Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices

Appendix 14.E: Written Scheme of Investigation for GI Watching Brief, Geoarchaeological Boreholes, Geophysical Survey and Archaeological Trial Trenching

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

Appendix 14.E – Written Scheme of Investigation for GI Watching Brief, Geoarchaeological Boreholes, Geophysical Survey and Archaeological Trial Trenching

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Immingham Green Energy Terminal

Written Scheme of Investigation for GI Watching Brief, Geoarchaeological Boreholes, Geophysical Survey and Archaeological Trial Trenching

Air Products

Project reference: 60673509

26 August 2022

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1. Introduction

1.1 AECOM (the Archaeological Consultant) have been commissioned by Air Products (the Client) to design the archaeological assessment of the proposed ammonia import terminal as part of the Immingham Green Energy Terminal (the Proposed Scheme).

1.2 The Proposed Scheme for the terrestrial elements comprises four areas known as the Main Site, the Pipeline corridor, the Storage Tank Area, and a Temporary Construction Area which together cover approximately 47.37ha of mixed-use land alongside Kings Road and Queens Road (A1173 road) at Immingham.

1.3 Previous archaeological investigations consisted of geophysical survey (ECUS 2013) and a Desk-Based Assessment (DBA) (AECOM, July 2022).

1.4 This document forms the Written Scheme of Investigation (WSI) for the completion of an archaeological watching brief of Geotechnical Investigations (GI), geoarchaeological borehole survey, geophysical survey and an archaeological trial trench evaluation within the Proposed Scheme red-line boundary.

1.5 The works specified in this document will be undertaken by a competent and suitably qualified Archaeological Contractor (the Archaeological Contractor) who should be a Registered Archaeological Organisation with the Chartered Institute for Archaeologists. They will be employed by the Principal Contractor. This document sets out the methodology, specification and protocol to be adhered to during the completion of the archaeological fieldwork, interim reporting and preparation of the fieldwork reports which will be completed by the Archaeological Contractor. In addition, the requirements and responsibilities of the Archaeological Contractor, the Archaeological Consultant, Principal Contractor and the Client have been set out to assist the Archaeological Contractor in the completion of the archaeological works.

1.6 This document has been produced by the Archaeological Consultant on behalf of the Client and will be sent to the Archaeological Officer for North East Lincolnshire for review and approval prior to works commencing.

2. Background Information

The Scheme

2.1 This WSI covers the landside terrestrial parts of the Proposed Scheme. Refer to the Scoping Report (AECOM, 2022) for more detail on the Scheme components. The proposed new facility at the Port will comprise:

2.2 On the landside, the infrastructure is considered associated development and will consist of the necessary infrastructure to facilitate the associated green hydrogen production facility to serve the first user of the principal development. The landside infrastructure will consist of:

- Pipework and pipelines required to link the jetty and unit operations.
- A control building at the foot of the jetty to accommodate personnel operating the jetty.
- Refrigerated ammonia storage consisting of a pressure controlled large tank.
- Hydrogen production units, known as converters.
- Hydrogen liquefiers to liquefy the hydrogen for temporary storage and road transport.
- Road tanker loading bays for both liquid and gaseous hydrogen for distribution to the points of use throughout the UK.

2.3 The construction of the jetty and topside jetty infrastructure will facilitate the import of ammonia into Immingham. The ammonia will then be stored and processed to create green hydrogen for onward transport to other parts of the UK. The jetty, topside and pipeline to the storage facility is the Nationally Significant Infrastructure Project (NSIP) and the site areas for the transfer, storage and processing of the ammonia will be included in the Development Consent Order (DCO) as associated development.

2.4 A number of off-shore elements will be required but these are outside the scope of this WSI and are therefore not considered here.

Site Location

2.5 The Proposed Scheme for the terrestrial elements comprises four areas known as Main Site, the Pipeline Corridor, the Storage Tank Area, and the Temporary Construction Area which together cover approximately 47.37ha of mixed-use land alongside Kings Road and Queens Road (both the A1173 road) at Immingham (Figure 1). The Proposed Scheme site is generally flat and is situated below the 2m contour.

2.6 The wider landscape is characterised by mixed industrial and commercial development with industrial estates to the south of the site and business park estate to the north-east. The docks comprise several operational areas, with bulk commodities such as liquid fuels, solid fuels, and ores, as well as freight, being handled from in-river jetties.

Main Site

2.7 The Main Site (approx. 21.79ha) is formed by three former agricultural fields used as farmland which are bounded by linear hedgerows and minor drainage ditches. It is centred on National Grid Reference (NGR) TA 19890 14605. The northern boundary of the site is defined by Kings Road (A1173) and an electrical sub-station in the north-western corner and is demarcated by a wire fence. Queens Road (also A1173) runs along the eastern boundary with residential and commercial properties adjacent to the site. A short tarmac access road has been constructed from Kings Road into the site.

2.8 A series of overhead power cables run across the middle and southern boundary of the site with a mains water and gas pipe also along the southern boundary.

Pipeline Corridor

2.9 The Pipeline Corridor (approx. 3.95ha) crosses an area that has mostly already been impacted by industrial development alongside Queens Road, including parts that are currently unused. At the eastern end the corridor continues along the edge of a narrow belt of woodland between Laporte Road and the Humber Estuary and is under a Tree Protection Order. It is centred on NGR TA 20646 15035.

Storage Tank Area

2.10 The Storage Tank Area (approx. 8.91ha) is a former works site / storage area within Immingham Port which is currently covered in hardstanding. It is centred on NGR TA 20874 15355.

Temporary Construction Area

2.11 The Temporary Construction Area (approx. 12.81ha) is situated at the eastern end of the scheme and is an agricultural field situated on NGR TA 21296 15324.

Geology and Soils

2.12 The British Geological Survey (BGS) web-based Geology of Britain Viewer indicates that the geology within the Proposed Scheme site is characterised by superficial deposits of river and estuarine Alluvium (clay, silt and sand) that formed up to 2 million years ago in the Quaternary Period and tidal flat deposits (clay and silt). The underlying bedrock is Sedimentary chalk Bedrock. The alluvium formed in an environment dominated by rivers with fine silt and clay deposited from overbank floods and some bogs depositing peat.

2.13 The Soil Survey of England and Wales soil association mapping (Soil Survey of England and Wales, 1984) (1:250,000 scale) describes the soils a loamy and clayey soils of coastal flats with naturally high groundwater, characteristic of wet brackish coastal flood meadows.

2.14 Historic boreholes from the BGS viewer that were drilled in 1937 / 1938 along the southern side of the Main Site indicate topsoil and clay to a depth of over 5 feet and sealing peat (4 feet thick) over a sequence of silt, boulder clay and chalk (borehole references TA21SW91, TA21SW278).

Archaeological Background

2.15 The archaeological background of the Proposed Scheme and a 1.6km study area, 2km for designated heritage assets, including previous archaeological investigations, has been presented in detail as part of a Heritage Desk-Based Assessment (AECOM, July 2022). The following baseline information is summarised from this document.

2.16 There are no World Heritage Sites, scheduled monuments, Grade I or II* listed buildings, conservation areas, registered parks and gardens, registered battlefields or protected wreck sites within the 2km study area for designated heritage assets.

2.17 There is one Grade II listed building located within the 2km study area (approx. 1.57km to the north-west), namely the Immingham War Memorial [NHLE 1455139] which is located at the junction with Humberville Road.

2.18 The earliest evidence of prehistoric date is a pair of ditches. These were found to contain flintwork of Neolithic (4,000 – 2,500 BC) or Bronze Age (2,500 – 700 BC) origin and may have been dug to flank a trackway. This suggests prehistoric occupation in the area.

2.19 A high-status Roman settlement and industrial site (AD 43 – 410) has been recorded at Stallingborough Interchange. Undated cropmarks of rectangular ditched enclosures could form part of the Roman landscape.

2.20 There are no assets of early medieval date (AD 410 – 1066) within the study area.

2.21 There is evidence for medieval (AD 1066 – 1540) settlement activity within the study area. A possible deserted medieval settlement near Mauxhall Farm is visible on aerial photography, including ridge and furrow cultivation features, trackways, and possible building platforms. Ridge and furrow are recorded at Stallingborough. Alluvial layers show that the site was prone to flooding and were perhaps farmed rather than inhabited.

2.22 Aerial photography has recorded the remains of post-medieval (AD 1540 – 1900) field boundaries and narrow ridge and furrow cultivation features at Harborough Marsh. They also recorded the presence of either singular or a series of drainage ditches. A series of historic road and trackways of post-medieval date are recorded on the early Ordnance Survey (OS) maps which may have their origins in the medieval period. These include North Moss Lane, Kiln Lane and Laporte Road, amongst others.

2.23 Several woodland features are shown on historic OS maps, including Long Strip and Fox Covert. Other landscape features are also recorded, including an osier (willow plantation) at Reeds Meer, a mere at Stallingborough, and a blow well (spring) also at Stallingborough.

2.24 Aerial photographs and historic OS maps record historic flood defences across the study area, including at Immingham, Kiln Lane Trading Estate, and at Harborough Marsh. Historic OS maps also record the presence of several features associated with coastal navigation and transportation, including Stallingborough Ferry and the site of a coastguard station. The maps show several buildings that reflect the rural and coastal character of the area prior to the development of the docks.

2.25 Immingham Dock was established by the Humber Commercial Railway and Dock Company in association with the Great Central Railway. A temporary settlement or workers' village was established at Immingham comprising a series of corrugated tin huts, known as Tin Town, for the dock construction workers.

2.26 Construction of the dock began in 1906 and was complete by 1912. Features that are associated with the historic development and operation of the docks include a coaling stage and a former grain store. In addition, there are several records relating to the use and expansion of the transportation infrastructure associated with the dock and port at Immingham. During World War I the dock was a submarine base for British D-class submarines. This was later used for cruise ships in the 1930s.

2.27 There are numerous features relating to World War II activity in and around the docks at Immingham, including gun emplacements, anti-landing obstacles, barrage balloon sites, and other buildings and installations. Evidence of German bombing raids is also represented by several lines of small circular hollows on aerial photographs.

2.28 In the second half of the 20th century the docks expanded with the construction of east and west jetties and the addition of several deep-water jetties for bulk cargo. Immingham Oil Terminal jetty was constructed in 1969 on the banks of the Humber, west of the dock entrance, whilst Immingham Bulk Terminal was commissioned in 1970 for the export of coal and the import of steel. In 1985 the Immingham Gas Jetty was opened.

2.29 There are several undated cropmark sites recorded on the HER, including an area of enclosures or natural features, a sub-circular feature, possible a prehistoric ring ditch or another natural feature, and linear features to the south of Kiln Lane Industrial Site. Undated peat deposits were recorded in a historic geological borehole alongside North Beck Drain.

2.30 Geophysical survey within part of the DCO site boundary did not identify any significant archaeological features. However, various anomalies were detected which likely relate to buried paleoenvironmental features (former tidal channels and pools), although it is possible some could relate to possible medieval salt production sites and salterns. Recent former land boundaries, land drains, services and ground disturbance were also identified.

2.31 The Proposed Scheme is located in the coastal marsh character zone, which is dominated by industrial works, particularly installations related to the petrochemical industry and docks at Immingham. Only the western part of the DCO site boundary retains any historic character which is related to post-medieval agriculture.

