor to excavate the ground in spits. The Archaeological Contractor shall use the professional judgement to determine the appropriate depth of each spit. Any variations to the excavation methodology shall be at the discretion of the Archaeological Contractor and recorded in writing for inclusion in the final report. Each spit shall be examined carefully to assist the recovery of any archaeologically significant artefacts and thus to determine when to cease machining. It is the responsibility of the Archaeological Contractor to ensure that the finished surface is machined to a suitably 'clean' state in order to identify, define and investigate any exposed archaeological deposits. If the surface is not sufficiently clean, hand cleaning of the surface will be required. Machine excavation will comply with the Employer's Technical Standard - Route wide soil resources plan (HS2-[illegible]-EV-TD-000-000008).

4.2.8 The Archaeological Contractor shall ensure that water is discharged and excavated material from archaeological excavations are stored in accordance with the Contractor's environmental protection requirements (as set out in the package Works Information and their Environmental Management Plan) and any relevant consents for the worksite. The Contractor shall monitor discharge rates and, if necessary, conductivity of discharge waters to ensure compliance.

4.2.9 Within alluvial sequences the Contractor shall pay particular attention to establishing the vertical extent of layers of archaeological potential and shall be aware that horizons of cultural activity may be interdigitated with horizons of sterile alluvium. The Contractor shall supervise the excavation of alluvial deposits in such a manner so as to allow a cumulative or continuous section to be recorded.

4.2.10 Should any material be excavated that is deemed to be contaminated or potentially contaminated it shall be investigated, controlled (e.g. placed separately from clean material) and removed from the site in accordance with the Contractor's environmental protection requirements (as set out in their Environmental Management Plan).

Fieldwork Recording

4.2.11 Archaeological recording shall be undertaken by the Contractor to the general requirements as described in the GWSI: HERDS (section 7.3). A sufficient sample of the archaeological features and deposits revealed must be sampled/or fully excavated to allow the resolution of the aims and objectives of the work. Structures, features, or finds which might reasonably be considered to merit preservation in-situ shall not be unduly damaged.

4.2.12 Archaeological recording is to include, as a minimum:

- at least one representative section at (1:10 or 1:20 scale) of each evaluation trench, from ground level to the base of the excavation;
- the written record of individual context descriptions on appropriate pro-forma;
- plans at appropriate scales (1:10, 1:20 or 1:50);
- single context planning should be used only if appropriate;
- photographs and other appropriate drawn and written records; and
- other sections, including the half-sections of individual layers or features shall b drawn as appropriate to 1:10 or 1:20.

4.2.13 A 'site location plan', indicating site north shall be prepared at 1:1250. Individual 'trench plans' at 1:200 (or 1:100) shall be prepared which show the location of archaeology investigated in relation to the investigation area. The location of site plans will be identified using OSGB co-ordinates.

4.2.14 Section drawings shall be located on the relevant plan and OSGB co-ordinates recorded. The locations of the PGM bench markers used and any site TBM shall also be indicated.

4.2.15 A record of the full extent in plan of all archaeological deposits as revealed in the investigation shall be made. These plans will normally be based on digital survey data (digital planning methods shall be agreed in advance with the Employer) supplemented where appropriate by hand drawn records on polyester based drawing film (at a scale of 1:10 or 1:20 unless otherwise agreed with the Employer). All hand drawn information shall be digitised (or preferably generated digitally in the first instance), and final deliverables will be supplied in an Esri format and adhere to standards set out in the Employer's Cultural Heritage GIS Standard (HS2-HS2-GI-SPE-000-000004). Single context planning shall be used where complex stratigraphy is encountered.

4.2.16 A 'Harris matrix' stratification diagram shall be employed to record stratigraphic relationships (Harris et al. 1993) where appropriate. This record shall be compiled and fully checked by the Contractor during the course of the excavations. Spot dating shall be incorporated onto this diagram during the course of excavations.

4.2.17 Recording of structural evidence revealed below ground level will vary according to the level of special interest of the structure and its relationship to archaeological remains. Structures of little or no significance shall be noted on a site plan. Detailed drawings of important features revealed in investigations may be required in accordance with the aims and objectives of the investigation as defined in the Project Plan.

4.2.18 The photographic record will be in digital format, resulting in high resolution TIFF (uncompressed) images. Photographs will illustrate both the detail and context of the principal archaeological features discovered. In addition, the Contractor shall take appropriate record photographs to illustrate work in progress. All photographic records will include information detailing: site name and number/code, date, context, scale and orientation.

Human Remains

4.2.19 It is possible that prehistoric cremation burials will be present on the Site. Where human remains are identified, all subsequent work must be undertaken in accordance with Schedule 20 of the High Speed Rail Act (Vol. II) and the Employer's Burial Grounds, Human Remains and Monuments Procedure (HS2-HS2-EV-PRO-0000-000008).

