

**LONDON ARRAY ONSHORE
WORKS, GRAVENEY, KENT ME13
9EF**

**AN ARCHAEOLOGICAL
INVESTIGATION**

**LOCAL PLANNING AUTHORITY:
SWALE BOROUGH COUNCIL**

SITE CODE: KCHG08

JANUARY 2011



PRE-CONSTRUCT ARCHAEOLOGY

DOCUMENT VERIFICATION

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1 ABSTRACT

- 1.1 This report details the results and working methods of an archaeological investigation undertaken by Pre-Construct Archaeology Ltd on land at Cleve Hill, Graveney, Kent ME13 9EF (Figure 1) as part of the onshore works for the London Array offshore wind farm development.
- 1.2 Pre-Construct Archaeology Ltd was appointed as Archaeological Contractor to undertake the works by Gifford on behalf of London Array Limited (LAL).
- 1.3 The archaeological investigation related to the landfall of the export cables which will enter the inter-tidal area to the north of Graveney Hill farm and to the west of Seasalter Road at Cleve Hill, Graveney, Kent (NGR central point N605066.555, E164620.21). It comprised of two separate programmes of work: the first monitored exploration works required to assess the presence of and if necessary remove and/or destroy unexploded ordnance (UXO). The second phase was to excavate and record under archaeological control four trenches necessary for the export cables.
- 1.4 As archaeological consultant, Gifford has previously undertaken an assessment of the potential for archaeological remains and identified significant archaeological activity in the immediate area, particularly with regards to prehistoric, Roman and medieval remains, and Second World War defence structures.
- 1.5 The archaeological investigation undertaken in advance of the Onshore Cable Works successfully fulfilled the approved Archaeological Brief (Gifford 2010). All intrusive groundworks were monitored by Pre-Construct Archaeology Ltd and archaeological remains, where found, were fully investigated and recorded.
- 1.6 The earliest deposit encountered on site was the natural London Clay. Rising at the southern end of all four trenches, it was overlain by a deposit of sand demonstrating the alignment of an ancient Swale foreshore. Sealing this, and present throughout all four trenches, was a deposit of estuarine clay which attests to the repeated flooding and eventual silting-up of the marshland environment.
- 1.7 Within Trench 3 were found two oak branches that were located atop the estuarine clay and are of an unknown purpose, although a fish trap, perhaps uncompleted, is a possibility. A timber sample from one of the pieces has been radiocarbon dated to AD430 (± 30).
- 1.8 The alluvial deposits which sealed the timber feature were clearly divided into two separate phases separated by sandy clay, which attests further to the repeated episode of flooding which eventually resulted in the location of the site being turned over to land.
- 1.9 It is possible that the structure located during the UXO survey is a remnant from the dummy harbour of Operation Starfish, although this conclusion is purely hypothetical with little evidence to go on. The ordnance recovered from the site reflects the role that it played as part of Operation Starfish during the Second World War. The 20mm shells were indicative of strafing of the area by German fighter planes.
- 1.10 An undated posthole was also found.

2 INTRODUCTION AND PROJECT AIMS

2.1 This report details the results and working methods of an archaeological investigation undertaken by Pre-Construct Archaeology Ltd on land at Cleve Hill, Graveney, Kent ME13 9EF (Figure 1) as part of the onshore works for the London Array offshore wind farm development. Pre-Construct Archaeology Ltd was appointed as Archaeological Contractor to undertake the works by Gifford on behalf of London Array Limited (LAL).

2.2 The archaeological investigation related to the landfall of the export cables which will enter the inter-tidal area to the north of Graveney Hill farm and to the west of Seasalter Road at Cleve Hill, Graveney, Kent (NGR central point N605066.555, E164620.21). It comprised of two separate programmes of work. The first, between 3rd and 18th August 2010, monitored exploration works required to assess the presence of and if necessary mitigate UXOs (Figure 10). The second phase, conducted between 16th September and 1st October was to excavate and record under archaeological control four trenches necessary for the export cables (Figure 2).

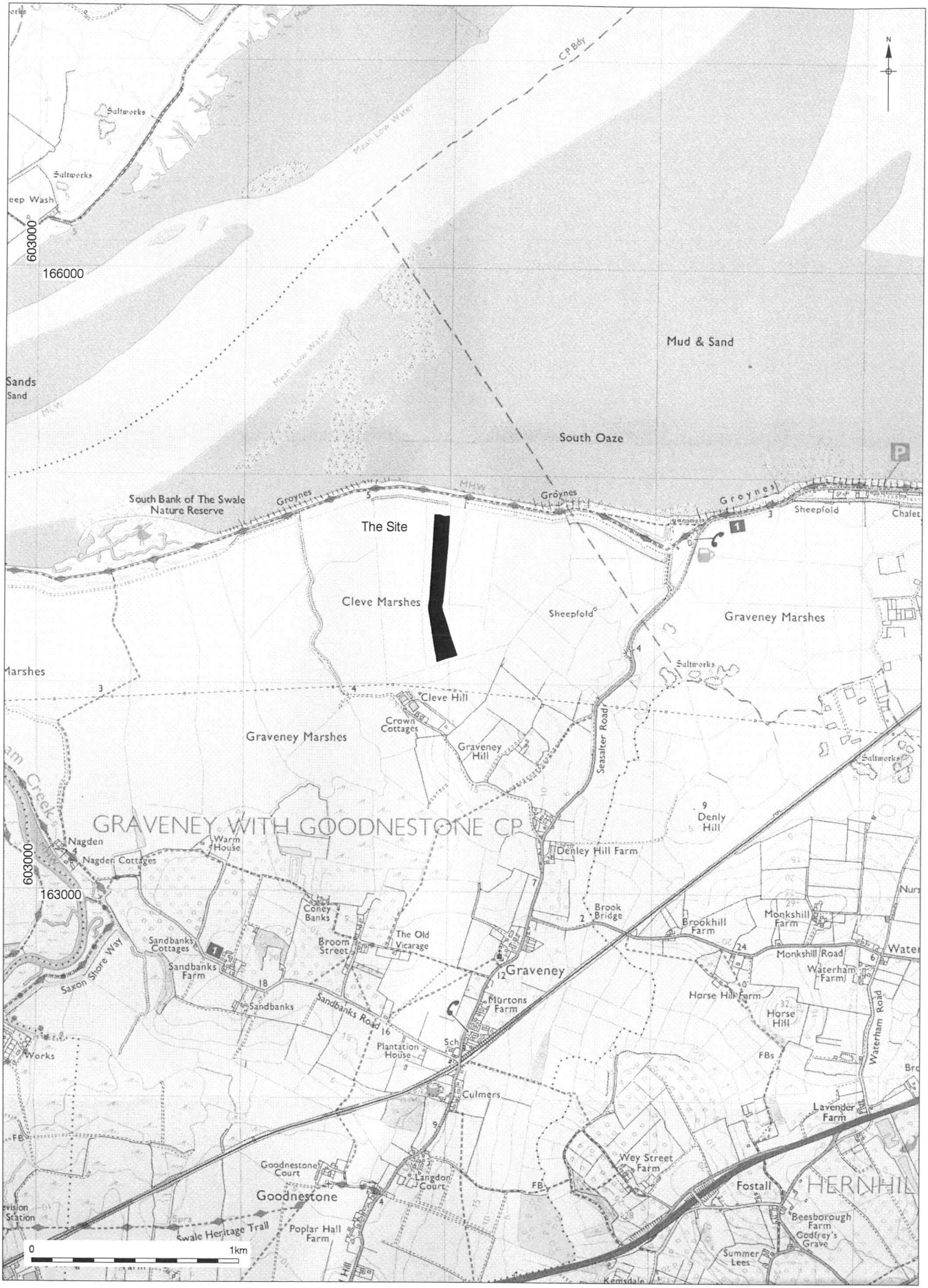
2.3 The aims of the project as set out in the Archaeological Brief (Gifford 2010) were:

- To record comprehensively any archaeological remains that may be impacted by the proposed works;
- To survey the location of any archaeological features recorded within the areas affected by the works;
- To understand more fully the spatial use of the landscape through time, particularly with reference to any evidence for prehistoric activity, the medieval salt making industry, and the World War II decoy site.
- To determine the extent, condition, nature, character, quality and date of any archaeological remains present, and to establish the ecofactual and environmental potential of archaeological deposits and features.
- To investigate the palaeo-environment according to research aims defined and agreed on the basis of the above assessment of potential.
- If possible to protect any archaeological remains in the inter-tidal area by establishing exclusion zones so that plant, and anchors used in the works do not damage these sites.

2.4 The central National Grid Reference of the site centre is TR05116412.

2.5 Site records were compiled continuing the use of PCAs previous site code for the project, KCHG08.

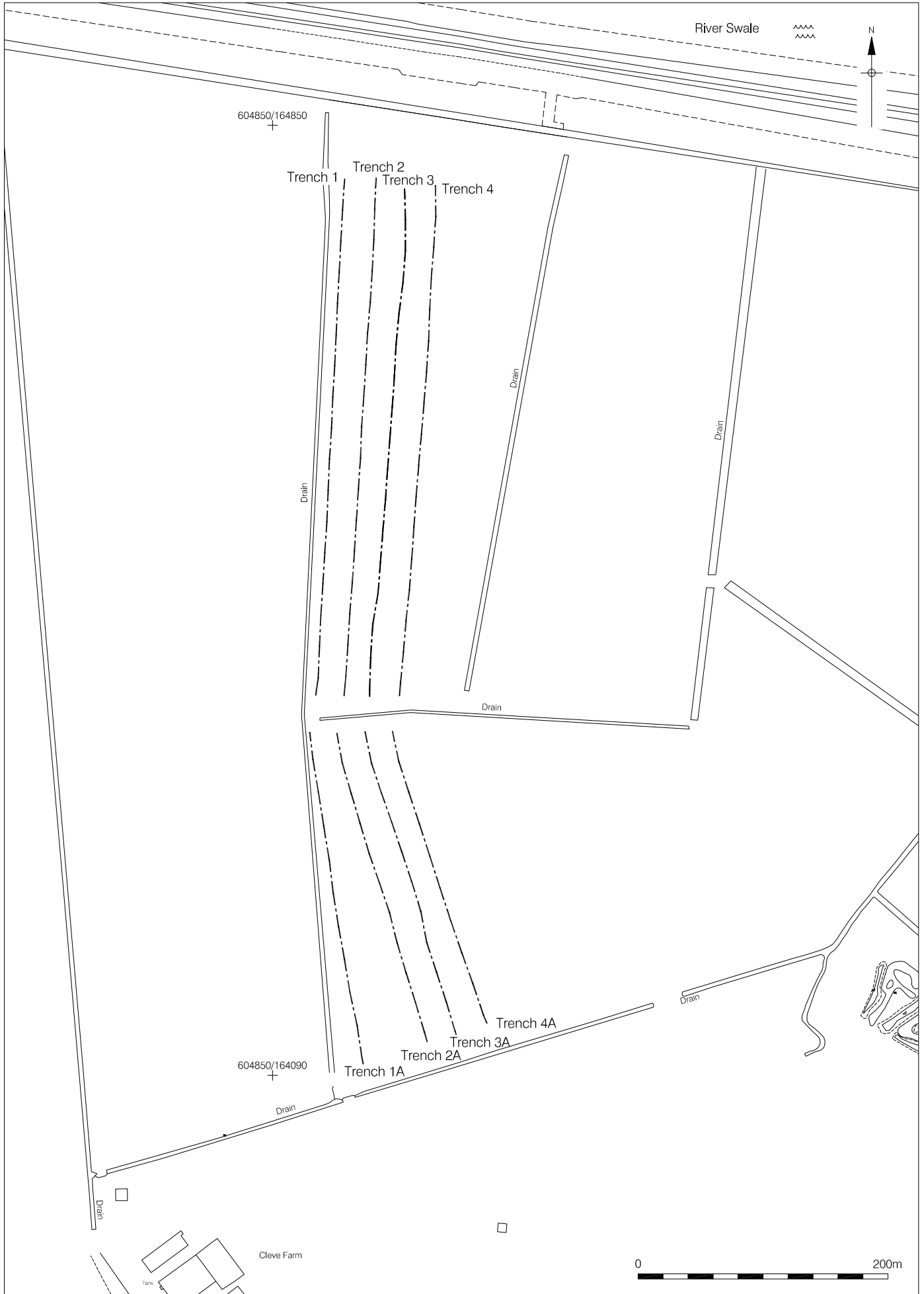
2.6 The UXO exercise was supervised by Paw Jorgenson and the cable-trench investigation was supervised by Guy Seddon, both of Pre-Construct Archaeology Ltd. The project was managed by Chris Mayo for Pre-Construct Archaeology Ltd.