Previous Archaeological Investigations

2.32 There have been several archaeological reports written for development within the 1.6km study area, including desk-based assessments, archaeological geophysical surveys, archaeological monitoring / watching briefs, archaeological evaluation, trial trenching, archaeological excavation and historic building recording (refer to the Desk-Based Assessment, Appendix A, table A.1). work directly relevant to the Proposed Scheme include the following:

- In 2011 an archaeological geophysical survey on land next to Queens Road (east of the Main Site) recorded mostly variations reflecting the presence of modern features, including boundary fencing, a gas pipeline and miscellaneous ferrous rich objects (Pre-Construct Geophysics, 2011).
- In 2013 a desk-based assessment for a Proposed Scheme at the Main Site concluded a high potential for late post-medieval and modern land management features; moderate potential for Neolithic to Romano-British environmental and organic remains within waterlogged contexts, a

low potential for Iron Age to Romano-British activity; and a low potential for medieval and post-medieval activity, including salt making industry (ECUS Ltd,2013).

- Subsequent archaeological geophysical survey at the Main Site (Bunn, 2013) identified various anomalies which likely relate to buried paleoenvironmental features (former tidal channels, pools and salt marsh). Some of the feature identified could relate to possible medieval salt production sites on the edge or close to the former tidal channels. Recent former land boundaries, land drains, services and ground disturbance were also identified.
- In 2018 an archaeological geophysical survey at Mauxhall Farm, Stallingborough (1.4km to the south-west of the Proposed Scheme) identified possible archaeological anomalies, including potential enclosures and medieval ridge and furrow (APS, 2019).
- Further survey work at Mauxhall Farm (metal-detection and fieldwalking) combined with archaeological evaluation trial trenching recorded remains of prehistoric to Roman date (APS, 2020).

3. Aims and Scope of Archaeological Works

3.1 This WSI sets out the methodology and protocols for a programme of archaeological work that comprises:

- Archaeological watching brief of Geotechnical Investigations (GI) work (Main Site, Pipeline Corridor, Storage Tank Area);
- Geoarchaeological Boreholes (Main Site, Pipeline Corridor);
- Archaeological Trial Trenching (Main Site, possibly Temporary Construction Area); and
- Geophysical Survey (Temporary Construction Area).

3.2 The scope of the archaeological works is to be agreed in consultation with the Archaeological Officer for North East Lincolnshire.

3.3 It is preferable that the Archaeological Contractor has a member of staff available for the project with experience of salterns. The Archaeological Officer for North East Lincolnshire has seen such features mistakenly identified in the past and subsequently has noted this requirement as a preference.

Archaeological Watching Brief of Geotechnical Investigations

3.4 A series of GI boreholes and test pits will be excavated across the Main Site, Pipeline Corridor (excluding the area under a Tree Protection Order (TPO)) and in the Storage Tank Area. This work is being organised and managed by the Principal Contractor using a third-party specialist (the GI Contractor).

3.5 These comprise cable percussion boreholes, cone penetration tests, trial pits and electrical resistivity tests. It is expected this work will begin in early October 2022 and last for approximately 14 weeks (this is not confirmed and subject to change).

3.6 The Archaeological Contractor shall provide a geoarchaeological specialist to be present on site to observe the excavation of the GI works.

3.7 The health, safety and welfare facilities for this work shall all be provided by the Principal Contractor and/or the GI contractor. The Geoarchaeologist will need to sign on to any health and safety documents on-site. The Archaeological Contractor will produce a Risk Assessment and Method Statement (RAMS) and archaeological method statement for the geoarchaeological works. Refer to the Health and Safety section below for information on the production of risk assessment, method statement, and site inductions. The Principal Contractor and/or GI Contractor shall provide the Archaeological Contractor with information regarding access points etc.

3.8 The GI Contractor shall provide to the Archaeological Contractor, via the Archaeological Consultant, the logs from all GI investigations across the site as soon as they are available. The Geoarchaeologist must include this information in the archaeological report.

3.9 The broad objectives of the GI Archaeological Watching Brief are to:

- minimise or mitigate impact to archaeological remains identified through avoidance;
- assess the depth of topsoil and subsoil overlying deposits within which archaeological remains may occur;
- record the character and sequence of the deposits within each GI intervention;
- inform the baseline evidence for any Environmental Impact Assessment that would be carried out for the proposed scheme; and,
- provide information that may assist in development of an appropriate archaeological strategy as the proposed scheme progresses.

Geoarchaeological Boreholes

3.10 Three transects of geoarchaeological boreholes will be excavated, totalling 37 points – two transects in the Main Site and one along the Pipeline Corridor (excluding the TPO area) (Figure 3, Table 1). This work will be undertaken in conjunction with the GI work.

Table 1 Borehole Transects

Transect Number	Borehole Numbers
Transect 1 (Main Site)	BH1 – BH13
Transect 2 (Mian Site)	BH14 – BH 25
Transect 3 (Pipeline Corridor)	BH26 – BH37

3.11 The Archaeological Contractor will provide the equipment and Geoarchaeologist required to allow clean cores to be extracted and competently assessed. It is expected that the Geoarchaeologist shall use the site facilities (welfare etc.) of the GI Contractor and sign on to any health and safety documents on-site (refer to the Health and Safety section below).

3.12 The Archaeological Contractor shall provide a Geoarchaeologist to direct the geoarchaeological work on site and undertake any relevant lab and analysis works on the cores off-site at the Archaeological Contractor's suitable facility. The Geoarchaeologist shall provide their assessment for inclusion in the archaeological report.

3.13 The objectives of the Geoarchaeological Boreholes are to:

- identify the presence of peat deposits within the redline boundary of the Scheme;
- assess the geoarchaeological potential of the peat deposits if present;
- produce a geoarchaeological deposit model of the site to detail the sequence and distribution of sub-surface deposits across the area;
- determine the location, nature, extent, date, state of preservation, significance, and complexity of geoarchaeological and paleoenvironmental sequences;
- provide information within the limitations of the investigation, regarding the paleoenvironmental and the paleo-topography of the site and place the results into the context of the wider landscape; and,
- aid further evaluation and understanding of the archaeological potential within the Proposed Scheme limits.

Geophysical Survey (Magnetometry)

3.14 The Temporary Construction Area (Figure 1) has not been subjected to previous archaeological investigation. Therefore, a detailed magnetometry survey covering 12.81ha shall be conducted across this area. Care must be taken due to the recorded presence of World War II activity and at least one likely bomb crater (refer to Unexploded Ordnance (UXO) section of this WSI).

3.15 The Archaeological Contractor will provide a suitably qualified team to undertake the survey. They will also provide a suitable report (see Section 7 below). The results of the survey will be used to make a recommendation in the report whether further archaeological investigations are required.

3.16 The objectives of the detailed magnetometry survey are:

- to identify the presence or absence of magnetically anomalous archaeological features within the site; and,
- if such features are recorded, to define the extent and (where possible) the nature of such anomalies in order to advise the requirement/s for further archaeological evaluation.

Archaeological Trial Trenching

3.17 The scope of the archaeological trial trenching is based on a general principle of 3% coverage across the area of the Main Site resulting in a total of 108 trenches, with a 1% contingency (equivalent to approx. 2169.89sqm). Trenches are 30m long by 2m wide and shall go to a depth suitable for exposing and excavating the archaeology. The trench layout is included as Figure 2.

3.18 Other areas of the Proposed Scheme are being investigated using other more suitable archaeological techniques.

3.19 Three trenches (T1, T3 and T4) have been targeted at possible archaeological features identified on the geophysical survey (Pre-Construct Geophysics, 2011), possibly medieval salterns. Two trenches (T1 and T2) have been designed to cross from outside of the likely palaeochannel, partly into the line of the channel itself – one from the northern side and one from the southern side. The trenches and their dimensions are listed below in Table 2.

Table 2 List of Trenches

Trench Number	Dimensions	Targeted?
T1	30m x 2m approx.	Yes – paleochannel and geophysical anomaly, possible saltern
T2	30m x 2m approx.	Yes - paleochannel
T3	30m x 2m approx.	Yes – geophysical anomaly, possible saltern
T4	30m x 2m approx.	Yes – geophysical anomaly, possible saltern
T5 – T108	30m x 2m approx.	No

3.20 The aim of the archaeological trial trenching investigation is to provide further information on the archaeological resource within the Proposed Scheme boundary.

3.21 The general objectives of the archaeological trial trenching are to:

- assess the presence or absence of surviving archaeological remains within the Main Site;
- assess the location, nature, extent, date, condition, state of preservation, significance and complexity of any archaeological remains;
- assess the likely range, quality, and quantity of artefactual and environmental evidence present;
- inform a strategy for any required archaeological mitigation via recording, preservation and/or management of identified assets;
- interpret any archaeological remains identified within its local, regional, and national archaeological context; and,
- assess the potential the Site has to address research questions set out in the North East Lincolnshire Local Plan 2013 to 2032 (North East Lincolnshire District Council, 2018).

3.22 The presence or absence, nature and significance of archaeological deposits identified during the archaeological evaluation will be utilised to guide further mitigation and research specifications, to inform the requirement for and scope of any archaeological mitigation that may be required.

3.23 The fieldwork will be carried out in accordance with the Chartered Institute for Archaeologists (CIfA) Standards and Guidance for Archaeological Field Evaluation (2020a) and Code of Conduct (2021).

4. Methodology of Archaeological Works

General Requirements

4.1 All archaeological works will be carried out in accordance with this WSI and any further instructions from the Principal Contractor. This WSI takes account of the guidance provided by the Chartered Institute for Archaeologists (CIfA) Code of Conduct (CIfA, 2021), the Standard and Guidance for Archaeological Field Evaluation (CIfA, 2020a), and other current and relevant good practice and standards and guidance (refer to Appendix A).

4.2 The Archaeological Contractor will undertake the works according to this WSI and any subsequent written variations. No variation from or changes to the WSI will occur except by prior agreement with the Archaeological Consultant and in consultation with the Archaeological Officer for North East Lincolnshire.

Archaeological Watching Brief of Geotechnical Investigations (GI)

4.3 The Archaeological Contractor shall provide a suitably qualified Geoarchaeologist to monitor the GI investigations. The GI logs will be provided to the Geoarchaeologist for consideration against these results and those of the geoarchaeological boreholes. The scope of the GI monitoring is:

- Geoarchaeological monitoring of all GI investigation points; and,
- The assessment, interpretation and reporting of the results, utilising the geotechnical contractor's logs and the results of soil sample assessment and analysis, where appropriate, along with the results from the geoarchaeological boreholes.

4.4 Archaeological monitoring is to extend to a depth no greater than the lowest Holocene deposits of archaeological interest, whilst the geoarchaeological recording and sampling is to extend to the lowest Pleistocene deposits of geoarchaeological significance. The Principal Contractor will provide a plan of the geotechnical works to the Archaeological Contractor and the Archaeological Consultant prior to the start of the works.

4.5 The monitoring of starter/inspection pits for cone penetration tests, boreholes or windowless samples will not be undertaken. The location of all known archaeological assets, as provided by the datasets discussed above, will be taken into account during the siting of the GI works and individual exploratory investigations may be moved in order to avoid known archaeological resources. Any such relocation will be undertaken with the advice of the Principal Contractor and Archaeological Consultant and have been approved by the Client.

4.6 All access to and welfare for the site will be provided by the GI Contractor, the Geoarchaeologist must sign on to any health and safety paperwork required by the GI team and the Principal Contractor on site. The Archaeological Contractor will also produce a RAMS document for the watching brief of the geotechnical works (see the Health and Safety section of this WSI). This will be approved by the Principal Contractor prior to the start of the works.

4.7 The Archaeological Contractor will complete a daily monitoring *pro forma* for each monitored GI intervention. The *pro forma* will include the GI intervention number monitored, a brief summary of observations and/or field notes, and the time and date of monitoring. These will be submitted to the Archaeological Consultant every Monday for the previous week and be appended to the report (see Section 7 below).

4.8 The Archaeological Contractor shall record the date, time and duration of all archaeological monitoring site visits until the work is completed and shall ensure that all site records and finds are kept secure at all times, conserved and archived to the required standards (Appendix A).