4.2.20 The Contractor shall confirm how the requirements set out in the Project Plan will be implemented as part of their procedure for excavating and recording human remains in the Contractor's method statement.

4.2.21 At locations known to contain human burials, or that have a high potential for the presence of human remains, provision shall be made by the Contractor for site inspection by a suitably qualified osteo-archaeologist in order to determine the age of the remains.

4.2.22 Should human remains be discovered, the Contractor shall notify the Employer immediately so that these procedures can be implemented. This notification may be initially made personally or by telephone but shall be confirmed in writing (including email) within 24 hours of discovery. Police or Coroner and the EHO will be notified as well according to Schedule 20 of the HS2 Act.

4.2.23 The Contractor will be required to cease all works at that location until further instruction is provided by the Employer. The Contractor shall undertake an initial in situ observation and assessment of the remains and shall advise the Employer of the course of action required.

4.2.24 Lifting of human skeletal remains shall be kept to the minimum which is compatible with an adequate evaluation or excavation, where the remains contribute to Specific Objectives and as required by the Project Plan.

4.2.25 Visible grave goods and other obvious artefacts, shall be recorded and lifted before the end of the working day to avoid the risk of vandalism and theft. Where this is not feasible or appropriate, the Contractor shall ensure, on liaison with the Employer that adequate site security is provided. As a minimum, this will require a 24 hour comprehensive security regime until sensitive remains have been recorded and lifted. This is a particular issue for rural sites and 'occasional burials'.

Environmental Sampling

4.2.26 It is expected that in the area west of Breakspear Road, located on London Clay will have low potential for environmental sampling as evidenced by previous environmental sampling as part of an archaeological strip, map and sample at the Copthill Cutting (Network Archaeology 2008). However, there may be moderate potential for alluvial deposits at either side of the existing railway, especially in the areas at the north of the site.

4.2.27 The Archaeological Contractor will consider environmental sampling when encountering possible organic deposits. The potential for palaeoenvironmental remains is deemed to be highest along the northern extent of the Water Main route.

4.2.28 Any alluvial or peat sequences encountered on Site will be sampled; exposed sections through the alluvial/peat material will be recorded according to standard sedimentary criteria in order to inform on the mode and environment of deposition.

4.2.29 A series of overlapping monolith tins will be taken down through the sequence to recover undisturbed columns of sediment suitable for off-site sedimentological and palaeoenvironmental assessment (i.e. pollen, diatoms, LOI, organic content, Calcium Carbonate content, Mag Sus). Bulk samples, c 20-40 litres in volume, will also be taken in association with the monolith tins. These will be taken at intervals of c 10cm (respecting any sedimentary boundaries) adjacent to the monolith tins down through the sediment profile. The bulk samples will be taken to retrieve plant macro fossils, molluscs and to recover plant material suitable for C14 dating.

4.2.30 Colluvial soils or suspected colluvial soils will be sampled by monolith tins by the same method as described in for soil micromorphology, and sedimentary analysis (i.e. loi, CaCo, Mag sus) A, E, O, B soil horizons.

4.2.31 Further sampling techniques which may be used include phosphate analysis on areas that show signs of poaching in order to establish animal enclosure areas and if possible hearth areas are encountered, identified through discoloration by possible burning, or by accumulations of possible hearth stones, then samples will be taken on a closely-spaced grid from within and around the area for off-site magnetic susceptibility analysis. Associated soil horizons will be bulk sampled for palaeoenvironmental remains and also by monolith tin in order to retrieve undisturbed columns of sediment suitable for off-site analysis.

4.2.32 The selection, preparation for and methods of taking samples together with their size, presentation and processing shall be in accordance with current best practice (e.g. CIfA 2014; Campbell et al. 2011; Ayala et al. 2007).

4.2.33 The Contractor shall use ten litre plastic buckets (with lids and handles), or strong polythene bags (double bagged) secured at the neck, for the recovery of bulk 'disturbed' environmental samples. An adhesive label recording the project event code, context number and sample information shall be securely fixed to a vertical face of the bucket only or attached to the neck of the bag. Labels shall be completed with an indelible ink pen. A duplicate non-adhesive label shall be inserted within the bucket or between the polythene bags.

4.2.34 The Contractor shall be responsible for the protection of all samples and finds and for their transport (including loading and unloading) to the processing facilities or other location as agreed with Employer. Samples shall be protected at all times from extreme temperatures and from wetting and drying out due to weather exposure.

4.2.35 Processing of all soil samples collected for biological assessment, or subsamples thereof, should be completed within two weeks of collection. The preservation state, density and significance of material retrieved shall be assessed by the Contractor's specialist. Special consideration shall be given to any evidence for recent changes in preservation conditions that may have been caused by alterations in the Site environment. Unprocessed sub-samples shall be stored in appropriate conditions in accordance with the Contractor's method statement.