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Figure 1
Site Location
1:25,000 at A4



3 PLANNING BACKGROUND

3.1 National Guidance: Planning Policy Statement 5

3.1.1 In March 2010 the Department of the Environment issued Planning Policy Statement 5 (PPS5) "Planning for the Historic Environment", providing guidance for planning authorities, property owners, developers and others on the preservation and investigation of archaeological remains.

3.1.2 In short, government policies provide a framework which:

- Protect Scheduled Ancient Monuments;
- Protect the settings of these sites;
- Protect nationally important un-scheduled ancient monuments;
- Has a presumption in favour of in situ preservation;
- In appropriate circumstances, requires adequate information (from field evaluation) to enable informed decisions; and
- Provides for the excavation and investigation of sites not important enough to merit in situ preservation

3.1.3 In considering any proposal for development, the local planning authority will be mindful of the policy framework set by government guidance, in this instance PPS5, of existing development plan policy and of other material considerations.

3.2 Local Guidance: Archaeology in Kent

3.2.1 Curatorial responsibility for the current development resides with Kent County Council Heritage Conservation Group (KCCHCG), who provides archaeological advice to the Local Planning Authority (LPA).

3.2.2 The development of the site is subject to the Archaeology Policies of Swale Borough Council:

Swale Borough Local Plan Adopted February 2008:

Policy E16: Scheduled Ancient Monuments and Archaeological sites

Development will not be permitted which would adversely affect a Scheduled Ancient Monument, as shown on the Proposals Map or subsequently designated, or other nationally important monument or archaeological site, or its setting.

Whether they are currently known or discovered during the Plan period, there will be a preference to preserve important archaeological sites in-situ and to protect their settings. Development that does not achieve acceptable mitigation of adverse archaeological effects will not be permitted.

Where development is permitted and preservation in-situ is not justified, the applicant will be required to ensure that provision will be made for archaeological excavation and recording, in advance of and/or during development.

3.2.3 There are no Scheduled Ancient Monuments within the development area.

3.3 Planning Permission

3.3.1 Archaeological conditions requiring a programme of archaeological mitigation works have been

attached to the LAL planning permission. These state:

Archaeological Works

- 10 No works shall be carried out until the developer has secured the implementation of:-
 - i) archaeological field evaluation works in accordance with a specification and written timetable which has been submitted to and approved in writing by the local planning authority; and
 - ii) following on from the evaluation, any safeguarding measures to ensure preservation in situ of important archaeological remains and/or further archaeological remains and/or further archaeological investigation and recording in accordance with a specification and timetable which has been submitted to and approved in writing by the local planning authority.
- 11 No works shall be carried out until details of foundations designs and any other proposals involving below ground excavation have been submitted to, and approved in writing by, the local planning Authority. The development shall be carried out in accordance with the approved details.
- 12 No works shall be carried out until the developer has secured the implementation of a programmed of building recording in accordance with a written specification and timetable which has been submitted to and approved in writing by the local planning authority.

4 GEOLOGY AND TOPOGRAPHY

4.1 Geology

4.1.1 The geology of the area comprises London Clay that is overlain by superficial deposits of alluvium (BGS Sheet 273). The clays are part of the Wallasea 1 soil association.

4.2 Topography

4.2.1 The site is located in two fields, directly to the north of Cleve Hill, where the sub-station is being constructed and to the south of the sea wall where the mouth of the Swale turns inland. The fields are part of the Cleve Marshes and lie at a height of c.2mAOD.

4.2.2 A steep grassy embankment forming part of the sea defences lies to the north of this. The concrete sea wall sits on top of this embankment.

4.2.3 The inter-tidal area is known as the South Oaze and comprises sand and mud that is covered at high tide. The sea defences are constructed of concrete blocks to the south of the sea wall, and slope towards the beach.

5 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

5.1 The following information is derived from a previous archaeological Written Scheme of Investigation prepared by RPS (2008), the Brief for the Onshore Cable Works (Gifford 2010) and previous work by Pre-Construct Archaeology Ltd (Holden 2008).

5.2 General

5.2.1 The Historic Environment section of the Environment Statement sets out the archaeological background to the development site principally using desk-based data sources that have included the Kent Sites and Monuments Record, aerial photographs, and historic maps / Admiralty Charts; augmented by a walkover survey (RPS, 2005). This has been further informed by subsequent investigations including two archaeological watching briefs on geotechnical pits (Wessex Archaeology 2007 and Reynolds 2008), archaeological mitigation works entailing strip, map and sampling for the National Grid works (Wessex Archaeology 2008), geotechnical investigations (Geotechnical Engineering Limited, 2006), geophysical survey on Cleve Hill (Archaeological Surveys Ltd, 2008) and an archaeological evaluation and watching brief across the area of the substation (Holden 2008, Seddon 2009).

5.2.2 An undated mound identified as a cropmark on aerial photographs lies within the corridor of the onshore cable route. Although not visible as an extant earthwork or evident by residual finds, below ground remains may still survive.

5.2.3 The baseline data suggests that there is also a potential for currently unknown archaeological remains to survive on the development site that could include:

- Former land surfaces of early prehistoric date that may contain “land-based” sites with associated finds and features on the reclaimed marsh and inter-tidal zone.
- Palaeo-environmental evidence for changes in the environment including those present in surviving peat deposits on the reclaimed marsh and inter-tidal zone.
- Features and finds associated prehistoric, Roman and medieval activity on the higher ground of Cleve Hill.
- Buried remains of former military defences.
- Former sea defence features including those delineating possible Roman and medieval shorelines with others represented by derelict barges on the current shoreline.
- Features and finds associated with human activity and exploitation of the coastal marsh including remains associated with the medieval and pre-medieval salt industry, trackways, decoy ponds, and former and reclamation features as evident by palaeo-ditches and banks.
- Features and finds associated with human activity and exploitation of the shoreline and inter-tidal zone including fish traps and evidence for oyster beds. Other coastal features including possible landing stages.
- Wrecks and their cargoes at the inter-tidal zone and in areas of reclaimed land as illustrated by the 9th century Graveney Boat.

5.2.4 Finds of burnt flint and a residual undiagnostic worked flint were recovered from the plough soil

during the watching briefs on the geotechnical pits (Wessex Archaeology 2007 and Reynolds 2008). Modern drainage ditches and a seawall bank were recorded during the strip, map and sampling works (Wessex Archaeology 2008). This work and the geotechnical investigations (Geotechnical Engineering Limited, 2006) also identified an alluvial deposit on the reclaimed marshland. Former field boundaries suggested by linear spreads of magnetic debris, and anomalies interpreted as geological or pedological features were recorded by the geophysical survey on Cleve Hill (Archaeological Surveys Ltd, 2008).

- 5.2.5 A more recent search of the Kent HER was undertaken on 18th January 2010 for a 500m search radius surrounding the cable route, in order to establish the known archaeological sites and findspots within the close vicinity of the cable route. The search established that there are a number of archaeological sites and features in the area that illustrate the land-use and industries of this area probably dating from the medieval period to the 20th century. There are no known archaeological sites or features within the fields proposed for the cable trenching. The majority of the sites are likely to be associated with salt working, stock management, former field boundaries, a former sea wall, and World War II defences. For the intertidal area, three sites are within the application boundary for the cable route, and all are recorded as the probable remains of fish weirs (HER no's MWX18696-8).

5.3 Medieval Salterns

- 5.3.1 There are quite a large number of undated mounds within the search area, the majority of them documented from a review of the historic aerial photographs, including a mound/mounds within the field immediately to the west of the field which will carry the cable route (HER no MWX18510). It is highly probable that these mounds are the remains of salt workings, and may date from the medieval to post-medieval periods, as there are a large number of these features in the fields on both sides of the Swale Channel. These probable salterns were constructed in the low-lying areas of the coastal marshland where they were periodically inundated by the sea in the medieval period. The mounds represent middens - artificial heaps of marsh clay waste discarded after brine extraction. A number of these mounds are Scheduled Monuments to the east of the development site, and English Heritage in the Scheduling document describes that 'the middens partially overlie and are surrounded by industrial structures in buried form. These may include wicker or clay-lined pits, evaporation kilns, lead boiling pans and the foundations of temporary wooden buildings'. It is possible that the fields through which the cable route passes through may contain remains of this industrial activity.

5.4 World War II Pillbox and Royal Navy 'Starfish' Decoy Operation Post

- 5.4.1 The site of Cleve Marsh has a number of monuments and remains dating to the World War II. The site was used from March 1941 as the location for a 'Starfish' Decoy site designed to divert enemy bombers from attacking the Royal Naval Dockyard at Sheerness. The decoy site was designed to look like Sheerness at night by the use of controlled fires and lighting effects that were controlled from a semi-sunken Operation Post. A 10kw semi-diesel generator was used to generate current for the lighting effect units and the ignition circuits. Pre-Construct Archaeology have undertaken a Level IV building recording survey of the Operation Post, and have

researched the methods used on the site to light the fires etc. 'Among the apparatus used on Starfish sites to simulate the effects of blazing incendiaries and High Explosives were a number of devices developed for use on the earlier 'QF' sites. These included clusters of 'basket fires', small wooden crates and metal frames were used at the Cleve Hill decoy site filled with combustible materials such as timber waste interleaved with layers of creosote that produced an impressive if fast-burning blaze within two minutes of ignition; coal and crib fires, which glowed dully for several hours, and paraffin 'grid fires'. A fifth fire type known as the 'boiling oil fire' sprayed paraffin, fuel oil and water in sequence over trays of burning scrap metal in order to simulate the effects not only of fires and smoke started by falling bombs but also the clouds of steam given-off when fire fighters attempted to douse them (Dobinson 2000, 101-104; Crowdy & Payne n.d.,7). The Cleve Hill decoy site used examples of each of these types, together with a number of fire devices developed specifically for use on Naval Starfish sites.' (Thompson and O'Gorman 2009

5.4.2 Lighting and effects on this site included:

- 1,200 yards of dummy street lighting;
- 50 'leaky' roof lights;
- Eight 'opening doors';
- Three sets of red 'obstruction' lamps;
- One dummy signalling lamp;
- Lights simulating those on ships at anchor.

5.4.3 In order to power these effects, the installation of approximately 80,000 yards of cable was planned; street and roof lighting effect units were also installed. An original Admiralty Plan of the array at Cleve Marshes illustrates the cable trenches which were excavated to power the effects. The proposed cable trenches will be located close to these trenches and possibly other former trenches for the lighting effects, and it is possible that remains from this period may be found within the archaeological trenches.

5.4.4 A World War II military pillbox and "observation post" were built within the site where the sub-station is now being constructed. Within the corridor of the permanent access road, a drainage ditch to the east of Seasalter appears to define the line of a former seawall defence and another pillbox survives in the field boundary to the south.

5.5 Archaeological Features within the Inter-tidal area

5.5.1 Three sites identified from historic aerial photographs are recorded on the Kent County Council Historic Environment Record (HER nos MWX18696-8 and Wessex Archaeology numbers 1007-9) within the application boundary of the cable route. They are recorded as fish weirs or traps, and are undated. Wessex Archaeology undertook an inter-tidal walkover survey during 2009 and inspected the locations of these features. However, no trace of them was observed at any of the locations. Wessex Archaeology concluded that no further inspection of the sites was recommended and suggested that the sites were absent as they believed there was no real evidence for the sites being obscured by sediment, or eroded or damaged by the action of the sea.