4.9 The GI investigations will be excavated by the GI contractor using an appropriate mechanical excavator. The GI contractor will be responsible for identifying the presence of services and ensuring it is safe to excavate.

4.10 Excavation of trial pits will proceed with a toothless ditching bucket under direct archaeological supervision, in level spits, until either the top of the first archaeological horizon or undisturbed natural deposits are encountered (the top of the sterile non-alluvial natural geological deposits). The GI Contractor will need to sample natural geological deposits below the level at which archaeological deposits occur. When the excavations have proceeded beyond the lowest potential archaeological horizon into undisturbed natural strata, the archaeological monitoring for that trial pit shall be deemed to be complete.

4.11 The GI Contractor shall provide a suitable and safe position from which the Archaeological Contractor can effectively view the excavation of the investigations. If archaeological remains are encountered, the machine excavation will cease to allow observation by the Archaeological Contractor. It is not proposed that the Archaeological Contractor should enter the excavations to investigate archaeological remains. All recording should be carried out from a safe position and follow the site rules set out by the Principal Contractor and the GI Contractor.

4.12 Archaeological recording will consist of:

- the collection of dating evidence from relevant archaeological deposit arisings and visual scanning of spoil heaps for dateable artefacts;
- where safe and practicable, a scaled drawn record of representative exposed sections and surfaces;
- photographs of exposed deposits within the trial pits, with an appropriate scale, and sufficient further photographs to establish the setting of the groundworks undertaken; and,
- a record of the datum (either m above Ordnance Datum or m below ground level) levels of the archaeological deposits to be provided by the GI Contractor.

4.13 Where no archaeological remains are encountered, a photographic record will be taken of the trial pit or trench and a written description with sketch section will be produced.

4.14 All photographs will be taken with a digital camera using a resolution of at least 10 megapixels.

4.15 If in the opinion of the monitoring archaeologists, archaeological remains of high significance are encountered, or if they include evidence for funerary activity, work will cease, the Archaeological Consultant will be notified, and all parties shall follow the procedure set out below for the discovery of human remains (see Human Remains section of this WSI).

4.16 The primary aim of the monitoring is to identify and record any archaeological or paleoenvironmental remains and geoarchaeological deposits present within selected GI investigations, and to minimise impact to significant remains through avoidance. If significant remains are identified then the GI investigation point will be relocated.

Geoarchaeological Boreholes

4.17 All elements of the investigation will be carried out to an acceptable archaeological standard in accordance with the relevant Chartered Institute for Archaeologists standards and guidance (Appendix A).

4.18 The work will also be guided by the recommendations that are outlined in *'Environmental Archaeology: A guide to the theory and practice of methods, from sampling and recovery to post-excavation'* (English Heritage, 2011); and *'Geoarchaeology: using earth sciences to understand the archaeological record'* (Historic England, 2015).

4.19 A qualified Geoarchaeological Specialist or organisation capable and qualified to undertake the survey will be used by the Archaeological Contractor.

4.20 The Archaeological Contractor shall prepare and submit a separate method statement, programme and risk assessment for each of the elements of investigation prior to the commencement of the fieldwork (one of each document type for the Archaeological Trial Trenching and for the Geoarchaeological Investigations). The method statements shall be submitted to the Archaeological Consultant, the Principal Contractor and the Archaeological Officer for North East Lincolnshire for their review and approval.

4.21 The Principal Contractor will provide the Archaeological Contractor with georeferenced Ordnance Survey mapping for the works area, and the proposed scheme layout.

4.22 The Principal Contractor shall provide a PAS128 survey to the Archaeological Contractor prior to the start of the works for inclusion in their RAMS document. The Principal Contractor shall issue a permit to dig to the Archaeological Contractor prior to the excavation of the geoarchaeological boreholes. The Archaeological Contractor will be responsible for checking each excavation location immediately prior to the start of the geoarchaeological works using a CAT Scan.

4.23 The location of each core will be set out by the Archaeological Contractor surveyors and shall be surveyed and levelled in three dimensions to ordnance Survey Grid and Ordnance Datum (OD) to an accuracy of ± 100mm.

4.24 Prior to the start of investigation, the Archaeological Contractor will review the geology and soil description.

4.25 A hand core using a gouge type auger of 20mm or 30mm diameter and sampling chamber 1m in length will be used. Extension rods will be provided which will allow a maximum depth of penetration of up to 5m. each core will be drilled under the supervision of a Geoarchaeologist to a maximum depth of 5m or to the natural sterile geology that underlies the site. If appropriate, a starter pit will be manually excavated prior to the start of the core. The Geoarchaeologist will keep a field log of completed cores and a photographic record of each sampling location.

4.26 The sequence of sediment recovered in each core will be described on site, with the nature (where possible) and depths of the interfaces between the difference sediment units noted. The description shall comprise preliminary interpretation of the soil and sediment characteristics of the units and an overview of the stratigraphy that will characterise the deposit sequence and identify soil / sediment processes. The Geoarchaeologist will use their professional judgement to determine whether any sub-sampling or dating strategies are required and undertake them.

Geophysical Survey (Magnetometry)

4.27 All survey work will be carried out in accordance with this WSI and current good practice EAC Guidelines for the Use of Geophysics in Archaeology (Schmidt et al. 2016); the standards and guidance prepared by the Chartered Institute for Archaeologists (CIfA 2020a), the CIfA Code of Conduct (CIfA 2021); and other current and relevant best practice and standards and guidance (refer to Appendix A).

4.28 The survey shall be undertaken within a grid independently re-locatable on the ground by a third party, by measuring to a permanent feature. Historic England recommends a positional accuracy of ±10cm or better for locating geophysical survey grids. This will be achieved using dGPS equipment capable of receiving correctional data in real time. The chosen Archaeological Contractor shall be able to demonstrate they can achieve this accuracy giving detail of the equipment they will be using. Where required, the Archaeological Contractor must ensure that any survey stations are tied into permanent landscape features recorded on the latest Ordnance Survey edition to enable the accurate relocation of archaeological anomalies detected by survey.

4.29 An alternative, non-gridded survey method, such as the use of a cart, may be considered by the Archaeological Contractor to be more suitable for the survey.

4.30 The survey will be undertaken by an experienced operator to provide consistent results with regard to pattern recognition and to provide initial screening of noise resulting from recent ferrous disturbance and local magnetic pollution.

4.31 A detailed geophysical survey should be undertaken using a fluxgate gradiometer, utilising traverses of 1m with readings taken at intervals of 0.25m within a 20m x 20m or 30m x 30m survey grid. If it becomes evident that discrete features such as post-holes exist in some areas, it may be necessary to reduce the traverse width to 0.5m. the data should be downloaded at regular intervals on-site into a laptop computer for initial processing and storage. This will ultimately be transferred to a desktop computer for further processing, interpretation and archiving. Geoplot v.3 software (or comparable) will be used to interpolate the date to form an array of regularly spaced values at 0.25m x 0.25m intervals. Continuous tone greyscale images of raw data and an x/y trace plot will also be produced. Palette bars relating to the greyscale intensities to anomaly values in ohms will be included with the images.

4.32 The actual areas of survey, and any features of possible archaeological, paleoenvironmental and/or geoarchaeological interest, should be accurately located on a site plan and recorded in a written description sufficient to permit the preparation of a report on the site.

4.33 During fieldwork, a record should be made of surface and weather conditions and sources of modern geophysical interference that may have a bearing on subsequent interpretation of field data.

4.34 The interpretation of survey data must be undertaken by a competent archaeological geophysicist who is knowledgeable of the archaeological and geomorphological conditions prevailing on the site.

4.35 A clear distinction must always be made between interpretation that is scientifically demonstrable and interpretation based on informed speculation.

Archaeological Trial Trenching

Specific Requirements for the Principal Contractor

4.36 The Principal Contractor will provide a programme of estimated date and time at each trench location and will arrange land access with the landowner. They will determine access protocol and any specific requirements the landowner may have regarding arisings storage or re-instatement. Designated routes into and out of the area(s) will be identified and will be adhered to at all times.

4.37 The Principal Contractor will be required to make contact with the land access co-ordinator, to arrange land access. The Principal Contractor will also be required to provide an onsite contact that can be provided to the landowners in the event of questions or concerns regarding the works. This may be a member of the archaeological onsite team.

4.38 The archaeological works shall not extend beyond the specified extent shown on Figure 2.

4.39 The Principal Contractor will notify the Archaeological Consultant immediately of any areas that cannot be excavated and will provide clear explanation for the situation.

4.40 The Principal Contractor will provide the Archaeological Contractor with any available details for known overhead or buried services, including a PAS128 survey prior to the start of works for inclusion in their RAMS document. Utility plans should be dated no older than three months and updated searches for services may need to be carried out by the Principal Contractor. Refer to the Health and Safety section of this WSI. The Principal Contractor shall issue a permit to dig to the Archaeological Contractor prior to the excavation of the trial trenches. The Archaeological Contractor will be responsible for checking each excavation location immediately prior to the start of the trial trenching works using a CAT scan.

4.41 The Principal Contractor is responsible for providing:

- Suitable welfare facilities.
- Mechanical excavator(s) suitable to cleanly excavate the trial trenches, with driver(s). the machine will need to be fitted with a toothless ditching bucket to reduce each trench under the archaeological supervision of the Archaeological Contractor.
- Appropriate safety fencing and edge protection for each trench.
- A PAS128 survey and information prior to the start of works.
- Information regarding access and egress.
- A UXO survey by a competent specialist.

4.42 The Principal Contractor will provide the Archaeological Contractor with any available details for site specific hazards including the presence of contaminated land or the threat of unexploded ordnance and will brief the Archaeological Contractor as to their location and the process for dealing with these issues on the site.

4.43 Access to the site and instruction for suitable and safe access/egress will be arranged by the Principal Contractor and communicated to the Archaeological Contractor by the Archaeological Consultant.

4.44 The Principal Contractor will allow for adequate time for the trenches to be archaeologically investigated and any surviving archaeological remains to be excavated and recorded.

Specific Requirements for the Archaeological Contractor

4.45 The Archaeological Contractor shall prepare and submit a separate method statement, programme and risk assessment for each of the elements of investigation prior to the commencement of the fieldwork (one of each document type for the Archaeological Trial Trenching and for the Geoarchaeological Investigations). The method statements shall be submitted to the Archaeological Consultant, the Principal Contractor and the Archaeological Officer for North East Lincolnshire for their review and approval.

4.46 The Principal Contractor will provide the Archaeological Contractor with georeferenced Ordnance Survey mapping for the works area, and the proposed scheme layout.

4.47 To ensure the successful completion of the archaeological trial trench evaluation, the Archaeological Contractor will:

- provide a method statement and risk assessment inclusive of a safe method of working (see Health and Safety section of this WSI);
- provide suitably qualified and competent staff who have valid Construction Skills Certification Scheme (CSCS) cards. In addition, the project manager should ideally be a named Member of the Chartered Institute for Archaeologists (MCIfA) who is adequately qualified to manage the required archaeological work in line with the guidance set out in the CIfA Code of Conduct (2021) or can demonstrate an equivalent level of competence;
- provide and monitor/maintain safe access into the trial trenches. No staff are to enter the trenches if it is declared unsafe by any competent person or the archaeological site supervisor;
- provide suitably qualified archaeologists, experienced in archaeological investigation, recording and the nature of archaeological deposits which are expected on this site;
- work with the Contractor and the Consultant to safely complete the archaeological site works;
- provide all hand tools and recording materials required to complete the archaeological evaluation; and
- ensure that during the archaeological trial trench evaluation the extent of any surviving archaeological deposits are mapped, and that any surviving archaeological remains are hand cleaned, defined and sample excavated, sufficient to determine their type, plan, form and relationships and that these are recorded. The archaeology should be characterised, and the significance and extent of the archaeology encountered, determined.