Top soil sampling

4.2.36 Topsoil sampling will be undertaken in order to determine potential for prehistoric buried landscapes. The guidance (D. Hodginson, personal communication Feb 9, 2018) indicates the topsoil should be sampled by excavating 10 (no.) pits of 0.5m² per ha. The evaluation area measures c. 3.7 ha, which means that 74 top soil samples will be taken.

4.2.37 The samples will be sieved and checked for any flints and other finds.

4.2.38 The results of the topsoil sampling will be also be assessed in conjunction with that undertaken as part of archaeological works to the west of the River Colne. Although the linear pattern of the Affinity trenches may preclude direct comparison of the results, it is anticipated that any significant pockets of activity could be identified.

Geoarchaeology

4.2.39 If alluvium is encountered in parts of the Site, samples will be taken if appropriate as the results may be able to contribute to the deposit model of the Colne Valley area (see environmental sampling above). If the bottom of the alluvium is not reached within the trench, hand augers will be taken across the trench (2no. minimum) to establish the depth of the alluvial deposits and contribute to the deposit model of the Colne Valley as a whole and to add information about the extent of superficial deposits in this area.

4.2.40 Samples collected for geo-archaeological assessment should be processed promptly by the Archaeological Contractor's specialist, particularly where storage of unprocessed samples is thought likely to result in deterioration. Appropriate assessment shall be undertaken as agreed with the Employer. Where preservation in situ is a viable and desirable option, consideration shall be given to minimising the possible effects of compression and loading on the physical integrity of the Site and any hydrological or chemical impacts of the proposed construction works (Campbell et al. 2011).

4.2.41 In the event that significant levels of alluvium are encountered a sampling strategy will be agreed with Emma Hopla (Heritage Advisor to HS2).

Backfilling

4.2.42 The trenches shall be pumped dry (by the Contractor or Principal Contractor) and any necessary protection measures for archaeological remains (in addition to those for below ground infrastructure, services or utilities) shall be completed prior to backfilling. Generally, all backfill material shall consist of non-toxic, uncontaminated, non-putrescible, natural and inert material which shall be compacted and (if necessary) tested (dynamic cone test or other) in accordance with a specification provided by the Contractor. Surface conditions shall be reinstated to the required standard.

4.2.43 The Contractor shall ensure, in liaison with the Employer that adequate protection is provided for any archaeological remains. Any specific archaeological requirements relating to backfilling including use of materials to mark excavated depth, such as geotextiles, shall be specified by the Contractor in the LS-WSI.

5 Post-investigation reporting and archiving

5.1.1 Trial trenching reports will be produced with the following structure:

- Executive Summary
- Introduction
- Summary of project's background (including the Specific Objectives addressed)
- Assumptions and limitations
- Description and illustration of the Site location
- Previous work(s) relevant to the archaeology of the Site (e.g. DDBA, previous surveys)
- Geology and topography of the Site
- Specific Objectives and Aims
- Scope and Methodology, to include:
  - Date(s) of fieldwork;
  - Number and dimensions of trial trenches;
- Results and observations
  - Stratigraphic report
  - Finds report
  - Environmental evidence report
  - Interpretation of results against original expectations and Specific Objectives
  - Review of evaluation strategy [where appropriate].
- Recommendations and research aims for further investigation
- Conclusions
  - Statement of potential of archaeology
  - Assessment of achievement (or not) of survey objectives.
- Evaluation of methodology employed and results obtained (i.e. a con [illegible] ng)
- Publication and dissemination proposals, including archive deposition
- References to all primary and secondary sources consulted.
- Appendices to include illustrations, contextual summary by t [illegible], finds reports,

environmental reports, Site matrices [where appropriate] and full definitions of the interpretation terms used in the report.

5.1.2 The trial trenching reports will contain figures accompanied by supporting text. All figures within the report shall be on the same paper size, where appropriate. All categories of anomaly identified will be labelled with the appropriate assigned number code on the figures, which will be referred to in the text document.

5.1.3 The following figures will be included in trial trenching reports:

- General plan (mandatory)
- Engineering design (mandatory)
- Site location
- Survey extent and trial trench locations
- Survey results to include plans and sections of archaeological features, deposits and sequences
- Selected photographs of representative and/or significant features and finds

6 Information Management

6.1.1 GIS deliverables will be provided in accordance with the Employer's Cultural Heritage GIS Specification (HS2-HS2-GI-SPE-000-000004). CAD files will be GIS compatible and follow standards set out in the same Specification. Figures may be produced using CAD but final deliverables must be supplied in GIS format.

6.1.2 Mapping and spatial data deliverables will conform to the Employer's GIS Standards as set out in HS2-HS2-GI-STD-000-000002 and other associated referenced documents.

6.1.3 The Employer's standard template for reports (HS2-HS2-PM-TEM-000-000004) will be used.

7 Quality Assurance Processes

7.1.1 Trial trenching reports will be prepared and conducted by suitably qualified, experienced and competent professionals.