6 METHODOLOGY

6.1 General

- 6.1.1 The fieldwork was conducted according to the Archaeological Brief for Onshore Cable Works (Gifford 2010), which was designed to assess the presence or absence of significant archaeological remains which may require further investigation.
- 6.1.2 Ben Found, Archaeologist for KCCHCG, inspected and monitored the archaeological works on behalf of Swale Borough Council.

6.2 UXO Investigation

- 6.2.1 An archaeological watching brief was conducted to create a record of any archaeological finds and features exposed during works that were undertaken in order to establish the presence/absence of unexploded ordnance on the site.
- 6.2.2 Prior to the archaeological work, a non-intrusive magnetometer survey of the site had been undertaken by BACTEC International Ltd (2010), which identified a number of targets which required intrusive excavation. These targets were recorded using X and Y co-ordinates and an estimated Z co-ordinate, allowing the necessary excavations to be targeted accordingly (Figure 10).
- 6.2.3 Trial holes were excavated across the site carried out using a mechanical excavator fitted with a flat bladed bucket, allowing the targets to be systematically cleared under archaeological supervision. The excavation by machine was conducted in spits of no more than 100mm thickness ensuring that deposits and features were not over-excavated and that any artefacts/biological evidence in the soil are recorded.
- 6.2.4 The excavations were constantly monitored by the attending archaeologist who regularly closely inspected exposed surfaces during the course of machining. Machine-excavated deposits and the exposed surface were regularly scanned for the presence and collection of artefacts. Exposed surfaces and excavated spoil were regularly scanned by metal detector.
- 6.2.5 Any revealed features were excavated and recorded in accordance with the Archaeological Brief (Gifford 2010). The UXO watching brief was recorded using a block of context numbers from 200 to 212 (Appendix 1).
- 6.2.6 When suspected UXOs were encountered, all work ceased until these had been removed by a qualified bomb disposal technician. The UXOs were stored in a safe place, for no longer than 24 hours and then destroyed during a controlled demolition.

6.3 Cable Trenches

- 6.3.1 The proposed cable trenches were set out by VolkerInfra and covered varying linear distances (see below, Figure 2). The Archaeological Brief (Gifford 2010) had designed that each trench would be excavated to bucket width (approximately 1.2m) and would proceed to a maximum depth of either 1.5m BGL (formation level for the trenches) or the level of natural geology, whichever was higher. It was proposed that a distance of 100m within each trench would be excavated and left open concurrently across all four trenches in order to allow archaeological horizons to be inspected simultaneously across the wider landscape. However, after

commencing operations with this approach, it became rapidly clear that the trench edges were of weak stability and caused trench collapse. The methodology therefore had to be adjusted to attempt the concurrent exposure of 50m within each trench, which proved workable.

Trench	1	1A	2	2A	3	3A	4	4A
Length (m)	413.98	268.96	415.58	257.71	407.55	250.72	409.79	246.05
Total (m)	682.94		673.29		658.27		655.84	

- 6.3.2 The four trenches were each split to account for the drainage ditch which bisects the site and had to be retained. The trenches to the north of the ditch were labelled Trenches 1, 2, 3 and 4, whilst to the south they were labelled Trenches 1A, 2A, 3A and 4A.
- 6.3.3 The trenches were excavated by 360° tracked mechanical digger in spits of no more than 200mm, under constant archaeological supervision. Each trench was overseen by a team of two archaeologists, to direct the machine and undertake investigation of the trench left open.
- 6.3.4 Following excavation, the trench was cleaned and inspected for archaeological finds and features. Sections were cleaned and inspected, and were drawn at a scale of 1:10 along the trenches at 25m intervals.
- 6.3.5 All deposits were recorded on pro forma context sheets. All deposits and features were recorded using a block of context numbers from 300 onwards (Appendix 1). Trench plans were drawn at a scale of 1:50.
- 6.3.6 The trenches were all surveyed using a GPS surveying system which also recorded ground levels at the top of each trench, from which datum information could be established within the sections. A photographic record was also kept of all the trenches in colour and monochrome slide and digital formats
- 6.3.7 Upon the observation of any potential archaeological feature or find, that area of the trench was stepped, to make it safe and a permit for entry was obtained, allowing access for further investigation and recording. Features were sectioned to allow their profiles to be established and full records to be made.
- 6.3.8 Within Trench 3, a timber feature was discovered (see below) for which a wider excavation area was opened up by machine under archaeological supervision, so that it measured approximately 118m² at ground level, and was stepped to expose a basal area of approximately 38m². The enlarged trench allowed the detailed investigation and recording of the archaeological remains within, although the full extent of archaeological remains could not be exposed owing to limitations on the area which had been cleared by the UXO survey.
- 6.3.9 Features were sampled in accordance with the Archaeological Brief (Gifford 2010).

7 ARCHAEOLOGICAL SEQUENCE

7.1 Phase 1: Natural

- 7.1.1 The earliest deposit recorded on site was London Clay [346], [348], [350] and [352]. It was recorded rising up at the southern extremities of the Trenches 1A to 4A at a height of 0.40m OD in Tr3A, falling to 0.04m OD in Tr1A. This was overlain by a deposit of sand [345], [347], [349] and [351], which was between 0.15m and 0.20m thick falling from 0.55m OD in Tr3A to 0.29m OD in Tr1A (Figures 7, 8 and 9).
- 7.1.2 The London Clay deposit demonstrated signs of erosion, and it is considered that it represents the extent of an ancient foreshore, with the overlying sand potentially representing a sedimentary foreshore deposit (Figure 3).
- 7.1.3 Overlying the sand was a dark blue and brown, liquefied estuarine clay recorded as [203], [303], [309], [312], [316], [325], [329], [333] and [337]. It had a maximum height of 0.31m OD in Tr1A and a minimum height of -0.07m OD in Tr2A (Figures 7, 8 and 9).

7.2 Phase 2: Saxon Timber Feature

- 7.2.1 Two oak branches [339] and [340] were located lying parallel to each other (2.47m apart) on a northeast-southwest alignment upon the estuarine clay in Tr3 at 0.10m OD (Figures 5 and 6). They were both very straight, coming from fast-grown coppiced oak trees that were felled in late winter-early spring. They also showed signs that they had been cut by an axe (*pers comm.* D. Goodburn, 24th November 2010).

Context Number	Length (mm)	Diameter (mm)
339	3849	44
340	3090	74

- 7.2.2 At either end of the branches, and running perpendicular to them (NW-SE) appears to have been an earthen bank, recorded as [338] and seen at an upper height of 0.40m OD. It appears that the bank was formed of redeposited estuarine clay and although it could be man-made it is also possible that the bank was formed through the natural deposition of material around the wood. Unfortunately due to the limitations on the exposed area, (due to ordnance clearance, or lack thereof) a fuller picture could not be gained of the banks or their relationship to the timbers.
- 7.2.3 It was noted that the area immediately surrounding both timbers was marked by a distinct blue alluvial clay deposit ([341] around [339] and [342] around [340]). Rather than being indicative of a separate phase of activity, this is interpreted as being staining of the alluvial clay by the timbers (Plate 1).
- 7.2.4 The route of Cable Trench 3 ran directly through a surviving section of timber [339], and therefore it was agreed with Ben Found, Archaeological Advisor for Kent County Council, that this section could be archaeologically recorded, cut and lifted to form a datable sample. This sample, which measured approximately 1.0m in length of which 150mm was sent for analysis, was subjected to radiocarbon dating which has shown the likely date of the wood to be AD430 (± 30), (Appendix 5).

- 7.2.5 Despite close cleaning and excavation no further structural remains (for example timber posts, piles, tie-backs or wattling) was found in association with the timbers and bank.
- 7.2.6 The initial interpretation of the feature formed by the timbers and bank was that it may have formed part of a fish trap, the remains of which are not uncommon in the area (Gifford 2010, 6). However this interpretation is unsubstantiated, particularly due to the lack of features which would be expected in association with such a trap – for example retaining posts.

Plate 1: View NE of Timber Feature



Plate 2: View N of Timber Feature



Plate 3: View SW of Timber Feature



7.3 Phase 3: Alluvial Deposits

- 7.3.1 Sealing the estuarine clay was a thick alluvial deposit [202], [302], [308], [311], [315], [324], [328], [332] and [336]. It was a firmly compacted, mid greyish brown clayey silt, c. 0.80m thick, and demonstrated a fall in height from south to north from 1.16m OD (Section 384) to 0.52m OD (Section 366, Figures 7, 8 and 9).
- 7.3.2 Above the lower alluvium was a band of sandy clay, recorded as [306], [313], [317], [318], [322], [327], [331] and [335]. It had a loose-firm compaction and had lenses of sand within it and was recorded between heights of 1.28m OD (Section 405) and c.0.92m OD in Trench 1A (Figures 7, 8 and 9).
- 7.3.3 The sandy clay was sealed to the north by an upper alluvium, [204], [212], [301], [307], [310] and [314]. This took the form of a firmly compacted light-mid greyish brown clayey silt, up to 0.72m thick, and recorded at heights ranging from 1.59m OD (Section 349) to 1.34m OD (Section 303).
- 7.3.4 To the south of the site the sandy clay was sealed by a subsoil, [201], [319], [320], [322], [326], [330] and [334]. This was a clayey silt, very similar to the upper alluvium to the north of the site only it had a greater content of organic material within its matrix. The layers were recorded at heights ranging between 1.58m OD (Section 368) and 1.32m OD (Section 404, Figures 7, 8 and 9).

7.4 Phase 4: 20th Century

- 7.4.1 Cut into the subsoil and observed during the UXO survey in the route of Trench 1 was found the possible construction cut of a small 20th century structure [208], [210]. It was L-shaped in plan with gently sloping sides, measuring 1.60m E-W by 1.60m N-S and had a depth of 0.48m. Its fill, [207], [209] was a firmly compacted dark yellowish brown clayey silt that contained moderate amounts of charcoal flecking and occasional small pieces of CBM and concrete (Figure 10).
- 7.4.2 During the investigation several 20mm shells were located across the site. These probably date to the Second World War. The majority of the ordnance found during previous investigatory work
-