4.48 The Archaeological Contractor is required to make a photographic record of the access routes and trench locations before and after the trenching works in each location.

Ecological Considerations

4.49 Consultation with the Principal Contractor's ecology and landscape consultants has identified the following constraints to machine excavation:

- a 3m stand-off from hedgerows will be maintained;
- the stand-off area for trees will comprise the extent of the canopy plus 3m;
- trees within hedgerows will also require the stand off to comprise the extent of the canopy plus 3m; and,
- a 10m stand-off will be maintained from all water courses.

4.50 The Temporary Construction Area is a high risk area for coastal birds under the Special Protection Area for the estuary. Therefore, the following condition will apply:

- The geophysical survey shall avoid two hours either side of the high tide time and only be conducted outside of that window.

4.51 The ecological constraints for hedgerows, trees and water courses are shown on Figure 4.

4.52 All ecological considerations outweigh the location of the trenches. Trenches shall be relocated or shortened, if necessary, to observe the ecological and landscape considerations. However, the trench location design has taken these considerations into account as far as possible at this stage.

Utilities Constraints

4.53 The utilities constraints are shown on Figure 4. It is the responsibility of the Principal Contractor to ensure an up-to-date PAS128 survey is undertaken prior to the start of the archaeological works and to ensure the information is provided to the Archaeological Contractor for inclusion in their RAMS documentation. It is the responsibility of the Archaeological Contractor to check it is safe to proceed prior to the start of excavation using a CAT Scan. Refer to the Health and Safety section of this WSI.

Machine Excavation

4.54 All trial trenches will be excavated at the locations indicated in Figure 2. The trenches shall be positioned to an accuracy of ± 100mm of the specified trench location using survey-grade GPS or equivalent metric-survey equipment.

4.55 Each trench location will be scanned by the Archaeological Contractor using a Cable Avoidance Tool (CAT scanner) and Genny prior to and during the excavation (mechanical excavation and hand excavation) to ensure that no live services are present.

4.56 Each trench will be opened under direct archaeological supervision using an appropriate mechanical excavator fitted with a toothless ditching bucket. Where necessary recent concrete or tarmacadam surfacing will be broken out and stored separately from other arisings.

4.57 All trenches shall be excavated to the dimensions indicated in Table 2. These dimensions are for the base of the trench. Where necessary to achieve this the trenches will be stepped to ensure stability and safety of the excavation and that safe access/egress and working conditions are maintained.

4.58 The arisings from the archaeological works will be stored adjacent to each trench (within a safe working distance) and will be separated according to material, (i.e. topsoil separated from subsoil).

4.59 The excavation will proceed under direct archaeological supervision, in broadly level spits of no more than 200mm, until either the top of the first archaeological horizon or undisturbed natural deposits are encountered. Particular attention should be paid to achieving a clean and well-defined horizon with the machine. It is not anticipated that entire trenches will require hand cleaning. Under no circumstances should the machine be used to cut arbitrary trenches down to natural deposits. The surface achieved through machine excavation will be inspected for archaeological remains. The mechanical excavator will not traverse any stripped areas.

4.60 If important concentrations of artefacts suggestive of significant activity are uncovered during machining, these should be left *in situ* in the first instance and investigated using hand tools only.

4.61 Machined surfaces will be cleaned by hand sufficiently to allow acceptable definition of the archaeological remains. Following cleaning, all archaeological remains will be planned, to enable the selection of features and deposits for sample excavation by the Archaeological Contractor.

4.62 The trenches will be clearly demarcated and secured with appropriate barrier fencing if required by the Archaeological Contractor or the Principal Contractor. Any required fencing will be supplied by the Principal Contractor, to ensure that persons or plant cannot inadvertently traverse across the area of investigation whilst archaeological works are in progress. The fencing will be regularly inspected and maintained by the Principal Contractor until works in each area have been completed.

4.63 Due to the possibility of encountering field drains during machine excavation, the Principal Contractor will ensure that any field drainage pipes damaged during the excavation are repaired prior to backfilling and that the landowner or tenant has opportunity to inspect the repairs.

4.64 The Principal Contractor will ensure there is a suitable pump/s available in the event of water in the trenches. This is most likely to occur from upward seepage from the high water table in the area. In the event of wet trenches, only essential personnel are to enter the trench at any one time to limit any accidental trampling of any archaeological features present.

4.65 Trenches will be fenced as required on the following criteria:

- 0.50m depth → cones and tape.
- 0.50m – 1.50m depth → based on site conditions and updated RAMS.
- >1.50m → HERAS type fencing.

4.66 If the Archaeological Contractor determines that any trench needs to be deeper than 60cm to achieve the objectives, then they shall consult directly with the Principal Contractor who shall provide a safe means of working to achieve the required depth. The Archaeological Contractor shall keep the Archaeological Consultant informed. The Principal Contractor shall provide the Archaeological Contractor with the means to pump water from the trenches as required. The Principal Contractor will acquire all relevant permissions to undertake the pumping with the relevant ecological advice.

4.67 The Archaeological Consultant shall make regular visits to the Site and will enable the Archaeological Officer for North East Lincolnshire to visit as and when necessary as well as any other necessary specialists e.g. from Historic England.

Hand Excavation

4.68 Any archaeological deposits/features identified will be cleaned and hand excavated in an archaeologically controlled and stratigraphic manner, sufficient to meet the aims and objectives of the investigation. Hand excavation will initially be targeted to provide information on the form, function and date of the feature. Stratigraphic relationships between features will be investigated and recorded.

4.69 The following sampling strategies will be employed for hand excavation:

a) **Linear features**: A minimum sample in length not less than 1m long, where the depositional sequence is consistent along the length. Multi-phase linear features with complex variations of fill type will be sampled sufficiently in order to understand the phasing and sequence of deposition. Where possible one section will be located and recorded adjacent to a trench edge. If appropriate all intersections will be investigated to determine the relationships between features. All termini will be investigated.

b) **Discrete features**: Pits, post-holes and other isolated features will normally be half-sectioned. A minimum requirement to meet the project objectives will be agreed in consultation with the Consultant. If large pits or deposits (over 1.5m diameter) are encountered, then the sample excavated should be sufficient to define the extent and maximum depth of the feature and to achieve the objectives of the evaluation but should not be less than 25%.

c) **Structures**: Each structure will be sampled sufficiently to define the extent, form, stratigraphic complexity and depth of the component features and its associated deposits to achieve the objectives of the evaluation. All intersections will be investigated to determine the relationship(s) between the component features. The remains of all upstanding walls will be hand cleaned sufficient to understand their dimensions, extent, composition, sequence and relationships.

d) **Flint scatters**: in particular, where these are associated with buried land surfaces, these will require hand cleaning and three-dimensional plotting prior to recovery;

e) **Timber structures and artefacts**: will require expert recording and conservation until they are assessed fully.

Recording

4.70 The perimeter of each trench and all archaeological remains within the trenches will be recorded in plan using metric survey-grade equipment (or its equivalent).

4.71 A full written, drawn, and photographic record will be made of each trench, even where no archaeological features are identified. Hand drawn plans and sections/elevations of features/ structures will be produced at an appropriate scale (normally 1:50 for plans and 1:10 or 1:20 for sections/elevations). A representative section of each trench will be drawn at a scale of not less than 1:50 but only after the features within the trench have been excavated. All plans and sections will include spot heights relative to Ordnance Datum in metres, correct to two decimal places.

4.72 Photography (digital, colour transparency and / or monochrome negative photographs) will be taken in line with current industry good practice and the requirements of the local authority (refer to Appendix A). In addition to records of archaeological features, a number of general site photographs will also be taken to give an overview of the site. Particular attention should be paid to obtaining shots suitable for displays, exhibitions and other publicity.

Backfilling

4.73 The trial trenches will not be reinstated without the prior approval of the Archaeological Consultant (as a minimum) and the Archaeological Officer for North East Lincolnshire (if required), although in exceptional circumstances backfilling will be permitted on health and safety grounds. The trenches will only be

backfilled by machine when conditions are appropriate and with direct archaeological supervision. Arisings will be returned strictly in the correct sequence and will be compacted.

4.74 Where services and drains are encountered during the archaeological works, these will be left *in situ* and retained on a suitable raised earth baulk. At the end of the investigations, they will be carefully covered with soil arisings from the excavations and consolidated using hand tools to avoid damage during the backfilling process.

4.75 The Archaeological Contractor shall use their professional judgement to recommend in writing (by email) the abandonment of any trench in the event the conditions become unsuitable. They shall make this recommendation to the Archaeological Consultant who will confirm it with the Client and the Archaeological Officer for North East Lincolnshire. The Archaeological Consultant shall provide written confirmation (by email) of the agreement to abandon each trench.

4.76 The Archaeological Contractor must seek the agreement of the Archaeological Consultant (and the Archaeological Officer for North East Lincolnshire if required) before closing / backfilling any trench. Remote approval via email can be sought to ensure efficiency of the works. The Archaeological Contractor will provide photographs of:

- the full length of the trench from each end;
- an example of the section from topsoil to base of trench;
- each feature excavated whether they were determined to be archaeological or not; and,
- any other photographs deemed necessary to facilitate remote approval for closure.

4.77 The Archaeological Contractor will provide a short description with the photographs explaining the features within the trench, any artefacts recovered from them, and confirming whether any samples have been recovered in line with the sampling strategy. The trench can only be backfilled with written approval by return email from the Archaeological Consultant (and the Archaeological Officer for North East Lincolnshire if required).

Artefact Recovery

4.78 All artefacts will be collected, stored and processed in accordance with standard methodologies and national guidelines (refer to Appendix A) and in line with local authority requirements.

4.79 Except for modern artefacts all finds will be collected and retained and the Archaeological Contractor will clarify in their Method Statement, their site-specific Selection Strategy and will ensure that it is in line with CIfA (2020b) and relevant local authority guidelines. Each ‘significant find’ will be recorded three dimensionally. Similarly, if artefact scatters are encountered these should be also recorded three dimensionally. Bulk finds will be collected and recorded by context.

4.80 All recovered artefacts will be stabilised, conserved and stored in accordance with the current national conservation guidelines and standards (refer to Appendix A). If necessary, a conservator will visit the site to undertake ‘first aid’ conservation treatment. If waterlogged organic materials are encountered and appropriate cold storage facilities are not available onsite, the project manager will arrange the removal of the finds to nearby suitable facilities.

4.81 Artefacts will be stored in appropriate materials and conditions and monitored to minimise further deterioration.

Environmental Sampling

4.82 The Archaeological Contractor will include an environmental sampling strategy within their Method Statement, created by the Archaeological Contractor’s Environmental Specialist. The Historic England Science Advisor will be consulted regarding the sampling strategy proposed by the Archaeological Contractor. In addition, the Archaeological Contractor’s Environmental Specialist will visit the Site to ensure that the agreed sampling strategy is appropriately implemented and to offer specialise advice when require.

4.83 Any samples taken must come from securely stratified deposits using the methodologies outlined by Historic England (2011).

4.84 Appropriate provision will be made for the recovery of material suitable for scientific dating. Any samples taken must come from appropriately cleaned surfaces, be collected with clean tools and be placed in clean containers. They will be adequately recorded and labelled, and a register of all samples will be kept. Once the samples have been obtained, they should be stored appropriately in a secure location prior to being sent to the appropriate specialist. Provision will be made for the ongoing processing and initial assessment of sampled material in order to provide timely feedback regarding quality of preservation and significance of specific deposits during the evaluation and to inform the ongoing strategy.

4.85 Samples will be taken from securely stratified, dateable deposits, with a low risk of contamination. A provisional sampling strategy is proposed in Table 3.