7.1.2 Trial trenching reports will be checked and then reviewed by senior qualified, experienced and competent professionals prior to issue to the Employer for acceptance. Final reports, following comments, will be checked and reviewed again prior to issue.

8 Evidence of engagement

8.1.1 Historic England's advisor for the Greater London Archaeological Advisory Service (GLAAS) has been consulted on the plans and methodology for these works (meeting 31/08/2017) and was content with the methodology for the EWC works. His comments regarding the strategy for the Colne Valley has a whole were addressed through workshops (See below).

8.1.2 A meeting between the archaeological consultant for Fusion (Main Works Contractor for the Central section) and the Archaeological contractor was held (28/09/17) in collaboration with HS2's heritage team. The purpose of the meeting was to discuss the archaeology of the Colne Valley as a whole, as it is currently divided between the two sections. It was agreed that a common strategy will be drawn by the two contractors with regards to assessing the potential for Pleistocene and early Holocene deposits but also later prehistoric and historic remains through non-intrusive and intrusive works.

8.1.3 A further workshop was held with representatives from Area Central and Area South EWC with GLAAS, Historic England, London Borough of Hillingdon, and Buckinghamshire County Council on 7 November 2017 to discuss the archaeological programme across the Colne Valley and cooperation between Central and South sections regarding to archaeological strategies, with a particular focus on urgent enabling works.

8.1.4 Discussions are on-going with GLAAS and with representatives of Area South in order to ensure an iterative process in relation to knowledge sharing.

8.1.5 All relevant Project Plans and results of investigations will be shared between contractors. This work will inform the scope and methodology of the next phase of works.

9 References, glossary of terms and acronyms

9.1 References

Title	Reference
Ayala et al. 2007 'Geoarchaeology. 'Using Earth sciences to understand the archaeological record. Historic England Guidance.	Na
Colne Valley East Detailed Desk Based Assessment	1D037-EDP-EV-REP-S000-000004
Cultural Heritage GIS Specification	HS2-HS2-GI-SPE-000-000004
Chartered Institute for Archaeologists, (CIfA), 2014 By-Laws, Standards and Policy Statements of the Chartered Institute for Archaeologists, Standards and guidance	Na
Campbell, G, Moffett, L and Straker, V 2011 'Environmental Archaeology. A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition)'. Portsmouth: English Heritage	Na
Harris, E et al, 1993, Practices of archaeological stratigraphy, Academic Press, London	Na
HS2 Phase One Environmental Statement and Supplementary Environmental Statements	CH-001-006, ES 3.5.2.6.4 CH-002-006, ES 3.5.2.6.5 CH-003-006, ES 3.5.2.6.6 CH-004-006, ES 3.5.2.6.7
Project Plan for an Archaeological Recording of Harefield to Southall 48 inch, 1200NB HP Pipeline Diversion (006) (Cadent Gas)	1EW02-CSJ-EV-PLN-S002-000001
Final Report on the results of archaeological trial trenching for the 18-inch Fulmer to Haste Hill 450NB HP Pipeline Diversion	1EW02-CSJ-EV-REP-S002-000019
Technical Standard – Temporary Works	HS2-HS2-CV-STD-000-000005
Technical Standard - Route wide soil resources plan	HS2-HS2-EV-STD-000-000008
Generic Written Scheme of Investigation: Historic Environment Research and Delivery Strategy	HS2-HS2-EV-STR-000-000015
Technical Standard - Specification for historic environment investigations	HS2-HS2-EV-STD-000-000035
HS2 Technical Standard: Specification for Project Plans and Location Specific Written Scheme of Investigations	HS2-HS2-EV-STD-000-000036
Technical Standard: Historic Environment Physical Archive	HS2-HS2-EV-STD-000-000039

Procedure	
Technical Standard: Historic Environment Digital Data Management and Archiving Procedure	HS2-HS2-EV-STD-000-000040
Network Archaeology, 2008, Harefield to Southall Proposed Gas Pipeline, Archaeological Controlled Strip: Ancillary Pipe Dump	HAS56/report/v2.0
Scheme-wide Palaeo-environmental Desk-based Assessment	1D037-EDP-EV-REP-000-000033
Scheme-wide Geoarchaeological Desk Based Assessment	HS2-HS2-PM-TEM-000-000004