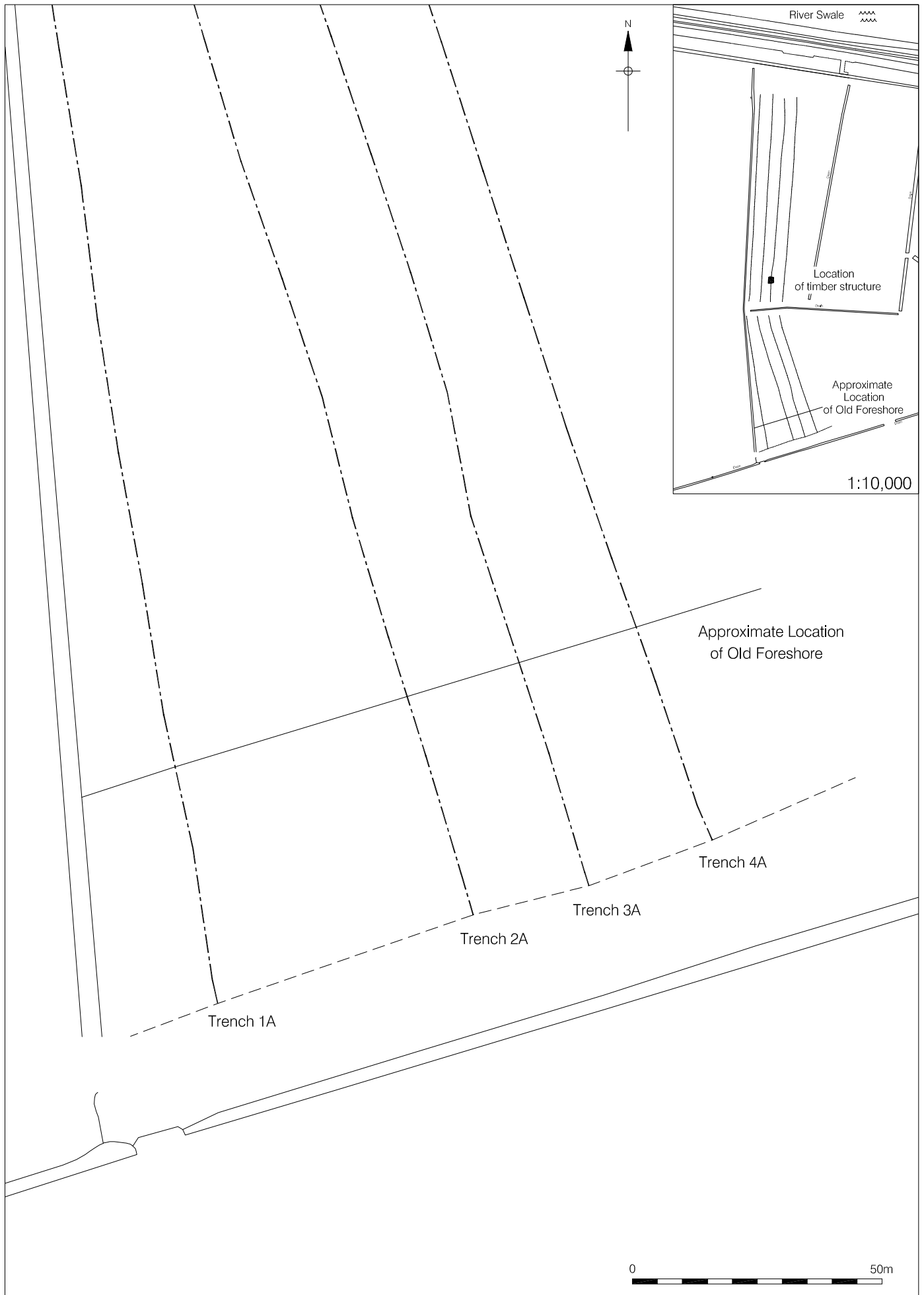
at the site was identified as German in origin, probably being fired from the nose cannon of either Messerschmitt 109s or Focke Wulf 190s. It therefore stands to reason that the shells discovered during this investigation have similar if not the same provenance. The majority of strikes (estimated at approximately which were made during the UXO investigation revealed only non-UXO finds, with agricultural debris constituting the majority.

7.4.3 The watching brief for the UXO investigation showed a general sequence of topsoil [200] overlying subsoil [201], which in turn overlaid 20th century made ground [211] to the south of the site and directly overlaid the naturally deposited alluvium elsewhere on the site.

7.4.4 The cable trenches showed topsoil overlying the above deposits and sealing the surface at heights between 1.84m OD (Section 349) and 1.59m OD (Section 303, Figures 7, 8 and 9).

7.5 Undated

7.5.1 A possible posthole [305] was cut into the top of the estuarine clay at 0.00m OD in Trench 3. It was sub-circular in plan with steep, almost vertical sides, measuring 0.30m in diameter with a depth of 0.20m. Its fill [304] was a loosely compacted, dark bluish grey sandy clay containing decayed organic material. It is possible that this feature represents a decayed tree root, though the uniformity of the feature is more indicative of a posthole. The feature was fully excavated but contained no datable material. It was located at co-ordinates 604955,194738.



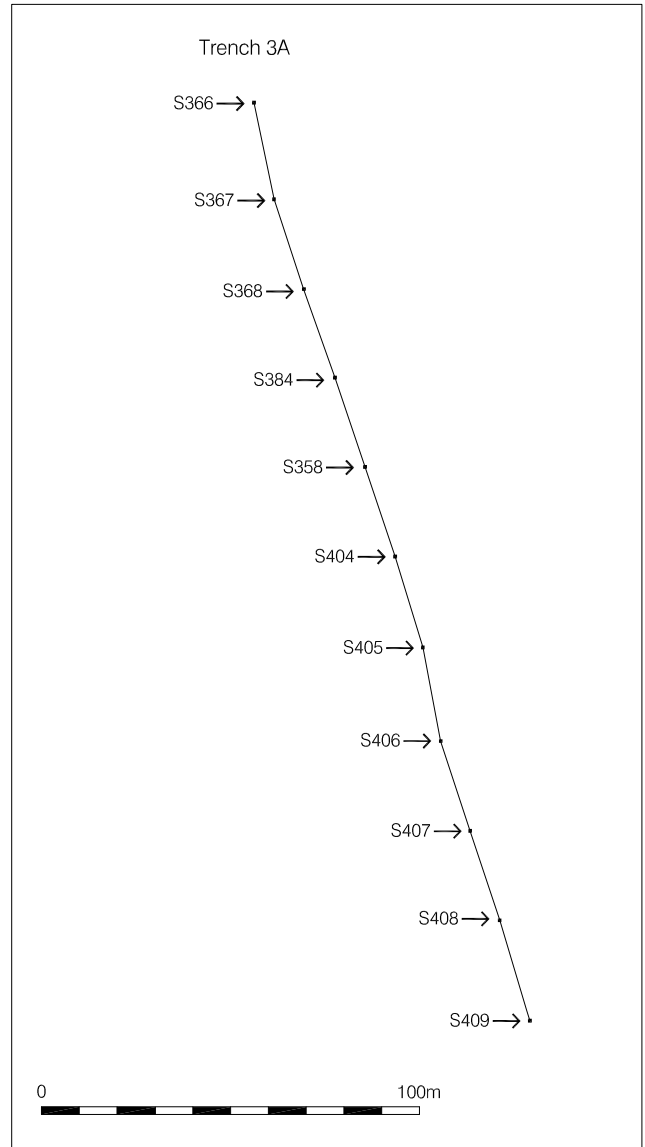
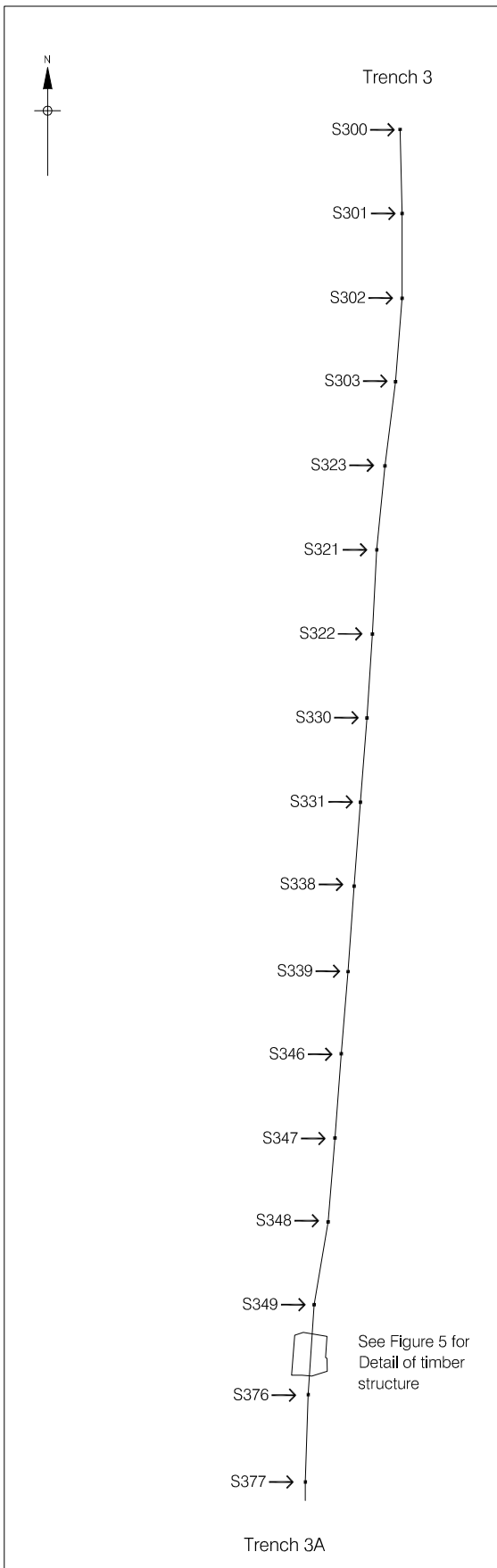
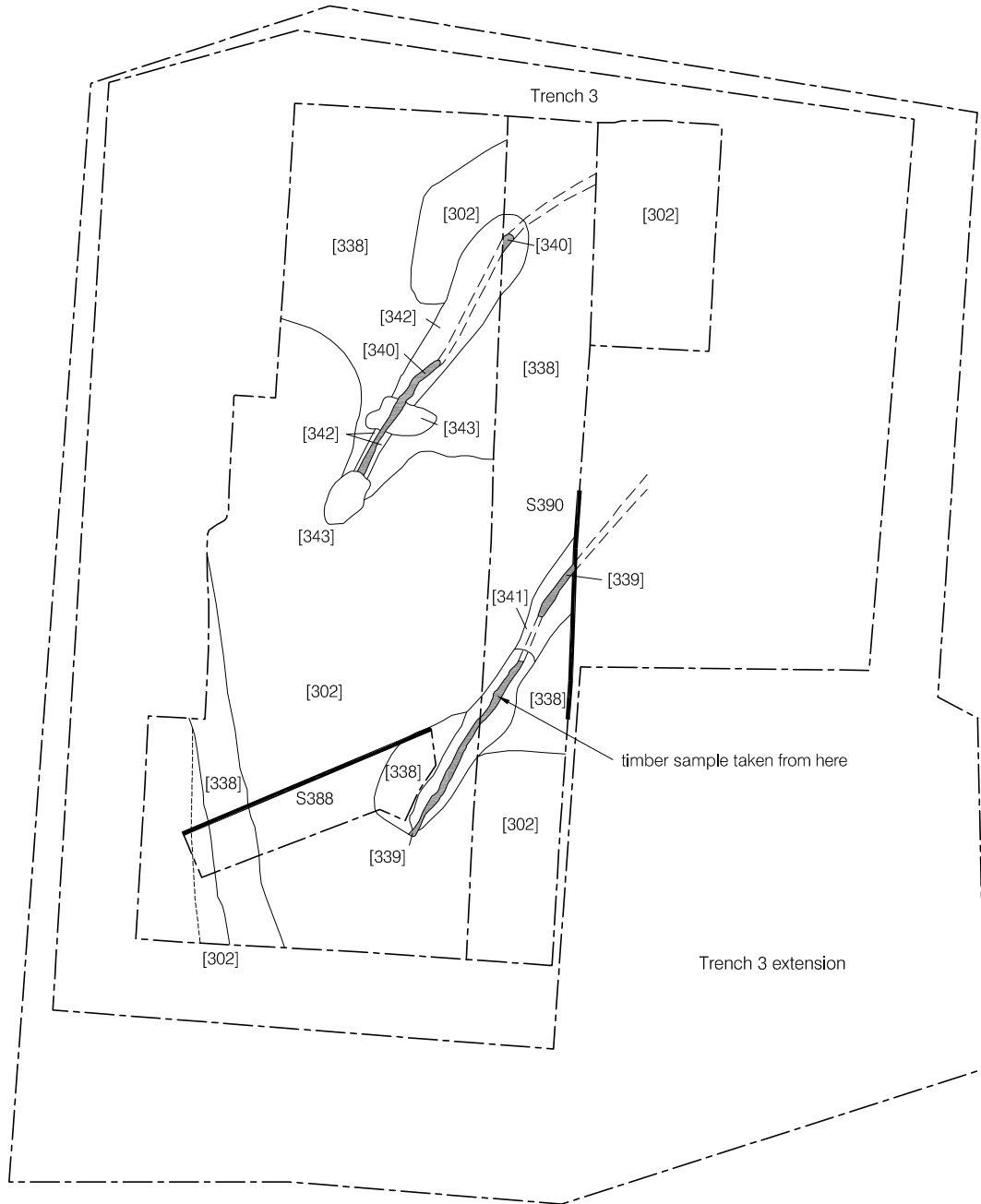