Table 3 Provisional environmental sampling strategy for evaluation

Potential Data	Method	Context Type	Sample Size (ltr)	Excavated Feature Sample
CPR	Bulk	Structural / occupation features	40	100%
		Pits (prehistoric)	40	50%
		Pits (Roman)	40	50%
		Pits (medieval)	40+	50%
		Pits (post-medieval)	40	50%
		Gully / ditch (settlement)	40	10%
		Gully / ditch (outfield)	40	5 – 10%
Waterlogged and organic remains	Bulk	All contexts	10 – 20	Layer (N/A)
Small bones	Bulk	All contexts	40	50%
Molluscs	Incremental	Deposit sequence	As advised by specialist	N/A
Pollen	Monolith	Deposit sequence	As advised by specialist	N/A

4.86 If large deposits of animal bone are encountered the advice of the project specialist will be sought regarding recording and sampling. Animal bone groups (i.e. articulated animal remains) will be assigned a number and documented using a suitable animal bone group sheet following Historic England guidance (2019). Assessment of biological remains will follow standard assessment procedures as laid out in Historic England guidance (2008; 2011; 2019).

Finds Processing

4.87 Initial processing of finds (and if appropriate other samples) will be carried out concurrent with the fieldwork.

4.88 The processing of finds will be finished shortly after completion of the investigations, the finds will be retained (according to the Selection Strategy), washed, marked, bagged and logged on a MS Access or GIS database (or equivalent), together with their locations according to the requirements set out in the Selection Strategy (e.g. ‘significant finds’ will be recorded on the OS National Grid (eastings, northings) and Ordnance Datum (height) to two decimal places).

4.89 The finds assemblage will be treated, labelled and stored in accordance with the appropriate Historic England guidance documents, local authority guidelines (if appropriate) and the Institute of Conservation guidelines (refer to Appendix A). The Archaeological Contractor will ensure that the processing of the assemblage is in accordance with the requirements of the recipient museum.

4.90 Each category of find or each material type will be examined by a suitably qualified archaeologist or specialist and the results incorporated into the fieldwork report.

Human Remains

4.91 If human remains are discovered during the course of the trial trench evaluation, the remains shall provisionally, in accordance with current good practice, be covered and protected and left in situ. The removal of human remains, if this is deemed necessary in consultation with the Archaeological Consultant and the Archaeological Officer for North East Lincolnshire, will only take place in accordance with a Ministry of Justice licence and under the appropriate Environmental Health regulations and the Burial Act 1857. In the event of the discovery of human remains the Archaeological Contractor will arrange to contact H.M. Coroner and will notify the Archaeological Consultant, the Principal Contractor, and the Client immediately.

Treasure

4.92 Any artefacts which are recovered that fall within the scope of the Treasure Act 1996 and Treasure (Designation) Order 2002 will be reported to the Archaeological Consultant immediately. Artefacts that are defined as Treasure according to the above legislation will be vested in the franchisee (e.g. The Duke of Cornwall is franchisee for Cornwall), or if none, the Crown. The Archaeological Contractor will contact H.M. Coroner and will ensure that the Treasure regulations are enforced and that all the relevant parties are kept informed. A list of finds that have been collected that fall under the Treasure Act and related legislation will be included in the fieldwork report.

4.93 Artefacts that are classified as ‘treasure’ will be removed to a safe place but where removal cannot be achieved on the same working day as the discovery, suitable security measures must be taken to protect the finds from damage or unauthorised removal.

5. Monitoring, Progress Reports and Meetings

5.1 The archaeological evaluations will be subject to regular monitoring visits by the Archaeological Consultant who will have unrestricted access to the site, site records or any other information. The work will be inspected to ensure that it is being carried out to the required standards and that it will achieve the stated objectives.

5.2 Weekly written progress reports (via e-mail each Monday by 10.00am) will be provided to the Archaeological Consultant by the Archaeological Contractor during the archaeological investigation. In addition, the Archaeological Contractor will inform the Archaeological Consultant and the Principal Contractor on the progress of the fieldwork verbally upon request.

5.3 Progress meetings attended by the Principal Contractor, the Archaeological Consultant, the Archaeological Officer for North East Lincolnshire and the Archaeological Contractor will be held on site during the course of the evaluations. Officers from Historic England will also be invited to attend, if appropriate. These meetings will be arranged by the Archaeological Consultant.

6. Completion of Fieldwork

6.1 The site will be left in a tidy condition and the Archaeological Contractor will ensure that all materials brought onto site are removed.

6.2 At the end of the archaeological evaluations the Archaeological Contractor will complete the following:

a. a completion statement submitted to the Archaeological Consultant and the Client within one working day of completing the fieldwork; and

b. an OASIS entry. If appropriate the entry should include caveats about conclusions drawn in advance of assessment and/or analysis.

6.3 The OASIS entry may be updated and re-submitted not later than three months after the completion of the fieldwork report. The Archaeological Contractor is advised to ensure that adequate time and costings are built into their tenders to allow sufficient time to complete the form.

7. Deliverables

7.1 For each of the methods of investigations outlined above the following documents need to be produced (Table 4).

Table 4 Scope of Deliverables Required

Scope of Work	Method Statement	Interim Report	Fieldwork Report
GI Watching Brief	One method statement to be produced coving both the GI watching brief and the geoarchaeological boreholes	Yes	One fieldwork report to be produced covering both the GI watching brief and the geoarchaeological boreholes
Geoarchaeological boreholes		Yes	
Geophysical Survey	Yes	Yes	Yes
Archaeological Trial Trenching	Yes	Yes	Yes

Method Statements

7.2 The Method Statement should include the following sections as a minimum (see CIfA 2020a for further information):

a. A statement on the technical, research and ethical competences of the project team, including relevant professional accreditation;

b. Site location (including map) and descriptions;

c. Context of the project;

d. Geological and topographical background;

e. Archaeological and historical background;

f. General and specific research aims of the project, with reference to Regional Research Frameworks;

g. Methods;

h. Details of how soil will be separated on site, where required;

i. Collection and disposal strategy for artefacts, ecofacts, and all paper, graphic and digital materials;

j. Arrangements for immediate conservation of artefacts;

k. Details of backfilling, which shall include measures to ensure that any field drainage pipes damaged during the excavation are repaired prior to backfilling and that the landowner or tenant has opportunity to inspect the repairs;

l. Post-fieldwork assessment and analysis of project data;

m. Report preparation (including details of the section headings);

n. Publication and dissemination proposals, as required;

o. Copyright;

p. Archive deposition, including wherever possible identification of a recipient museum or other repository and its requirements;

q. Timetable;

r. Staffing. Details on the expertise of the project team is also required. The project manager should be a named Member of the Chartered Institute for Archaeologists (MCIfA) who is adequately qualified to manage the required archaeological work or who can demonstrate an equivalent level

of competence. The composition and experience of the project team should be described. Specialists should be identified where required (e.g. for finds and environmental work);

s. A statement on compliance with relevant professional ethical and technical standards (including data standards);

t. Health and Safety considerations;

u. Environmental protection considerations; and

v. Monitoring procedures.

Interim Report – Geophysical Survey

7.3 An interim plot of results and interpretation will be provided to the Archaeological Consultant within 1 week of completion of the field survey. The interim report will include:

a. A brief summary of the results of the evaluation; and,

b. Plans showing the interim plot and interpretations.

Interim Reports

7.4 Within one week of the completion of the evaluation, an interim report will be prepared and submitted to the Archaeological Consultant who will then submit it to the Client and the Archaeological Officer for North East Lincolnshire. It will include:

a. A brief summary of the results of the evaluation;

b. A plan of the trench locations/geoarchaeological boreholes/GI locations; and

c. A quantification of the primary archive including contexts, finds and samples.

Fieldwork Report – GI Watching Brief and Geoarchaeological Boreholes

7.5 A preliminary interpretation of the soil and sediment characteristics of the cores will be made, including a summary of the stratigraphy that will characterise the deposit sequence and identify soil / sediment formation processes. The description of each deposit will include sediment type, inclusion, colour, bedding and nature of contacts to overlying and underlying units. The report will also include appropriate lithological diagrams.

7.6 The Archaeological Contractor's method statement will set out the level of assessment that the specialist geoarchaeological auger survey report will contain. It is expected that as a minimum it will contain:

c. Title page;

d. List of contents, figures, tables, etc.;

e. Non-technical summary;

f. Introduction;

g. 10 figure National Grid Reference;

h. Archaeological and Historical Background;

i. Aims and Objectives;

j. Methodology;

k. A deposit Model;

l. A description of deposit formation processes and depositional conditions;

m. A description of the archaeological and paleoenvironmental potential;

n. Discussion;

o. Recommendations, including fully costed recommendations and a justification for additional targeted geoarchaeological investigation, assessment (laboratory assessment) / analysis, and dating of deposits and sites, discovered during the course of the auger survey;

p. Conclusion;

q. References to all primary and secondary sources consulted;

r. OASIS reference number; and,

s. Statement of Indemnity.

7.7 A draft report should be submitted to the Archaeological Consultant for comment and review prior to the finalisation of the report.

7.8 An electronic copy of the draft report and drawings / figures will be submitted to the Archaeological Consultant for comment. A digital version of the report and illustrations will be produced within one week of the receipt of comments on the draft report from the Archaeological Consultant. The digital report shall comprise a complete version of the report in PDF format and separate digital text (in Microsoft Word format) and CAD mapping (in AutoCAD format) and any other illustrations or plates as appropriate (in JPEG or TIFF format).

7.9 Submission of the final report to the Archaeological Consultant should take place within three weeks of fieldwork completion.

Fieldwork Report – Geophysical Survey (Magnetometry)

7.10 The Fieldwork Report should be provided to the Archaeological Consultant for comment within three weeks of completion of the fieldwork. The final report should follow the guidance and standards listed (in Appendix A) but should include as a minimum:

a. Title page;

b. List of contents, figures, tables etc.;

c. Non-technical summary;

d. Introduction;

e. 10 figure National Grid Reference;

f. Archaeological and historical background;

g. Aims and objectives;

h. Methodology;

i. Results – supported by a survey location plan (minimum scale 1:2500), a plot of the raw data (minimum scale 1:1000, grey-scale format, and X-Y trace as appropriate), a plot of enhanced data and one or more interpretive plots (minimum scale of 1:1000);

j. Discussion;

k. Recommendations;

l. Conclusion;

m. Reference to all primary and secondary sources consulted;

n. OASIS reference number; and,

o. Statement of Indemnity.

7.11 The final report should be presented in Word format with any digital images in gif format and should be produced within two weeks of completion of the fieldwork.

7.12 A draft report should be submitted to the Archaeological Consultant for comment and review prior to the finalisation of the report.

Fieldwork Report – Archaeological Trial Trenching

7.13 It is anticipated that the Fieldwork Report will be delivered within six weeks of the completion of the fieldwork. If specialist reports are not available within that period a draft report should be submitted detailing the missing information, and the revised date should be discussed with the Archaeological Consultant.

7.14 The Fieldwork Report will include the following as a minimum:

a. a signed QA sheet detailing as a minimum - title, author, version, date, checked by, approved by;

b. a non-technical summary;

c. a site location drawing;

d. the archaeological and historical background;

e. the methodology employed for the investigations;

f. the aims and objectives of the investigations including relevant research themes and agendas identified;

g. the results of the trial trench evaluation (to include full description, assessment of condition, quality and significance of the remains);

h. where human remains are encountered the report will include a statement that addresses the future retention of the material, including if appropriate, options for reburial;

i. an appendix containing specialist artefact, dating and environmental sampling reports;

j. an appendix illustrating specific finds and general working shots or portraits of specific features or structures as appropriate;

k. a list of all finds that fall within the scope of the Treasure Act and associated legislation;

l. a stratigraphic matrix for each trench (as appropriate);

m. assessment /conclusion and a statement of potential with recommendations for further work and analysis identifying specific research questions;

n. a statement of the significance of the results in their local, regional and national context cross referenced to relevant research agenda;

o. the current and proposed arrangements for long-term conservation and archive storage (including details of the recipient museum);

p. general and detailed plans showing the location of each trench accurately positioned on an Ordnance Survey base map (at an appropriate and recognised scale);

q. detailed plans and sections illustrating archaeological features (at an appropriate and recognised scale), including a long section of each trench that contains archaeological remains;

r. a section and plan of ‘negative’ trenches, i.e. those containing no archaeological remains;

s. colour photographic plates illustrating the site setting, work in progress and archaeological discoveries; and

t. a cross-referenced index of the project archive.