9.2 Glossary of terms

9.2.1 The following terms have been used in this report:

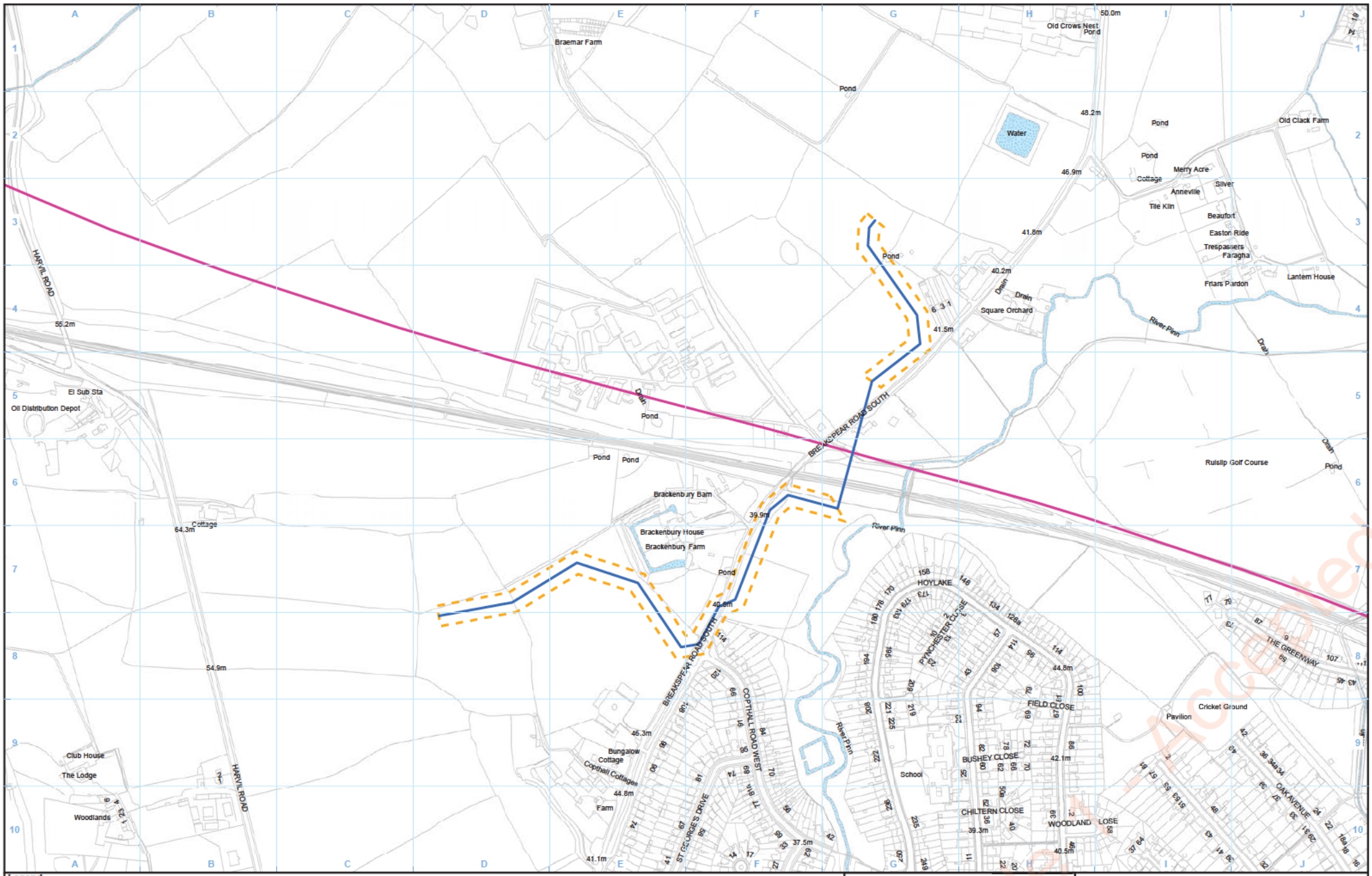
- **Contractor** – the organisation undertaking the works on behalf of the Employer.
- **Detailed Desk Based Assessment (DDBA)** – analytical document that builds on the information gathered previously in the Environmental Statement to address particular issues, questions or uncertainties within a given area. It may be developed to provide a more detailed understanding of the resource in an area to inform design development or construction programming.
- **Generic Written Scheme of Investigation: Historic Environment Research and Delivery Strategy (GWSI: HERDS)** – the framework for delivering all historic environment investigations undertaken as part of the HS2 Phase 1 programme.
- **Location** – a specific HS2 worksite or group of worksites that are being addressed as a combine historic environment investigation programme of assessment, evaluation and investigation.
- **Project Plans** – specification document for each specific package of activity (e.g. a survey, desk based assessment, excavation, recoding project). The plans would respond to the Specific Objectives set out in the GWSI: HERDS and be delivered within an agreed budget.
- **Works** – the specific historic environment assessment, evaluation or investigation works at each location.