Figure 4
Section and Detail Location
1:2,000 at A4



604929/164443
+



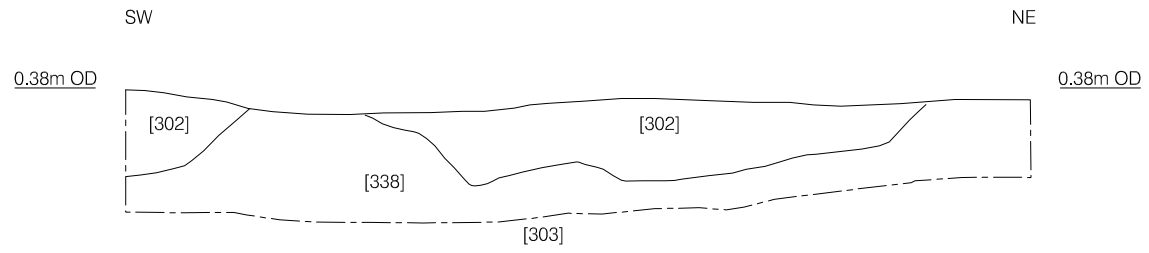
604929/164429
+

■ timber

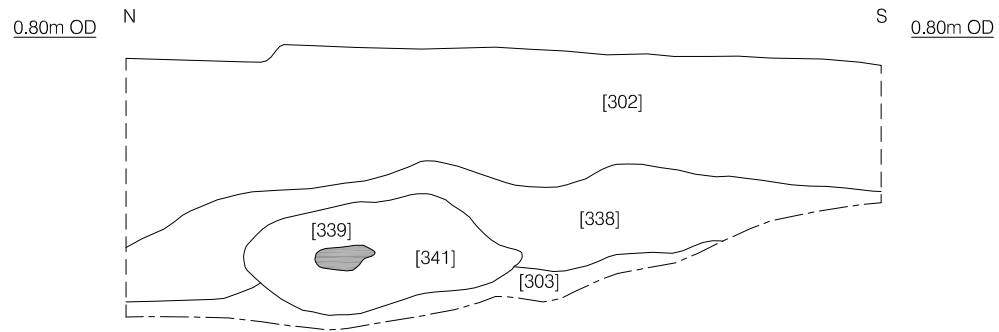


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Figure 5
Plan of Timber Structure in Trench 3
1:75 at A4



Section 388
Trench 3 Extension
Southeast Facing



Section 390
Trench 3
West Facing

■ timber



© Pre-Construct Archaeology Ltd 2010

Figure 6
Sections 388 & 390 from timber structure in Trench 3
1:25 at A4

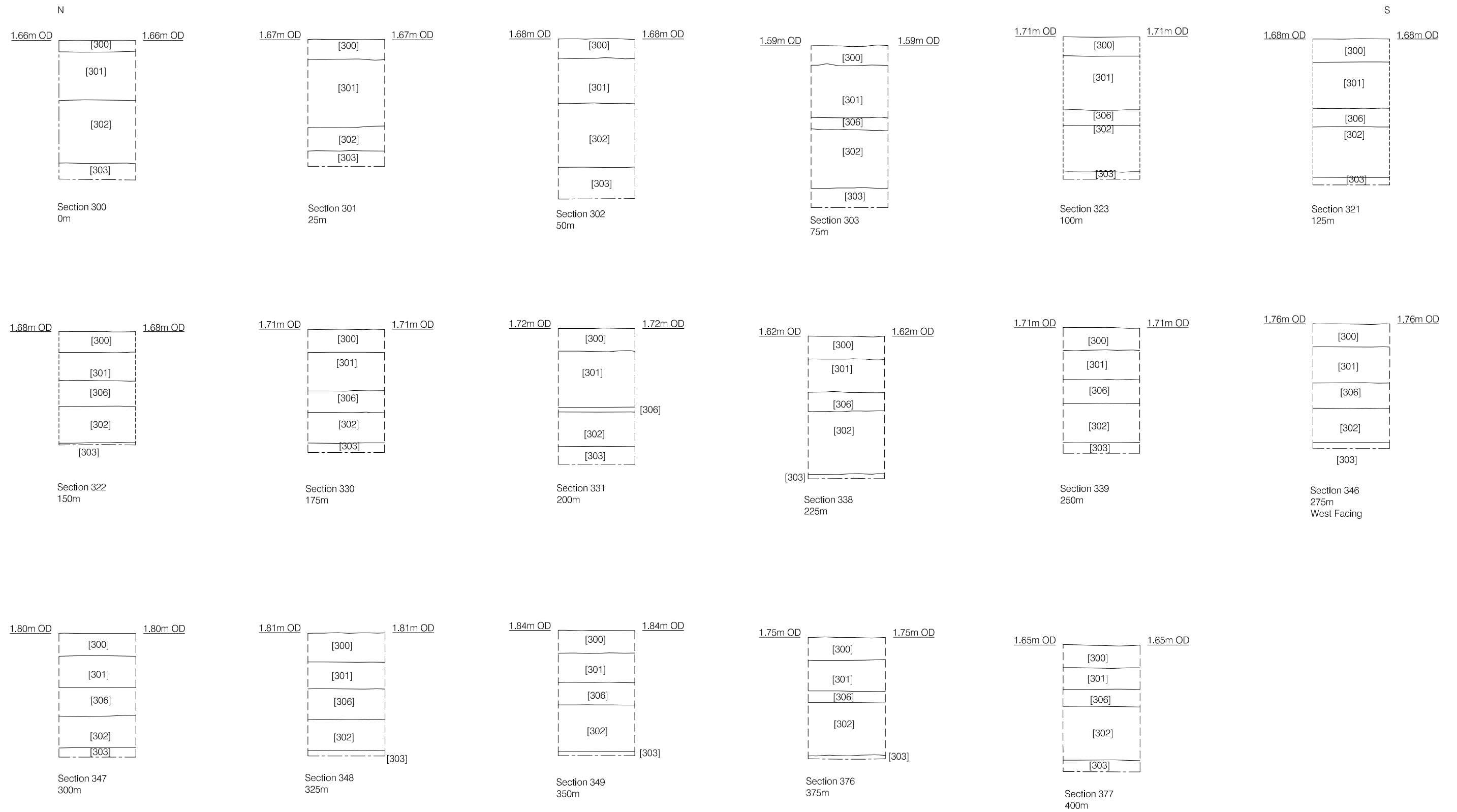


Figure 7
West Facing Sections at 25 metre intervals along Trench 3
1:50 at A3

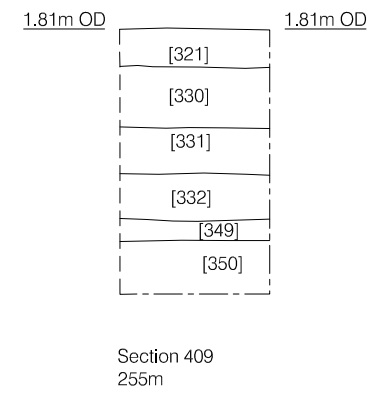
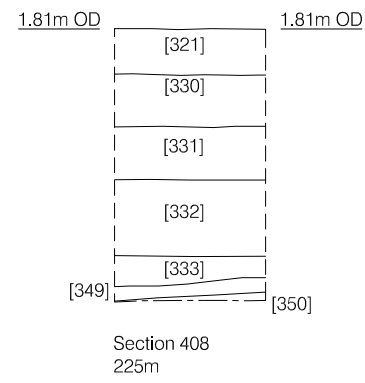
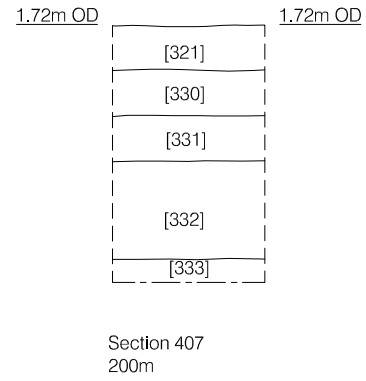
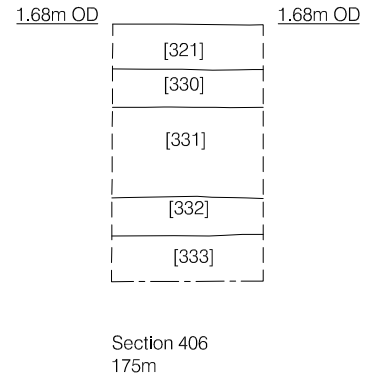
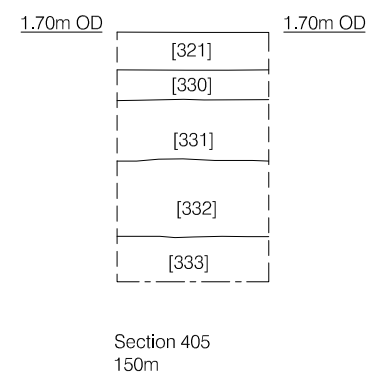
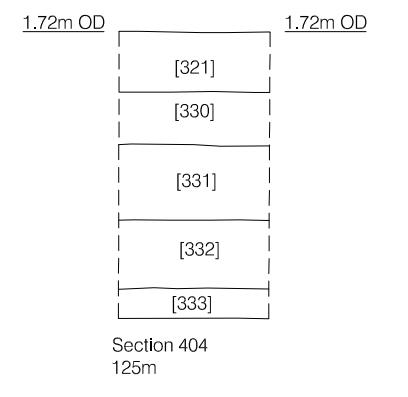
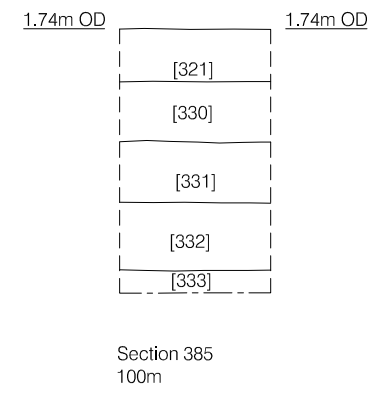
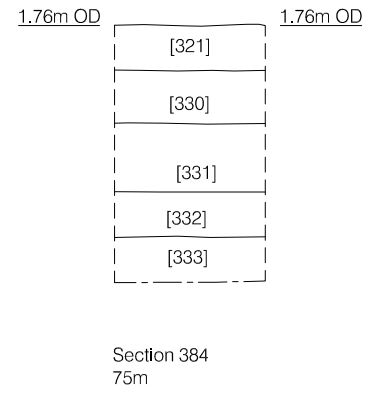
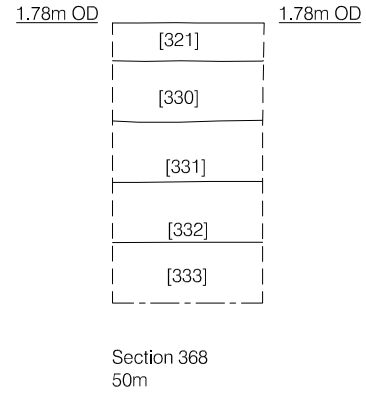
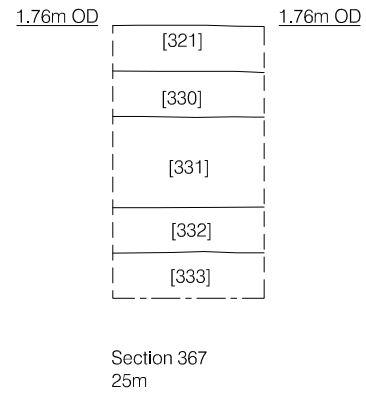
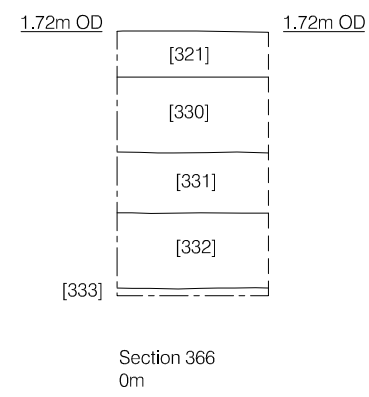