7.15 The Fieldwork Report will specifically comment on the level of preservation and will comment on the character of the overlying deposits and on the potential for extrapolating the results into adjacent areas.

7.16 Digital copies of the completed draft report (complete with illustrations and plates) in both Word and PDF format will be submitted to the Archaeological Consultant for comment. When the draft report is of a sufficient standard, the Archaeological Consultant will submit a copy of the draft report to the Client and to the Archaeological Officer for North East Lincolnshire. In finalising the report, the comments of the Archaeological Consultant and the Archaeological Officer for North East Lincolnshire will be taken into account.

7.17 The final report will be submitted to the Archaeological Consultant within two weeks of the receipt of comments on the draft report.

7.18 A project archive including image files in JPEG or TIFF format and digital text files in Microsoft Word format, and illustrations in AutoCAD format or ArcView shapefile format shall be submitted. A fully collated version of the Fieldwork Report shall be included in PDF format.

8. Archive Preparation and Deposition

8.1 Archaeological material recovered from fieldwork is irreplaceable and data recorded in the course of archaeological investigations should be copied and additionally held securely in a separate location in line with current good practice (refer to Appendix A).

8.2 The Archaeological Contractor should compile a Data Management Plan in line with CIfA guidelines (2020b) and include it in their Method Statement.

8.3 The site records and assemblages (list of fieldwork interventions, notebooks / diaries, context records, feature records, structure records, site geometry (drawings), photographs and films, finds records and associated data files) will constitute the primary Site Archive. This is the key archive of the fieldwork project and the raw data upon which all subsequent assessment and analysis and future interpretation will be based. The archive will therefore not be altered or compromised.

8.4 The Site archive should be quantified, ordered, indexed and made internally consistent, and in line with current good practice (refer to Appendix A). All finds and coarse-sieved, and flotation samples will have been processed and stored under appropriate conditions. The archive will also contain a site matrix, a summary of key findings and descriptions of artefactual and environmental assemblages. Arrangements should be made for the proper cataloguing and storage of the archive during the project life-cycle (it may be appropriate to liaise with an archive specialist). The content of an outline structure for a fieldwork archive is presented in MoRPHE, PPN3 Appendix 1, Product P1 and Product P3 (MoRPHE 2008).

8.5 The Archaeological Contractor will, prior to the preparation of the Archaeological Contractors Method Statement, liaise with the recipient museum to obtain agreement in principle to accept the physical, documentary, digital and photographic archive for long-term storage. The Archaeological Contractor will be responsible for identifying any specific requirements, archiving costs or policies of the museum in respect of the archive, and for adhering to those requirements.

8.6 The evaluation will have its own unique accession number, which will be obtained by the Archaeological Contractor from the recipient museum in advance of the preparation of the Archaeological Contractors Method Statement, to ensure that the project is recorded in accordance with the requirements of the local authority. The unique accession number will be recorded in the Archaeological Contractors Method Statement.

8.7 The archive of finds and records generated during the fieldwork will be removed from the Site at the end of each day and kept secure at all stages of the project until it is deposited with the recipient museum. The archive will be produced to current national standards (refer to Appendix A).

8.8 The deposition of the archive forms the final stage of this project. The Archaeological Contractor shall provide the Archaeological Consultant with copies of communication with the recipient museum and written confirmation of the deposition of the archive.

9. Health, Safety and Environment (SHE)

9.1 The works will be carried out under The Construction (Design & Management) (CDM) Regulations (Health and Safety Executive 2015).

9.2 The Archaeological Contractor will provide the Principal Contractor with details of their public and professional indemnity insurance cover.

9.3 Project staff are required to follow health and safety procedures and a risk assessment should be carried out by the Archaeological Contractor and submitted to the Principal Contractor prior to commencing work, to ensure the safety of workers on site.

9.4 The Archaeological Contractor will have their own Health and Safety policies compiled using national guidelines, which conform to all relevant Health and Safety legislation and good practice. A copy of the Archaeological Contractor's Health and Safety policy will be submitted along with their tender to the Principal Contractor, who will forward it on to the Client.

Risk Assessment and Method Statement

9.5 The Archaeological Contractor will prepare a Risk Assessment and Method Statement (RAMS) that will be submitted to the Principal Contractor for approval, 20 working days prior to commencing the work. The RAMS may be issued back to the Archaeological Contractor with comments requesting amendments to be made to the document, before it is reissued, reviewed and approved. The Archaeological Contractor will not start work until the RAMS has been approved by the Principal Contractor.

9.6 If amendments are required to the RAMS during the works, the Principal Contractor and any other interested party must be provided with the revised document at the earliest opportunity.

9.7 The contents required of all RAMS are as follows:

a. Scope of Works
b. Project Specific Hazards / Risks / Environmental Factors
c. Reference Documents
d. Subcontracted and third-party workers
e. Areas of Work (access and egress)
f. Resources
g. Plant and Equipment
h. Materials
i. Mandatory PPE
j. Task Specific PPE
k. Methodology of Works
l. Environmental Protection
m. HSE Hold Points
n. Attachments
o. Risk Assessment
p. Environmental Risk Assessment
q. Amendments Record

9.8 Briefing to those individuals involved in the work tasks will be delivered by the respective Site Manager or sub-contractor supervisor prior to works commencing. Site staff are to ask questions on anything that is

unclear or requires repeating. At the end of each shift, any feedback will be provided to the work supervisor / Site Manager on the RAMS performance via the Task Hazard Assessment procedure with a view to this being incorporated into future revisions of the documents as necessary.

9.9 All site personnel will familiarise themselves with the following:

- Site emergency and evacuation procedures.
- The site's health and safety coordinator.
- The first aider.
- The location of the nearest hospital and doctor's surgery.

9.10 All equipment that is used in the course of the fieldwork must be 'fit for purpose' and be maintained in a sound working condition that complies with all relevant Health and Safety regulations and recommendations.

9.11 The Archaeological Contractor will liaise with the Principal Contractor and other sub-contractors to ensure that the archaeological work is undertaken in an organised and professional manner.

9.12 All parties will have full regard for the safety of all personnel on site, including measures to ensure the safety of all.

Mandatory Training

9.13 Mandatory training requirements for all site staff are:

- Construction Skills Certification Scheme (CSCS) card (or equivalent United Kingdom based scheme), appropriate to the role they are undertaking.
- Asbestos in Soils Awareness training.
- Manual Handling.

9.14 Site Supervisors (Principal Contractor and Sub-contractors) are to hold the following mandatory training:

- Site Supervisors Safety Training Scheme (SSSTS) or equivalent.
- Construction Skills Certification Scheme (CSCS) card (Blac Card).
- Asbestos in Soils Awareness training.
- Manual Handling.
- First Aid at Work (3 day course).

On-Site Training

9.15 Toolbox Talks will be undertaken weekly, or as required following an incident, on relevant subjects and delivered by the Site Manager to all persons on site. The briefing will be held within the site welfare and following the talk the opportunity to raise health and safety concerns, improvement suggestions, good practices, etc. will be opened up to all present.

9.16 Daily Site Briefings also provide a media for employees to discuss Health and Safety issues and for training to be delivered as part of the delivery of key tasks. These are undertaken prior to any works being undertaken on site each day. The proposed works for the day is discussed and all controls / work procedures reinforced to ensure that all members of the site team understand their role. At the end of these briefings the workforce can then discuss the proposed work methods and other issues.

Existing Services

9.17 Statutory utilities plans will be provided to the Archaeological Contractor in advance of the site works. The Archaeological Contractor will be responsible for obtaining an up-to-date series of utilities plans and carrying out a PAS 128 B to D survey prior to the excavation of each trench.

9.18 The Principal Contractor will issue a permit to dig prior to the excavation of geoarchaeological boreholes and trial trenches.

Unexploded Ordnance (UXOs)

9.19 The Principal Contractor will undertake a survey for UXOs by a competent and trained professional prior to the commencement of the archaeological works. This is particularly relevant in the Temporary Construction Area but should be applied to the whole site. The Principal Contractor will supply the results of the survey to the Archaeological Contractor for inclusion in their RAMS documents.

9.20 If any further UXO requirements are recommended by the specialist undertaking the survey, then the Principal Contractor shall ensure they are fulfilled in relation to the archaeological works. The Principal Contractor will ensure a briefing is given to all personnel prior to the start of the archaeological works regarding the UXO risk and the measures taken.

9.21 The Principal Contractor will issue a permit to dig prior to the excavation of geoarchaeological boreholes and trial trenches.

Access, Welfare and Security Provisions

9.22 The Principal Contractor will provide information to the Archaeological Contractor to confirm the most suitable points for access and egress. The Archaeological Consultant will ensure these are clearly marked in the RAMS documentation and briefed to all site staff.

9.23 The Principal Contractor will supply welfare facilities at the Main Compound at a suitable location for the archaeologist(s) to make use of as needed. The Archaeological Contractor will supply mobile welfare and satellite compounds as needed for the completion of the works in this WSI.

9.24 The Principal Contractor will provide a security assessment of the site to the Archaeological Contractor prior to the start of the archaeological works. The Archaeological Contractor will ensure the security arrangements are included in their RAMS documentation and briefed to all site staff. The Principal Contractor will provide any security requirements deemed necessary by the security assessment (e.g. 24/7 security guards.

COVID-19

9.25 All work should be undertaken in line with current government advice, which, at the time of writing includes the Site Operating procedures (Construction Leadership Council 2021, and any subsequent updates).

10. Programme and Resources

10.1 The programme and key contacts for the project will be confirmed prior to the start of evaluation.

10.2 The Archaeological Contractor must ensure that they have adequate and appropriate management procedures in place to ensure that risks to the programme timetable (more extensive remains, better preserved deposits, exceptional finds, interruptions from periods of prolonged inclement weather and any delays due to the COVID-19 pandemic) can be identified at an early stage. These risks will be kept under constant review by the Archaeological Contractor to ensure that the aims and objectives are met within the agreed timetable and budget. The Archaeological Consultant and the Client will be notified at the earliest opportunity of any changes to the methodology or programme of work that arise from review.

10.3 Changes or variation to the programme will only be accepted after they have been agreed in writing with the Archaeological Consultant and the Client. The Archaeological Contractor shall give immediate warning to the Archaeological Consultant and the Client should any agreed programme date not be achievable.

10.4 In the event of significant, or important unanticipated archaeological discoveries (such as *in situ* flint scatters or human remains), the Archaeological Contractor will notify the Archaeological Consultant and the Principal Contractor immediately. Appropriate resources and associated timescales must be provided by the Archaeological Contractor and agreed upon with the Archaeological Consultant and the Principal Contractor so as to limit the risk to the programme whilst ensuring all necessary archaeological excavation and recording has been undertaken, to meet the aims and objectives of the evaluation. The Archaeological Consultant will inform the Archaeological Officer for North East Lincolnshire in the event of significant, or important unanticipated archaeological discoveries.

11. Confidentiality and Publicity

11.1 All communication regarding this project is to be directed through the Archaeological Consultant on behalf of the Client. The Archaeological Contractor will refer all inquiries to the Archaeological Consultant without making any unauthorised statements or comments. The Archaeological Contractor will not disseminate information or images associated with the project for publicity or information purposes without the prior written consent of the Client.