9.3 List of acronyms

Abbreviation	Definition
AIMS	Asset Information Management System
ACA	Archaeological Character Area
ASZ	Archaeological Sub-Zone
BIM	Building Information Modelling
CIfA	Chartered Institute for Archaeologists
CIR	Construction Integrated Recordin

CoCP	Code of Construction Practice
CSjv	Costain Skanska Joint Venture
DDBA	Detailed Desk Based Assessment
dWPI	Draft Work Package Instruction
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Geographical Information Systems
GWSI: HERDS	Genetric Written Scheme of Investigation: Historic Environment Research and Delivery Strategy
HS2	High Speed 2 Ltd
LLAU	Limits of Land to be Acquired or Used
LS-WSI	Location Specific Written Scheme of Investigation
OASIS	Online Access to the Index of archaeological investigations
PM	The Employer's Project Manager
PGM	Permanent Ground Markers
QA	Quality Assurance
TBM	Temporary Benchmark
TSA	The Survey Association
TST	Total Station Theodolite
VfM	Value for Money
WI	Works Information
WP	Work Package
WPC	Work Package Price
WPI	Work Package Instruction
WPM	Work Package Manager
WPP	Work Package Plan
WPQ	Work Package Quotation
WPS	Work Packaging Strategy

Figures



Legend

- HS2
- Easement outline
- Water main

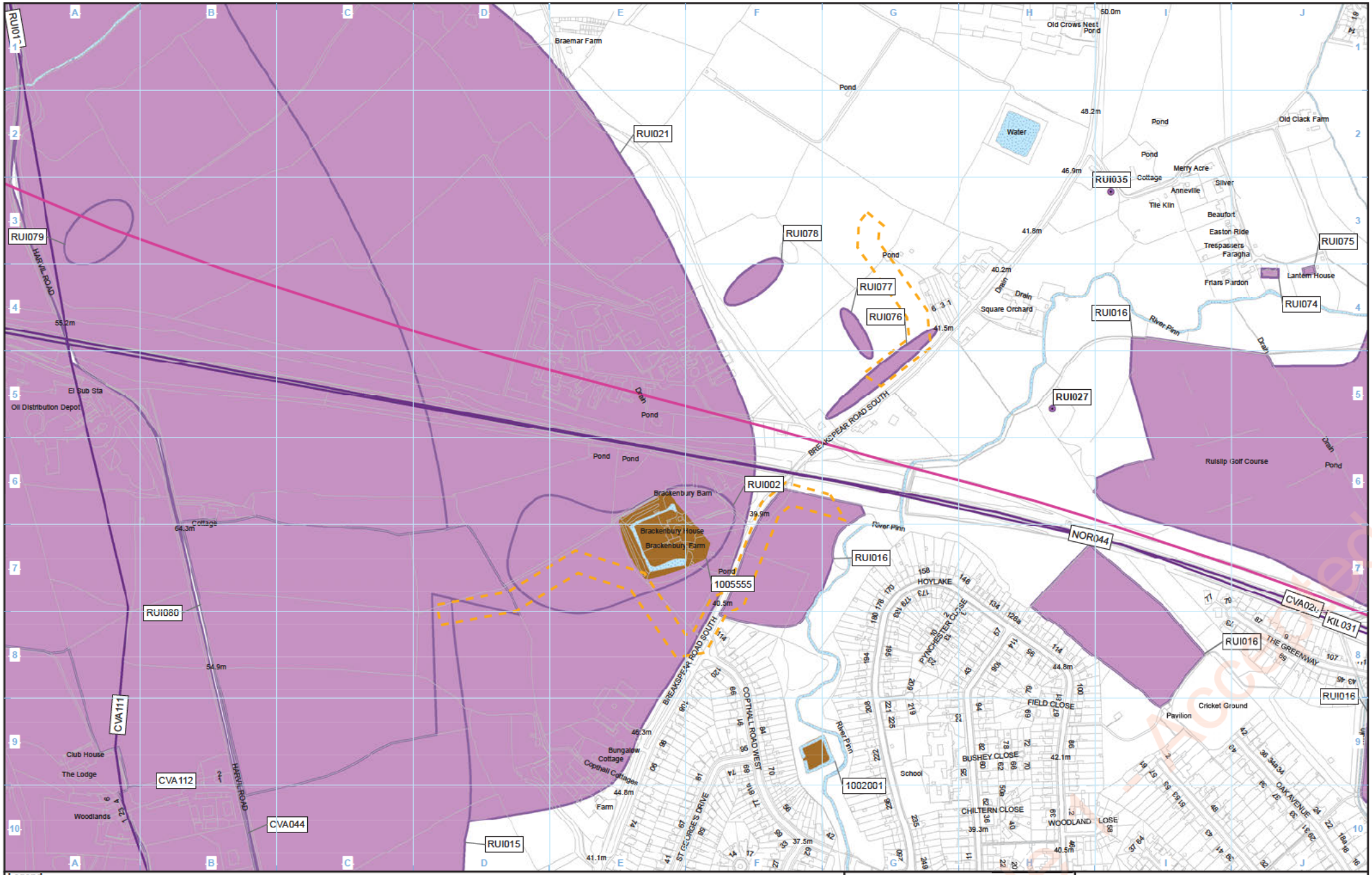
Map Number	tbc
Map Name	FIG. 1 SI , E LOCATION