Figure 8
West Facing Sections at 25 metre intervals along Trench 3A
1:50 at A3

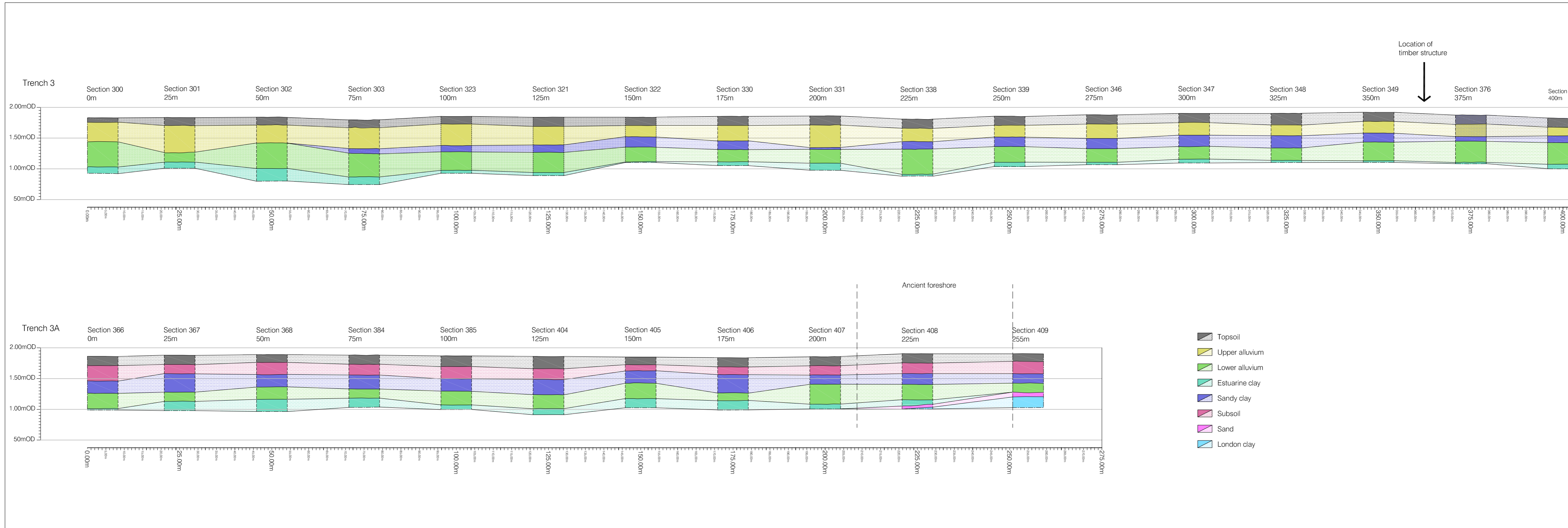


Figure 9
Deposit Model for Trenches 3 & 3A
Vertical Scale 1:75 at A2

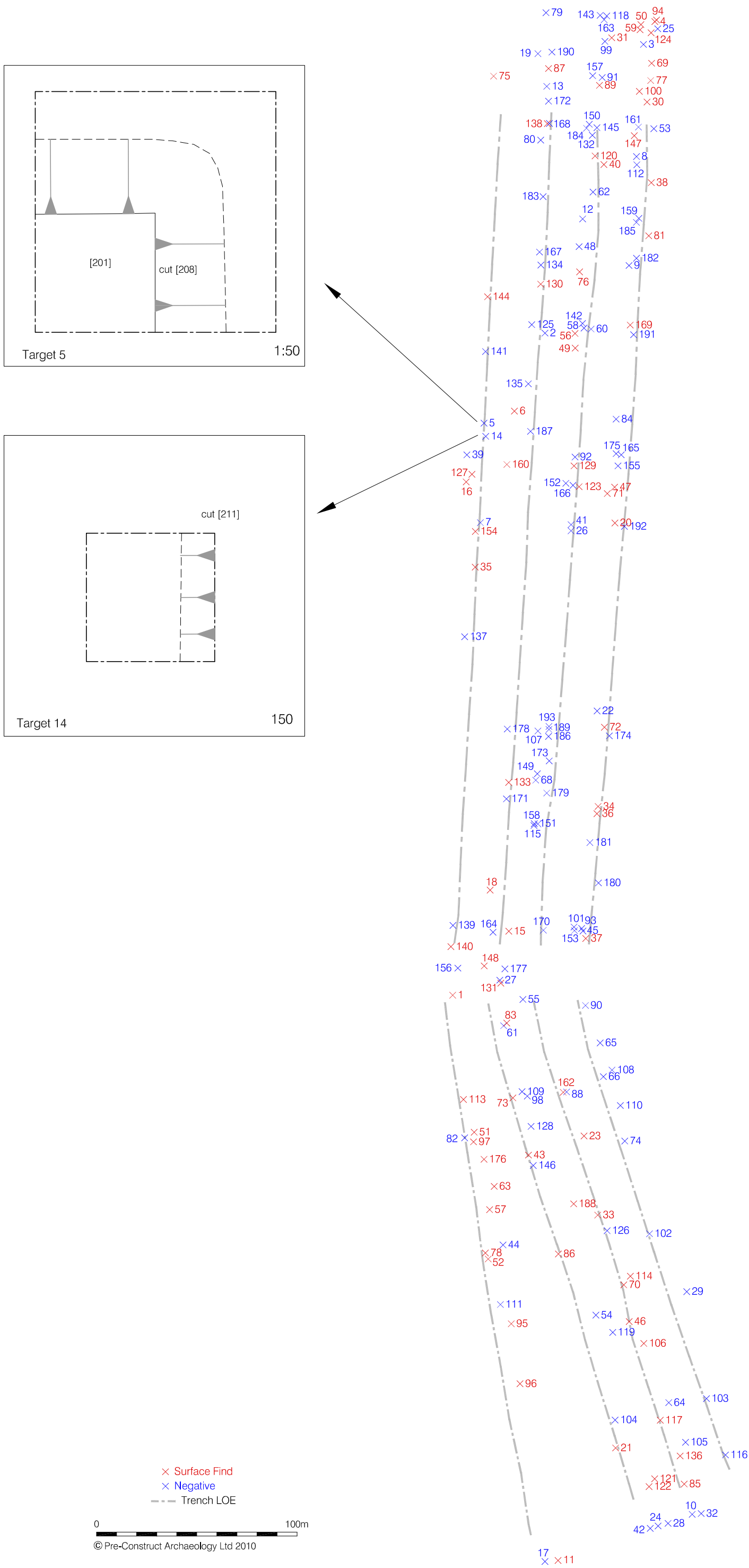


Figure 10
 UXO Survey showing Negative & Surface finds
 and Details of Cuts Found within the Targets
 1:2,000 and 1:50 at A4

8 CONCLUSIONS AND UPDATED PROJECT DESIGN

8.1 Interpretation and Conclusions

- 8.1.1 The archaeological investigation undertaken in advance of the Onshore Cable Works successfully fulfilled the approved Archaeological Brief (Gifford 2010). All intrusive groundworks were monitored by Pre-Construct Archaeology Ltd and archaeological remains, where found, were fully investigated and recorded.
- 8.1.2 The earliest deposit encountered on site was the natural London Clay. Rising at the southern end of all four trenches, it was overlain by a deposit of sand demonstrating the alignment of an ancient Swale foreshore (Figure 3) which is conjectured on the deposit model in Figure 9. Sealing this, and present throughout all four trenches, was a deposit of estuarine clay which attests to the repeated flooding and eventual silting-up of the marshland environment. The location of the site and the conjectured position of the foreshore, to the immediate north of Cleve Hill, can be combined well with place name evidence; *Cleve* in Old English means 'a place at the cliff' or 'hilly area' (pers comm. Helen Moore), which may be further indication of the historic shoreline being in the inland position suggested by the fieldwork.
- 8.1.3 The oak branches that were located atop the estuarine clay were initially interpreted as the remnants of a possible fish trap; a timber sample from one of the pieces has been radiocarbon dated to AD430 (± 30), (Appendix 5). They appeared to have been placed in a channel between possible earthen banks, and their parallel alignment combined with the fact that they have been felled by man makes it extremely unlikely that their deposition was accidental. The timber remains were located within the intertidal area approximately 280m to the north of the conjectured position of the ancient foreshore identified at the southern ends of the cable trenches.
- 8.1.4 Fish traps are commonly found in intertidal areas where they would be repeatedly filled by the tidal waters, the process of which usually requires substantial supporting structures to ensure their stability. The principal behind them was that a 'V'-shaped channel was formed in the direction of the falling tide to catch fish inside (Thames Discovery Programme 2010). The timber remains found were parallel rather than 'V'-shaped but this should be caveated by the relatively short distance (under 4m) over which they were found. The absence of any supporting structure as well as wattling, withies and pegs in association with the remains found is problematic. It could be conjectured that associated supports were located beyond the limits of excavation, yet this is considered unlikely given that a length of 3.8m on one timber was found, a length which would have certainly required support.
- 8.1.5 It is therefore entirely possible that the timbers may relate to a different structural purpose such as a brine pool associated with salt production or a temporary jetty (pers comm. Helen Moore), the superstructures of which must have been located outside of the limits of excavation. Another possibility is that the timbers were intended to form a fish trap under construction which was then abandoned prior to completion. Other examples of possible fish traps or weirs are recorded on the HER (Gifford 2010) but these are located within the existing Swale estuary to the north of the current river wall and are undated.
-

- 8.1.6 The alluvial deposits which sealed the timber structure and estuarine clay, and therefore post-date the AD 5th century, were clearly divided into two distinct phases separated by sandy clay, which attests further to the repeated episode of flooding which caused the area to eventually silt up and become dry land. This process can be fitted in to the worsening of the climate in the region from the 11th century onwards (pers comm. Helen Moore).
- 8.1.7 It is possible that the structure located during the UXO survey is a remnant from the dummy harbour of Operation Starfish, although this conclusion is purely hypothetical with little evidence to go on.
- 8.1.8 The ordnance recovered from the site reflects the role that it played as part of Operation Starfish during the Second World War. The 20mm shells were indicative of strafing of the area by German fighter planes. Of the 75 finds which were targeted and recovered during the UXO survey, 68 were non-ordnance.
- 8.1.9 An undated posthole was also found. The feature was sealed by the alluvial clay which is stratigraphically placed as dating from the AD 5th century onwards.

8.2 Research Objectives

- 8.2.1 To record comprehensively any archaeological remains that may be impacted by the proposed works; To survey the location of any archaeological features recorded within the areas affected by the works.

All archaeological deposits and remains which were exposed during the course of the UXO survey and cable trench excavations were fully recorded as per the Archaeological Brief (Gifford 2010)

- 8.2.2 To understand more fully the spatial use of the landscape through time, particularly with reference to any evidence for prehistoric activity, the medieval salt making industry, and the World War II decoy site.

The archaeological investigation revealed no activity pre-dating the Saxon period, and no remains relating to the medieval period. Alluvial deposits sealing the timber structure and therefore later than the AD 5th century demonstrate the continued flooding of the area, which would have rendered the site unsuitable for occupation and activity until the land-forming processes had completed.

A single undated posthole was found but was unattributable to a structure or activity.

The remains of what was interpreted as a construction cut for a possible feature relating to the World War II decoy site was found in isolation in Trench 1.

- 8.2.3 To determine the extent, condition, nature, character, quality and date of any archaeological remains present, and to establish the ecofactual and environmental potential of archaeological deposits and features.

Investigations within Trench 3 revealed the remains of a timber structure, consisting of two

parallel timbers felled by axe from oak and contained within an earthen bank. It is possible that the remains formed a fish trap created by embedding timbers within naturally formed hollows within the inter-tidal marshland environment, with the observed bank forming the edges of such a hollow. The lack of any additional remains associated with the timbers is perplexing, but it is possible that further remains were located beyond the limits of excavation (further work beyond the excavated LOE was impeded by the small areas which had been cleared by UXO survey) or that the structure was abandoned prior to completion or that the timbers related to another unknown purpose. One of the two timbers forming the feature has been radiocarbon dated to AD430 (± 30), (Appendix 5).