11.2 Publicity regarding the evaluation will be managed by the Archaeological Consultant on behalf of the Client.

12. Copyright

12.1 The Archaeological Contractor shall assign copyright in all reports, documentation and images produced as part of this project to the Client. The Archaeological Contractor shall retain the right to be identified as the author or originator of the material. This applies to all aspects of the project. It is the responsibility of the Archaeological Contractor to obtain such rights from sub-contracted specialists.

12.2 The Archaeological Contractor may apply in writing to use or disseminate any of the project archive or documentation (including images). Such permission will not be unreasonably withheld.

12.3 The results of the evaluation shall be submitted to the Client and the North East Lincolnshire County Council HER and will ultimately be made available for public access.

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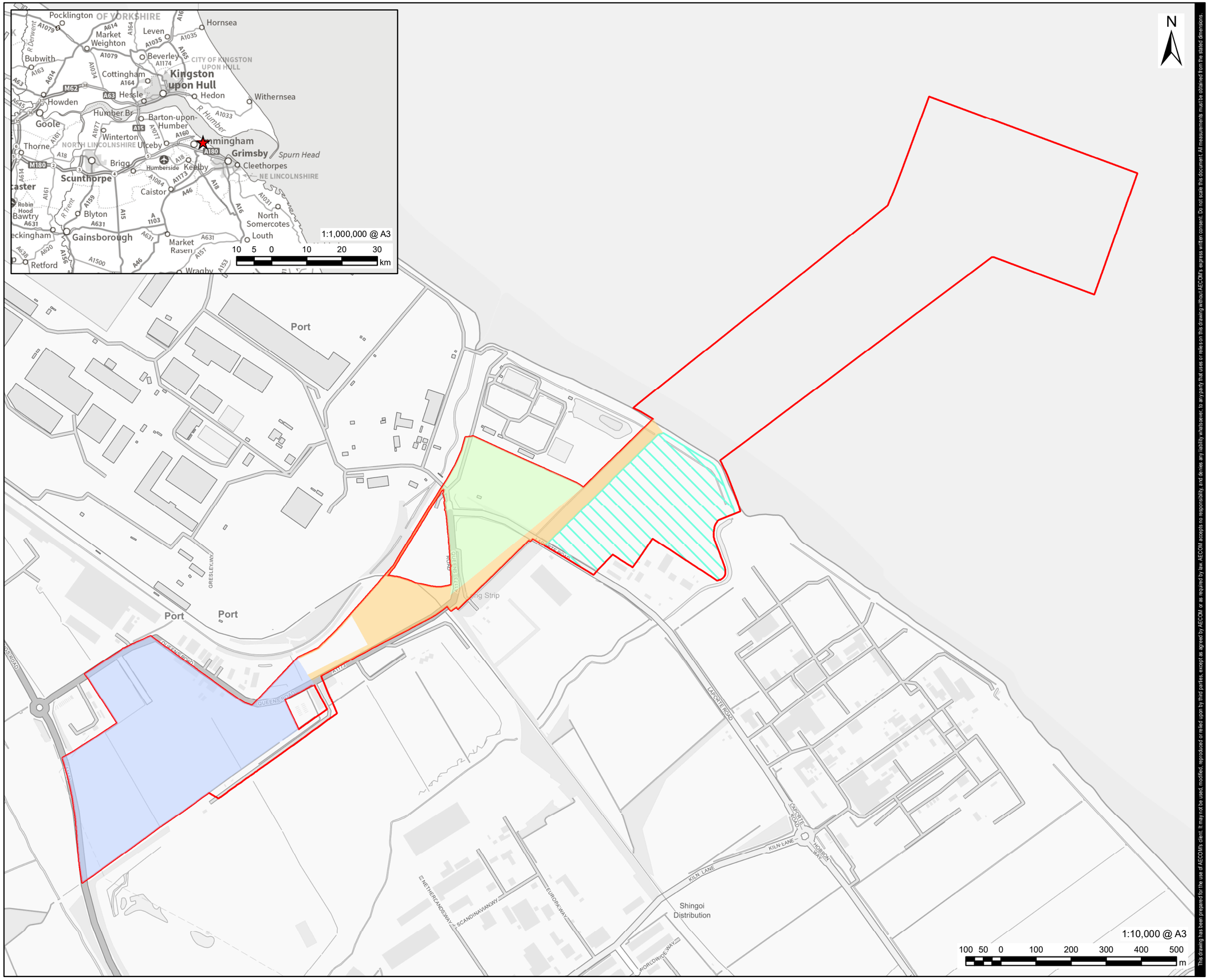
Appendix B Figures



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AECOM

PROJECT

Immingham Green Energy Terminal

APPLICANT

Associated British Ports

CONSULTANT

AECOM Limited
5th Floor
2 City Walk
Leeds, LS11 9AR
www.aecom.com

LEGEND

- Site Location
- Red Line Boundary of Scheme
- Temporary Construction Area (Geophyscial Survey, Possible Archaeological Trial Trenching)
- Main Site (GI Watching Brief, Geoarchaeological Boreholes, Archaeological Trial Trenching)
- Storage Tank Area (GI Watching Brief)
- Pipeline Corridor (GI Watching Brief, Geoarchaeological Boreholes)

NOTES

ISSUE PURPOSE

WSI

PROJECT NUMBER

60673509

DEVELOPMENT CONSENT ORDER NUMBER

TBC

FIGURE TITLE

Scheme Location

FIGURE NUMBER

Figure 1

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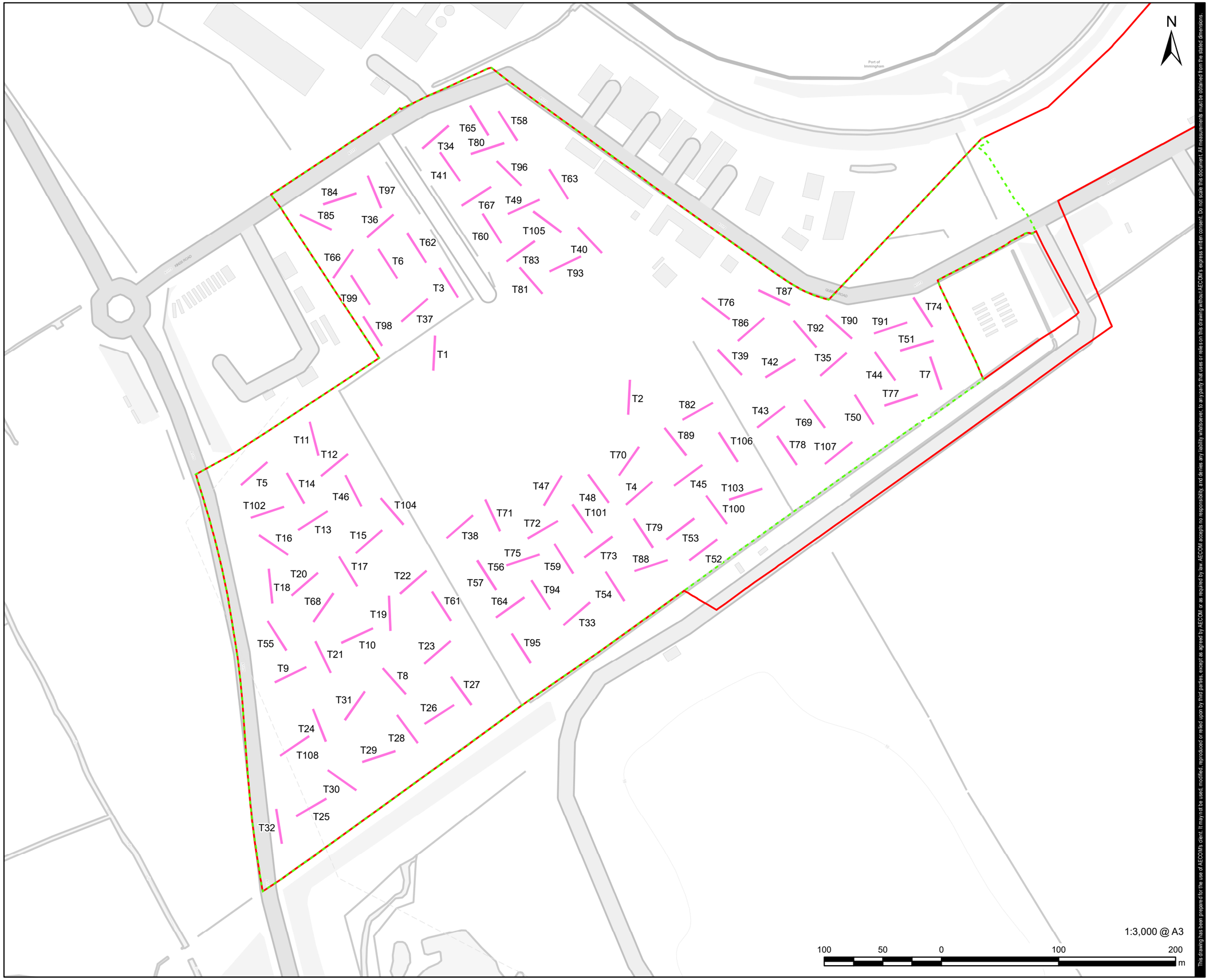

AECOM

PROJECT

Immingham Green Energy Terminal

APPLICANT

Associated British Ports

CONSULTANT

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5th Floor
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www.aecom.com

LEGEND

- Red Line Boundary of Scheme
- Main Site
- Trial Trench Location

NOTES

ISSUE PURPOSE

WSI

PROJECT NUMBER

60673509

DEVELOPMENT CONSENT ORDER NUMBER

TBC

FIGURE TITLE

Location of Trial Trenching

FIGURE NUMBER

Figure 2

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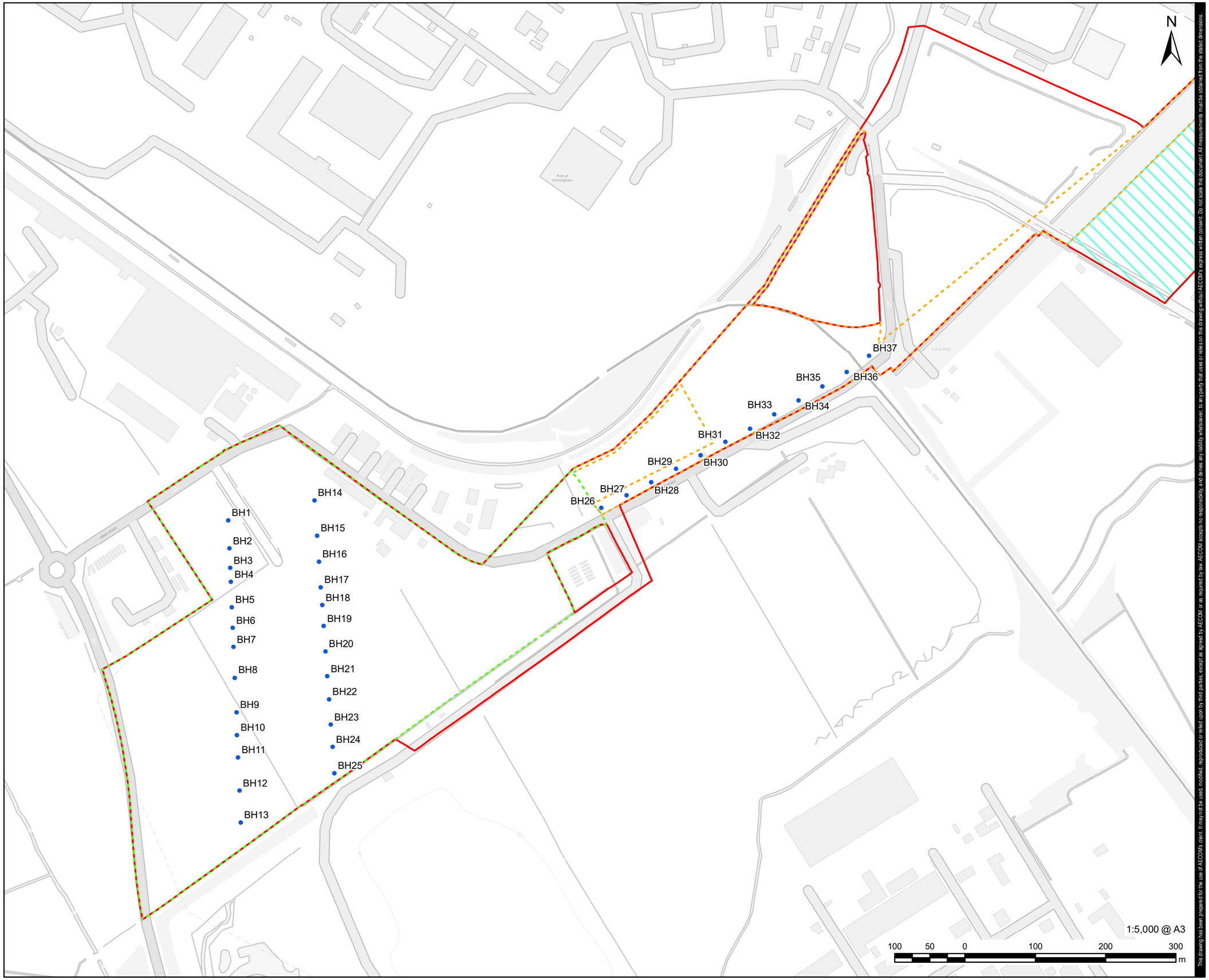