Scale at A3: 1:5,000

Metres 0 50 100 150 200

Doc Number: -tbc

Date: 14/05/18



Legend

- HS2
- Easement outline
- Undesignated heritage asset
- Undesignated heritage asset
- Undesignated heritage asset
- Scheduled Monument

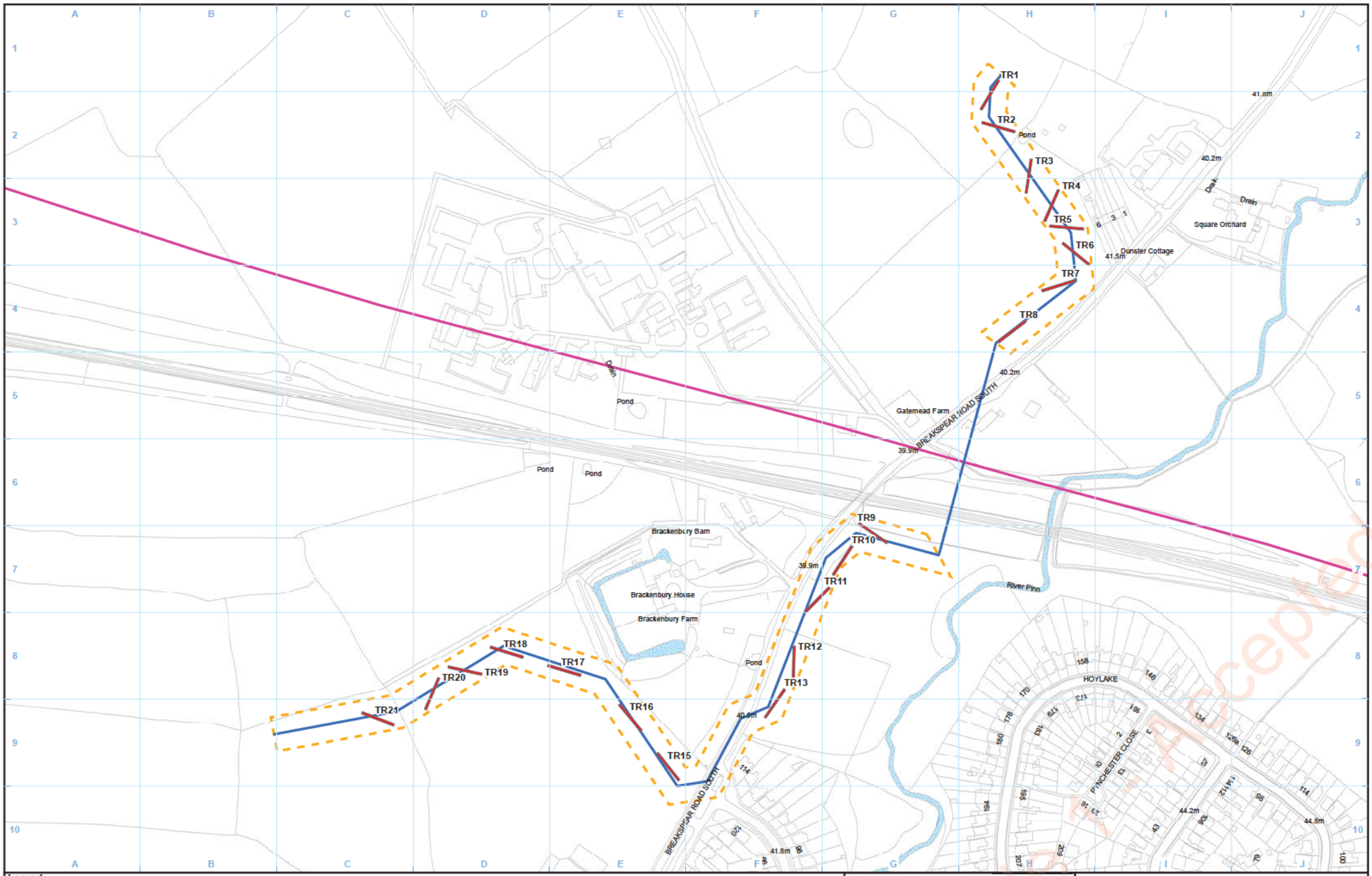
Map Number: tbc

Map Name: FIG. 2 HERITAGE ASSETS

Scale at A3: 1:5,000

Doc Number: -tbc

Date: 14/05/18



Legend

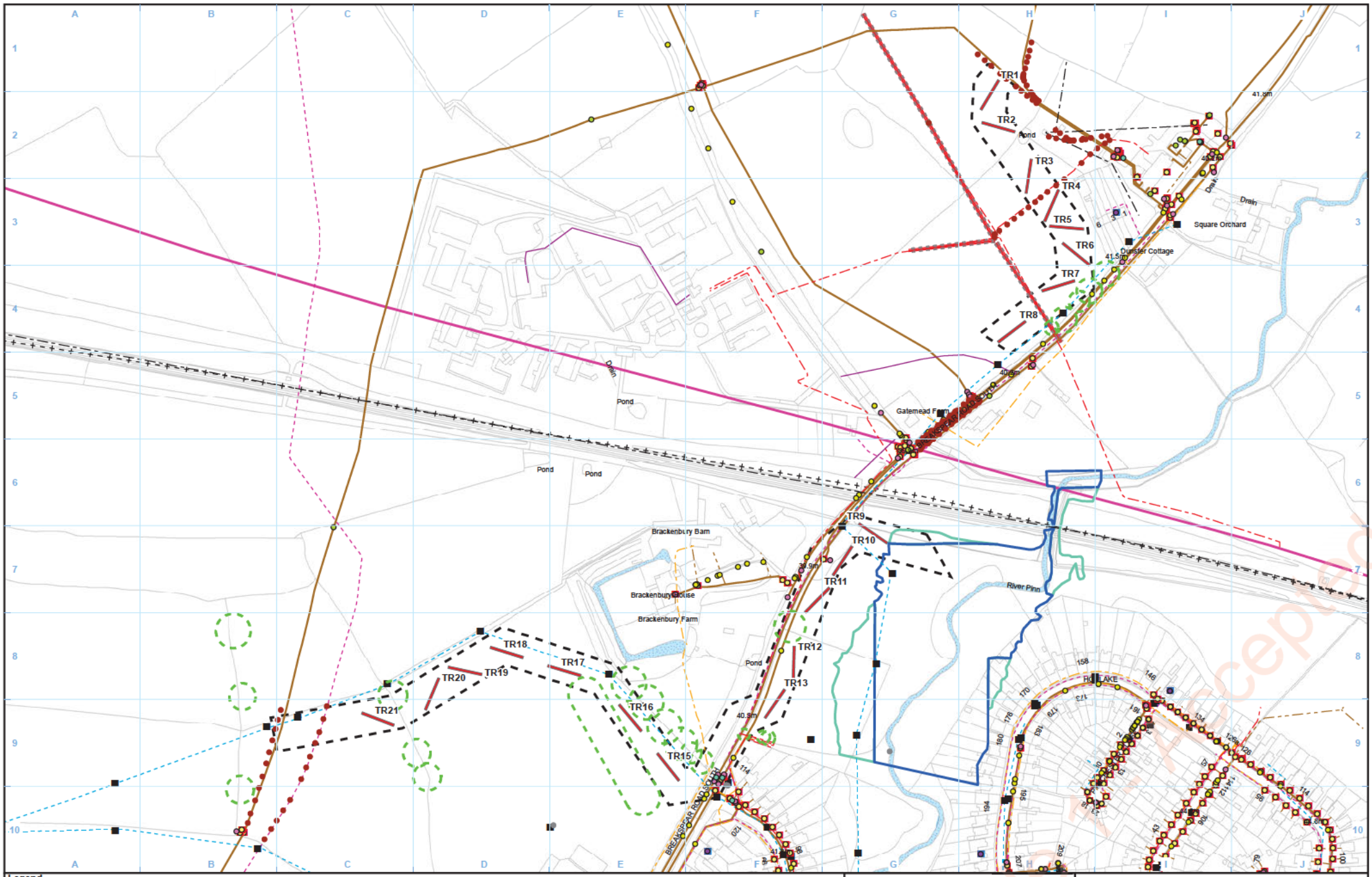
- HS2
- Easement outline
- Trial trenches
- Water main

Map Number	tbc
Map Name	FIG. 3 SCHE ME DES GN TRIAL TRENCHES

Scale at A3: 1:3,000

Doc Number: -tbc

Date: 15/05/18



Legend

- HS2
- Easement outline
- Trial trenches

Constraints

- 4CE_Points
- AG-BT
- AG-Electric
- ASS-W
- End Sewer Item
- Fitting WW
- Indicator Node
- Invert Level
- Mains Bursts
- Mains Company Meter
- Mains Fittings
- Mains Hydrants
- Mains Special Customers
- Mains Valves
- Manhole
- Operational Control
- Sewer
- Construct
- CTV
- Foul Water
- Gas High Pressure
- High Voltage Electrical Line
- Low Voltage Electrical Line
- Mains
- Mains Service Pipe
- Network Rail
- Overhead Electric Wires
- Tree root protection areas
- High Risk Flood Area
- Low Risk Flood Area

Map Number: tbc

Map Name: FIG. 4 SCHEME DESIGN TRIAL TRENCHES AND CONSTRAINTS

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Scale at A3: 1:3,000

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Date: 17/05/18