The investigation has allowed the recording of inter-tidal deposits along the route of the cable trenches, and this date has been used to form a deposit model (Figure 9) which demonstrates a consistent accumulation of sedimentary deposits across the site within the marshland environment. Of note was the exposure of an eroded alignment of London Clay at the southern edge of the trenches, which is considered to represent an antiquated foreshore.

- 8.2.4 To investigate the palaeo-environment according to research aims defined and agreed on the basis of the above assessment of potential.

Samples were taken from alluvial layers from localised positions across the site and these have been superficially processed, during which no peat, organic material or datable material was found within. Therefore expanded assessment of the alluvium will not provide any meaningful information and is not recommended.

Timber samples taken from the structure within Trench 3 have been inspected by experts and also radiocarbon dated to assess the felling date of the tree. The timber was from a fast-grown oak tree and is therefore likely to have originated from a location remote from the marshland environment of the site, perhaps further to the south on the higher, drier land.

- 8.2.5 If possible to protect any archaeological remains in the inter-tidal area by establishing exclusion zones so that plant, and anchors used in the works do not damage these sites.

The archaeological works were undertaken by PCA, LAL, Gifford and VolkerInfracore in such a way that impact upon the ground was limited to only those areas affected by the onshore cable works. The cable trenches were excavated in precise locations set out using digital survey either to formation level or to the top of natural geology whereupon, after archaeological investigation, they were backfilled for safety. The trenches will be re-excavated by the contractor in 2011 to install the cable within the same exact locations ascertained by survey.

The notable archaeological find of the timber structure was, after appropriate recording, archaeologically sampled within the route of cable trench 3 only so that the remainder of the structure beyond the limits of the cable trench was left *in situ* and protected.

8.3 Updated Project Design

8.3.1 PCA considers that this report is sufficient to form an Assessment stage document for the archaeological works. We also consider that the preparation of a note within a local round-up summary would be an appropriate form of public dissemination for the results, but that further publication in the form of an academic paper or equivalent would be inappropriate, given the minimal quantity of archaeology revealed and impacted upon by the works.

8.4 Confidence

8.4.1 Pre-Construct Archaeology Ltd considers that the work was undertaken professionally and fully within the remit of the approved Archaeological Brief (Gifford 2010).

9 CONTENTS OF THE ARCHIVE AND DEPOSITION

9.1 Paper Archive

Registers	16 sheets
Context sheets	66 sheets
Plans (1:20)	2 drawings on 8 sheets
Sections (1:10)	116 drawings on 116 sheets

9.2 Finds Archive

Mixed (CBM, Pot, Glass, Metal)	1 Box
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9.3 Environmental Archive

Bulk samples	3
Timber samples	2

9.4 Photographic Archive

Black and White 35mm	36 photographs
Colour Slide 35mm	36 photographs
Digital Image	82 photographs

9.5 Additionally, the archive includes material originating from PCAs previous work at the site (under the same site code) during an evaluation in 2008 in advance of the development of a new electrical substation with associated landscaping earthworks and the construction of a permanent access road.

9.6 Archive Deposition

9.6.1 Following completion of the project and with the approval of the Local Planning Authority, LAL and Gifford, PCA will seek to deposit the entire site archive with either the local museum or the Kent History Centre under the site code **KCHG08**.

10 ACKNOWLEDGEMENTS

- 10.1 Pre-Construct Archaeology Limited would like to thank Phil Emery of Gifford for commissioning the work on behalf of London Array Limited, and Helen Moore of Gifford for overseeing it. We also thank Don Liversidge of Metoc Plc, Steven Haagsma of VolkerInfra and Keith Henson and Lynsey Upsdell of London Array for their assistance. The archaeological work was monitored by Ben Found of Kent County Council.
- 10.2 The author would like to thank James Dracott, Elly Buttery, John Payne and Paw Jorgenson for their work on site and Paw again for carrying out the archaeological monitoring during the UXO survey. Thanks also to Jenny Simonson for producing the drawings and Chris Mayo for project management and editing. Comments on the timber were gratefully received from Damian Goodburn.

11 BIBLIOGRAPHY

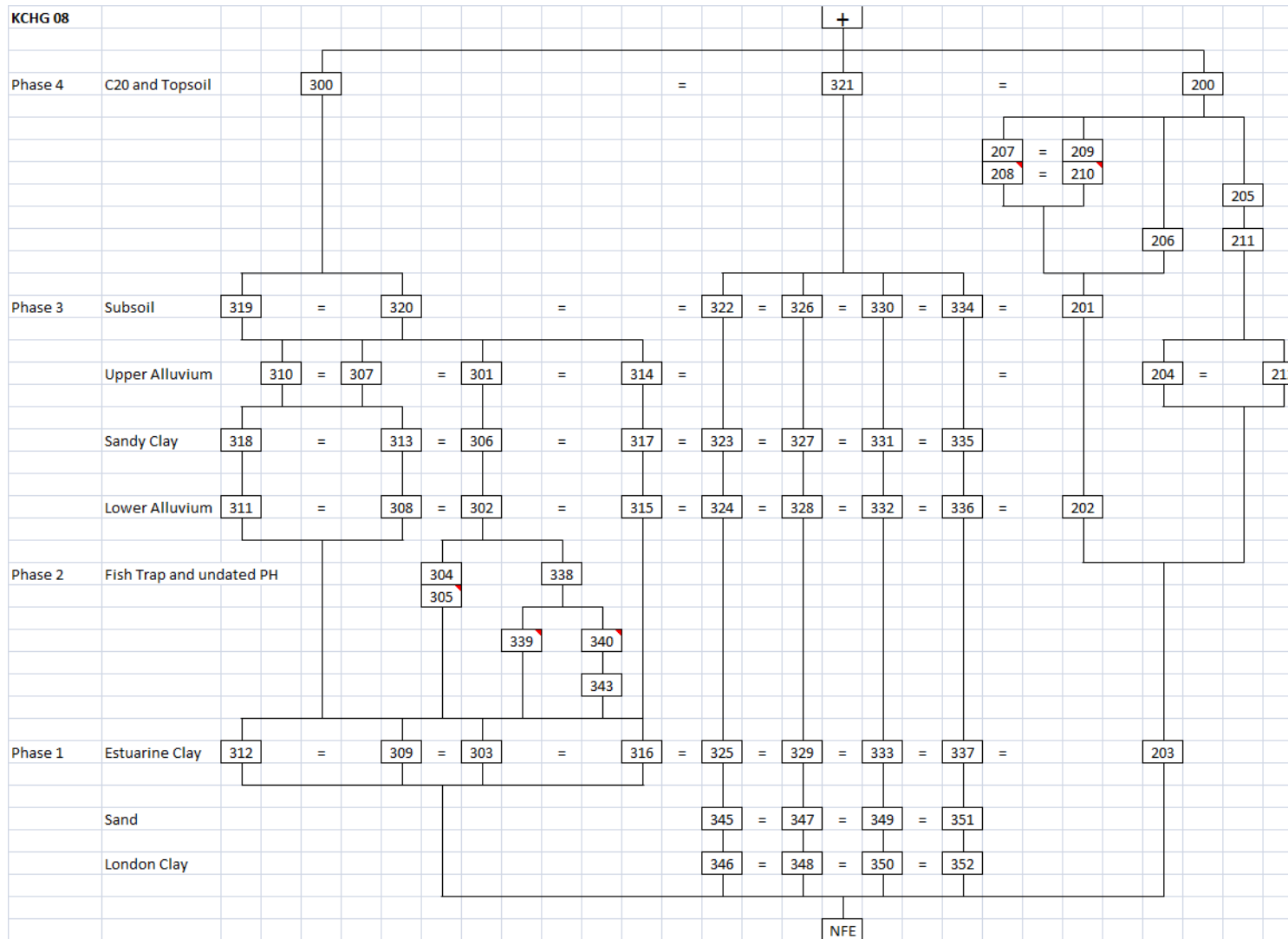
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12 APPENDIX 1: CONTEXT INDEX

Site Code	Context No.	Trench	Plan	Section / Elevation	Type	Description	Phase
KCHG08	200	UXO		Y	Ploughsoil	Modern	4
KCHG08	201	UXO		Y	Alluvial layer	Unknown	3
KCHG08	202	UXO		Y	Deposit	Alluvial layer	3
KCHG08	203	UXO		Y	Deposit	London clay	1
KCHG08	204	UXO		Y	Deposit	Alluvial layer	3
KCHG08	205	UXO		Y	Deposit	Colluvium	4
KCHG08	206	UXO		Y	Deposit	Layer of crushed shells	4
KCHG08	207	UXO		Y	Deposit	Fill of Cut [208]	4
KCHG08	208	UXO	Y	Y	Cut	Possible construction cut	4
KCHG08	209	UXO		Y	Deposit	Fill of Cut [210]	4
KCHG08	210	UXO	Y	Y	Cut	Possible construction cut	4
KCHG08	211	UXO		Y	Deposit	Land reclamation layer	4
KCHG08	212	UXO		Y	Deposit	Alluvial layer	3
KCHG08	300	1-4		Y	Layer	Topsoil	4
KCHG08	301	3		Y	Layer	Upper Alluvium	3
KCHG08	302	3		Y	Layer	Lower Alluvium	3
KCHG08	303	3		Y	Layer	Esturine Clay	1
KCHG08	304	3		Y	Layer	Fill of [305]	unphased
KCHG08	305	3	Y	Y	Layer	Cut of Possible Posthole	unphased
KCHG08	306	3		Y	Layer	Sandy Clay	3
KCHG08	307	2		Y	Layer	Upper Alluvium	3
KCHG08	308	2		Y	Layer	Lower Alluvium	3
KCHG08	309	2		Y	Layer	Esturine Clay	1
KCHG08	310	1		Y	Layer	Upper Alluvium	3
KCHG08	311	1		Y	Layer	Lower Alluvium	3
KCHG08	312	1		Y	Layer	Esturine Clay	1
KCHG08	313	2		Y	Layer	Sandy Clay	3
KCHG08	314	4		Y	Layer	Upper Alluvium	3
KCHG08	315	4		Y	Layer	Lower Alluvium	3
KCHG08	316	4		Y	Layer	Esturine Clay	1
KCHG08	317	4		Y	Layer	Sandy Clay	3
KCHG08	318	1		Y	Layer	Sandy Clay	3
KCHG08	319	1		Y	Layer	Subsoil	3
KCHG08	320	2		Y	Layer	Subsoil	3
KCHG08	321	1A-4A		Y	Layer	Topsoil	4

Site Code	Context No.	Trench	Plan	Section / Elevation	Type	Description	Phase
KCHG08	322	1A		Y	Layer	Subsoil	3
KCHG08	323	1A		Y	Layer	Sandy Clay	3
KCHG08	324	1A		Y	Layer	Lower Alluvium	3
KCHG08	325	1A		Y	Layer	Esturine Clay	1
KCHG08	326	2A		Y	Layer	Subsoil	3
KCHG08	327	2A		Y	Layer	Sandy Clay	3
KCHG08	328	2A		Y	Layer	Lower Alluvium	3
KCHG08	329	2A		Y	Layer	Esturine Clay	1
KCHG08	330	3A		Y	Layer	Subsoil	3
KCHG08	331	3A		Y	Layer	Sandy Clay	3
KCHG08	332	3A		Y	Layer	Lower Alluvium	3
KCHG08	333	3A		Y	Layer	Esturine Clay	1
KCHG08	334	4A		Y	Layer	Subsoil	3
KCHG08	335	4A		Y	Layer	Sandy Clay	3
KCHG08	336	4A		Y	Layer	Lower Alluvium	3
KCHG08	337	4A		Y	Layer	Esturine Clay	1
KCHG08	338	3	Y	Y	Layer	Silty Clay	2
KCHG08	339	3	Y	Y	Wood	Wooden Post	2
KCHG08	340	3	Y	Y	Wood	Wooden Post	2
KCHG08	341	3	Y	Y	Layer	Silty Clay	2
KCHG08	342	3	Y	Y	Layer	Silty Clay	2
KCHG08	343	3	Y	Y	Layer	Sandy Clay	2
KCHG08	344	*	*	*	*	*	*
KCHG08	345	1A		Y	Layer	Sand	1
KCHG08	346	1A		Y	Layer	London Clay	1
KCHG08	347	2A		Y	Layer	Sand	1
KCHG08	348	2A		Y	Layer	London Clay	1
KCHG08	349	3A		Y	Layer	Sand	1
KCHG08	350	3A		Y	Layer	London Clay	1
KCHG08	351	4A		Y	Layer	Sand	1
KCHG08	352	4A		Y	Layer	London Clay	1