AECOM

PROJECT

Immingham Green Energy Terminal

APPLICANT

Associated British Ports

CONSULTANT

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5th Floor
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LEGEND

- Red Line Boundary of Scheme
- Temporary Construction Area
- Main Site
- Pipeline Corridor
- Geoarchaeology Pit Location

NOTES

ISSUE PURPOSE

WSI

PROJECT NUMBER

60673509

DEVELOPMENT CONSENT ORDER NUMBER

TBC

FIGURE TITLE

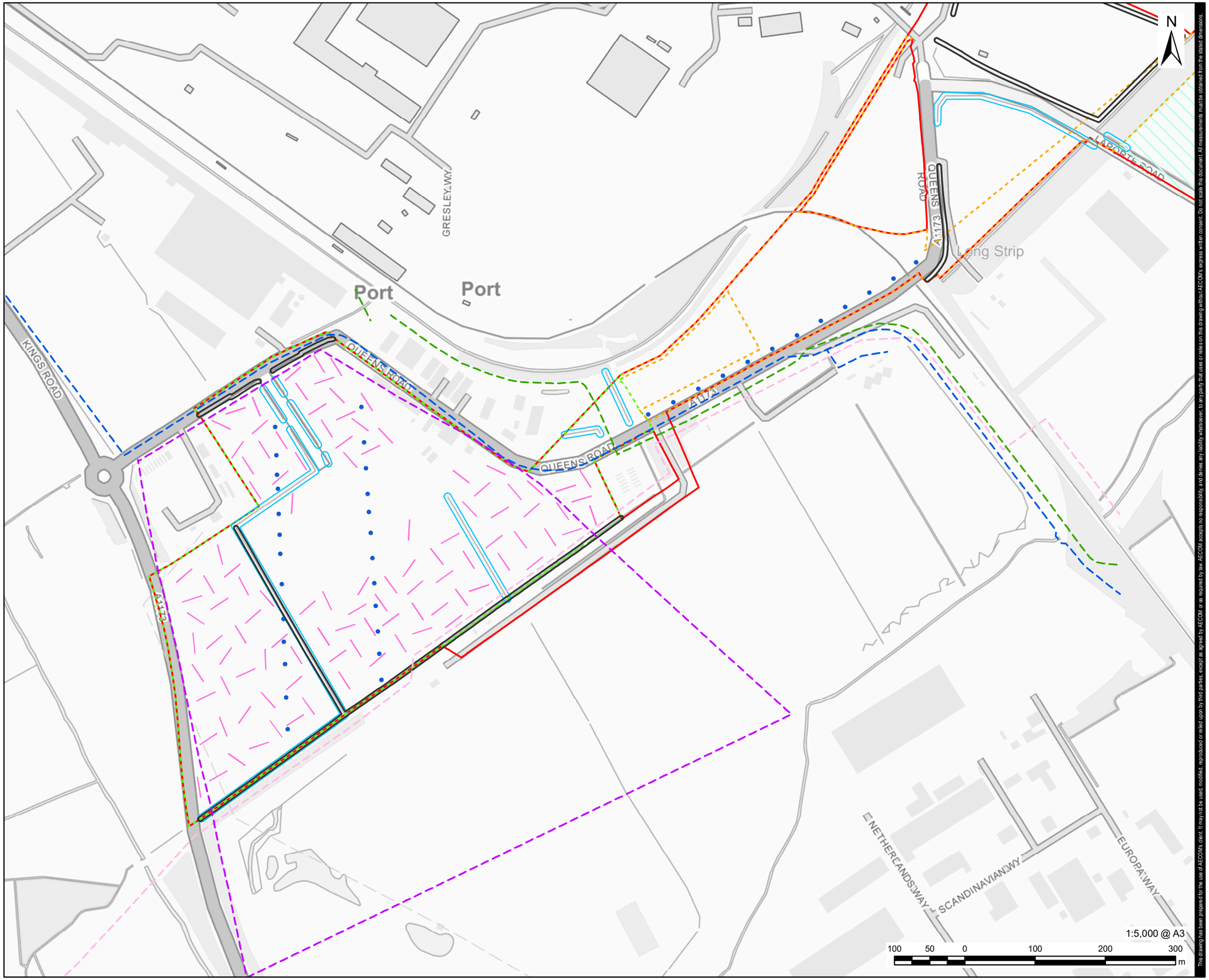
Location of Geoarchaeology Pits

FIGURE NUMBER

Figure 3

Revision: 1 Drawn: ER Checked: AG Approved: RW Date: 2022-08-30

Filename: \\na.aecomnet.com\fs\EMEA\Leeds-UKLDS2\Legacy\UKLDS2PFPSW0011\WIP\LE_Projects\Newproje\60673509 - AP Ammonia Terminal\400_Technical\GIS\02_Maps\Archaeological\WSI\AP_WSI_04_Location_of_Trial_Trenching_and_Geoarchaeology_Pits_20220823_ER.mxd



AECOM

PROJECT

Immingham Green Energy Terminal

APPLICANT

Associated British Ports

CONSULTANT

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LEGEND

- Red Line Boundary of Scheme
- Temporary Construction Area
- Main Site
- Pipeline Corridor
- Geoarchaeology Pit Location
- Dig Area
- IP Mains
- LHP Mains
- MP Mains
- Trial Trench Location
- Hedgerow and Canopy Buffer - 3m
- Surface Water Buffer - 5m

NOTES

ISSUE PURPOSE

WSI

PROJECT NUMBER

60673509

DEVELOPMENT CONSENT ORDER NUMBER

TBC

FIGURE TITLE

Location of Trial Trenching and Geoarchaeology Pits and Ecological and Utility Constraints

FIGURE NUMBER

Figure 4

Revision: 1 Drawn: ER Checked: AG Approved: RW Date: 2022-08-23

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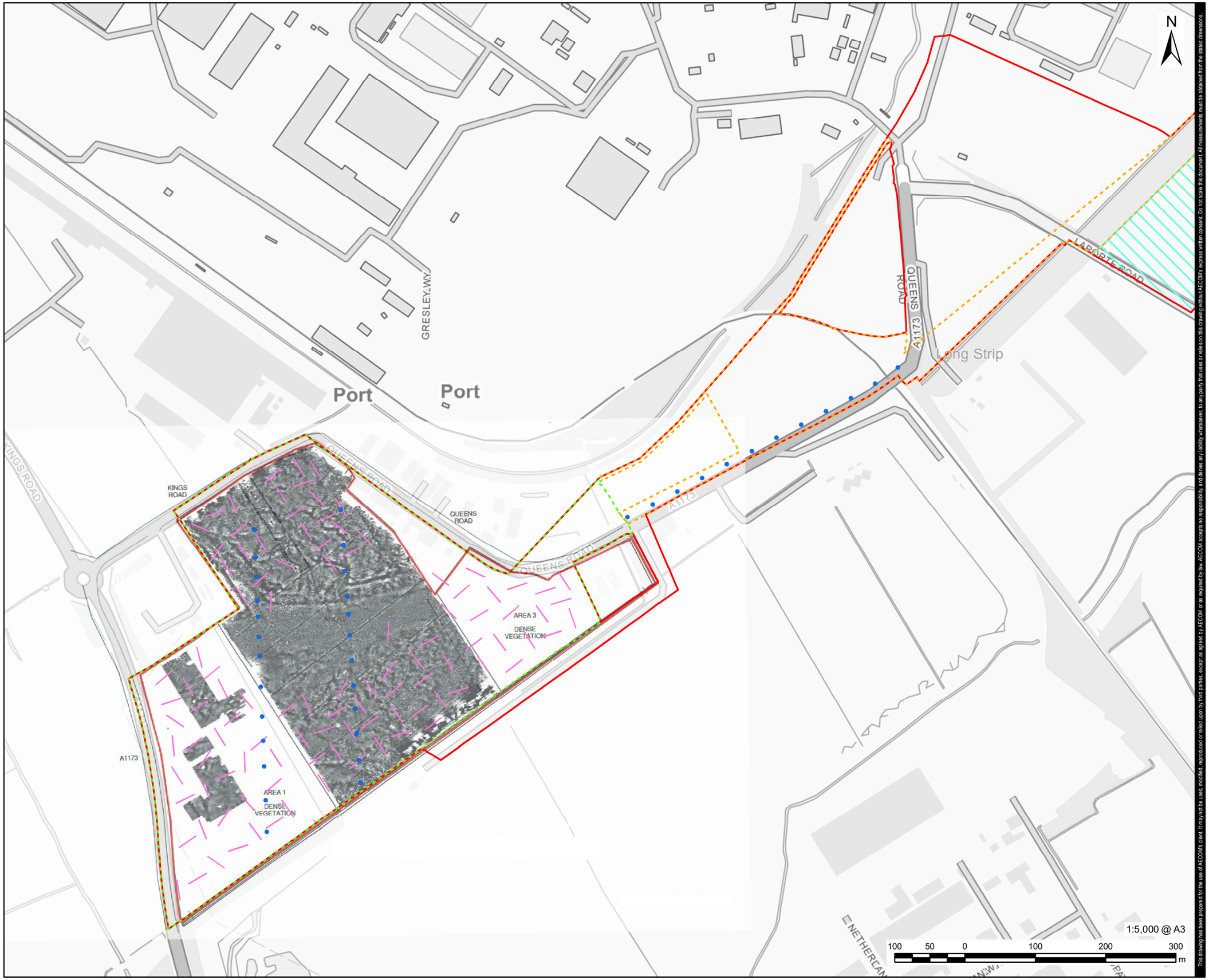

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LEGEND

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NOTES

Geophyscial Survey Results Not to Scale

ISSUE PURPOSE

WSI

PROJECT NUMBER

60673509

DEVELOPMENT CONSENT ORDER NUMBER

TBC

FIGURE TITLE

Geophysical Results and Location of Trial Trenching and Geoarchaeolgy Pits

FIGURE NUMBER

Figure 5

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