13 APPENDIX 2: MATRIX



14 APPENDIX 3: UXO STRIKES

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
1	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604883.6	164368.0
2	3.00m x 3.00m	2.40m	East-west	05/08/2010	Ploughsoil (200) over Alluvium (201) over Alluvium (202) over London Clay (203)		604929.6	164698.1
3	2.00m x 2.00m	2.70m	East-west	04/08/2010	Ploughsoil (200) over Alluvium (201) over Alluvium (202) over London Clay (203)		604978.7	164842.0
4	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604984.4	164853.4
5	1.60m x 1.60m	0.80m	East-west	05/08/2010	Ploughsoil (200) over Fill (207) over Cut [208] over Alluvium (201)		604899.2	164653.2
6	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604914.4	164659.2
7	3.00m x 3.00m	2.00m	East-west	06/08/2010	Ploughsoil (200) over Crushed shells (206) over Alluvium (201) over Alluvium (202) over London Clay (203)		604897.4	164603.6
8	2.00m x 2.00m	2.60m	East-west	04/08/2010	Ploughsoil (200) over Alluvium (201) over Alluvium		604975.2	164786.1

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
					(202) over London Clay (203)			
9	3.00m x 3.00m	2.80m	East-west	05/08/2010	Ploughsoil (200) over Alluvium (201) over Alluvium (202) over London Clay (203)		604971.5	164731.8
10	N/A	N/A	N/A	11/08/2010	N/A	Negative.	605003.0	164109.2
11	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604936.1	164086.2
12	3.00m x 3.00m	2.40m	East-west	04/08/2010	Ploughsoil (200) over Alluvium (201) over Alluvium (202) over London Clay (203)		604948.4	164755.0
13	3.00m x 3.00m	1.45m	East-west	03/08/2010	Ploughsoil (200) over Alluvium (201) over Alluvium (202) over London Clay (203)		604930.5	164821.1
14	3.00m x 3.00m	2.40m	East-west	05/08/2010	Ploughsoil (200) over Fill (209) over Cut [210] over Alluvium (201)		604900.1	164646.6
15	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604911.6	164399.9
16	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604890.3	164623.9
17	1.60m x 1.60m	1.06m	East-west	11/08/2010	Ploughsoil (200) over Colluvium (205) over		604929.6	164085.7

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
					Land reclamation (211) over Alluvium (212)			
18	N/A	N/A	N/A	09/08/2010	N/A	Surface find.	604902.3	164420.4
19	1.60m x 1.60m	0.40m	East-west	03/08/2010	Ploughsoil (200) over Crushed shells (206)		604926.1	164837.4
20	N/A	N/A	N/A	06/08/2010	N/A	Surface find.	604964.5	164603.4
21	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604964.8	164142.3
22	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604955.6	164509.7
23	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604949.1	164297.8
24	1.60m x 1.60m	1.60m	East-west	11/08/2010	Ploughsoil (200) over Colluvium (205) over Land reclamation (211) over Alluvium (212) London Clay (203)		604986.0	164103.4
25	1.60m x 1.60m	0.65m	Southwest-northeast	04/08/2010	Ploughsoil (200) over Alluvium (201)		604985.8	164849.8
26	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604942.6	164599.5
27	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604907.1	164372.5
28	N/A	N/A	N/A	11/08/2010	N/A	Negative.	604991.0	164104.7
29	N/A	N/A	N/A	12/08/2010	N/A	Negative.	605000.3	164220.2
30	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604980.5	164813.3
31	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604962.9	164845.3
32	N/A	N/A	N/A	11/08/2010	N/A	Negative.	605007.5	164109.6
33	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604955.9	164258.4
34	N/A	N/A	N/A	09/08/2010	N/A	Surface find.	604956.1	164462.1
35	N/A	N/A	N/A	06/08/2010	N/A	Surface find.	604894.8	164581.4
36	N/A	N/A	N/A	09/08/2010	N/A	Surface find.	604955.5	164458.5

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
37	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604949.9	164396.3
38	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604982.6	164773.1
39	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604890.7	164637.4
40	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604959.0	164782.1
41	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604942.6	164602.6
42	N/A	N/A	N/A	11/08/2010	N/A	Negative.	604982.1	164102.2
43	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604921.4	164288.3
44	N/A	N/A	N/A	11/08/2010	N/A	Negative.	604908.7	164243.5
45	3.00m x 3.00m	0.67m	East-west	10/08/2010	Ploughsoil (200) over Alluvium (201)		604948.6	164400.0
46	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604971.6	164205.3
47	N/A	N/A	N/A	06/08/2010	N/A	Surface find.	604964.3	164621.3
48	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604946.6	164741.2
49	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604944.7	164690.6
50	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604977.4	164851.9
51	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604894.3	164299.7
52	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604901.3	164236.5
53	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604983.9	164800.0
54	N/A	N/A	N/A	12/08/2010	N/A	Negative.	604955.0	164208.5
55	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604918.6	164365.9
56	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604944.6	164697.9
57	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604902.0	164261.1
58	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604949.1	164700.6
59	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604977.0	164849.3
60	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604952.6	164700.1
61	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604909.0	164352.8
62	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604953.6	164768.4
63	N/A	N/A	N/A	11/08/2010	N/A	Surface find - Possible shrapnel.	604904.3	164272.7
64	N/A	N/A	N/A	12/08/2010	N/A	Negative.	604991.3	164164.9
65	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604957.1	164344.2
66	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604958.7	164327.4
67	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604955.0	164365.0
68	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604925.0	164475.2

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
69	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604982.8	164832.6
70	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604968.9	164223.6
71	N/A	N/A	N/A	06/08/2010	N/A	Surface find.	604960.7	164618.1
72	N/A	N/A	N/A	09/08/2010	N/A	Surface find.	604959.2	164501.6
73	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604913.6	164316.8
74	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604969.4	164295.3
75	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604904.0	164826.2
76	N/A	N/A	N/A	05/08/2010	N/A	Surface find - 20mm round	604946.9	164728.6
77	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604982.3	164824.0
78	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604899.9	164239.5
79	1.60m x 1.60m	0.60m	East-west	03/08/2010	Ploughsoil (200) over Alluvium (201)		604930.1	164857.8
80	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604927.5	164794.3
81	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604981.3	164746.6
82	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604889.6	164296.9
83	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604910.6	164354.1
84	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604965.1	164655.2
85	N/A	N/A	N/A	11/08/2010	N/A	Surface find - 20mm round	604999.0	164124.3
86	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604936.3	164239.0
87	1.60m x 1.60m	0.35m	East-west	03/08/2010	Ploughsoil (200) over Crushed shells (206)		604931.4	164830.0
88	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604940.4	164319.8
89	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604956.8	164821.6
90	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604949.8	164362.9
91	N/A	N/A	N/A	03/08/2010	N/A	Negative.	604958.1	164825.5
92	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604944.6	164636.3
93	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604947.9	164401.3
94	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604985.2	164854.2
95	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604912.8	164204.2
96	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604917.2	164174.3
97	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604894.0	164294.9
98	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604920.8	164317.7

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
99	1.60m x 1.60m	0.28m	Southwest-northeast	03/08/2010	Ploughsoil (200)		604959.5	164843.5
100	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604976.7	164818.6
101	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604944.1	164402.0
102	N/A	N/A	N/A	11/08/2010	N/A	Negative.	604981.7	164249.1
103	N/A	N/A	N/A	12/08/2010	N/A	Negative.	605010.1	164166.9
104	N/A	N/A	N/A	11/08/2010	N/A	Negative.	604964.6	164156.2
105	N/A	N/A	N/A	12/08/2010	N/A	Negative.	604999.7	164145.1
106	N/A	N/A	N/A	12/08/2010	N/A	Surface find - 20mm round	604978.9	164194.4
107	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604926.1	164499.7
108	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604963.0	164330.7
109	1.60m x 1.60m	0.52m	East-west	10/08/2010	Ploughsoil (200) over Alluvium (201)		604918.2	164319.9
110	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604967.2	164313.0
111	1.60m x 1.60m	1.48m	East-west	11/08/2010	Ploughsoil (200) over Alluvium (204) over Alluvium (202)		604907.4	164213.8
112	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604975.4	164782.0
113	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604889.0	164316.0
114	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604972.2	164227.9
115	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604924.1	164452.6
116	N/A	N/A	N/A	11/08/2010	N/A	Negative.	605019.6	164138.8
117	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604987.1	164156.1
118	0.20m x 0.20m	0.10m	East-west	03/08/2010	Ploughsoil (200)		604960.4	164856.2
119	N/A	N/A	N/A	12/08/2010	N/A	Negative.	604963.4	164199.9
120	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604954.6	164786.4
121	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604984.3	164126.9
122	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604981.5	164123.0
123	N/A	N/A	N/A	06/08/2010	N/A	Surface find.	604946.4	164621.5
124	N/A	N/A	N/A	03/08/2010	N/A	Surface find.	604982.5	164847.8
125	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604923.0	164702.3
126	N/A	N/A	N/A	12/08/2010	N/A	Negative.	604960.6	164250.6

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
127	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604893.2	164627.7
128	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604922.7	164302.6
129	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604944.1	164631.9
130	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604927.5	164722.5
131	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604907.6	164374.0
132	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604953.2	164796.7
133	N/A	N/A	N/A	09/08/2010	N/A	Surface find - Possible shrapnel.	604911.5	164474.1
134	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604927.6	164732.0
135	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604921.3	164672.8
136	N/A	N/A	N/A	12/08/2010	N/A	Surface find - 20mm round	604997.0	164138.3
137	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604889.6	164546.7
138	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604930.8	164802.5
139	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604883.7	164402.8
140	N/A	N/A	N/A	09/08/2010	N/A	Surface find.	604882.7	164392.2
141	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604900.0	164688.9
142	N/A	N/A	N/A	05/08/2010	N/A	Negative.	604948.3	164702.9
143	1.60m x 1.60m	0.20m	Southwest-northeast	03/08/2010	Ploughsoil (200)		604957.1	164856.5
144	N/A	N/A	N/A	05/08/2010	N/A	Surface find.	604901.0	164716.2
145	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604955.5	164800.5
146	N/A	N/A	N/A	11/08/2010	N/A	Negative.	604923.8	164283.1
147	N/A	N/A	N/A	04/08/2010	N/A	Surface find.	604974.1	164796.5
148	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604899.3	164382.6
149	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604925.8	164478.4
150	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604951.7	164802.2
151	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604926.1	164453.4
152	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604940.0	164623.2
153	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604944.3	164400.2
154	N/A	N/A	N/A	06/08/2010	N/A	Surface find - Possible shrapnel.	604894.9	164599.2
155	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604966.0	164631.9
156	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604886.2	164381.5
157	N/A	N/A	N/A	03/08/2010	N/A	Negative.	604953.4	164826.4

Target	Excavation Size	Excavation Depth	Alignment	Date Excavated	Stratigraphic Sequence	Notes	Easting	Northing
158	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604924.3	164453.5
159	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604976.4	164755.3
160	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604910.6	164362.6
161	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604976.2	164800.8
162	N/A	N/A	N/A	10/08/2010	N/A	Surface find.	604938.7	164319.6
163	N/A	N/A	N/A	03/08/2010	N/A	Negative.	604956.1	164854.3
164	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604903.7	164399.4
165	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604967.6	164637.4
166	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604943.6	164622.2
167	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604926.9	164738.5
168	N/A	N/A	N/A	04/08/2010	N/A	Negative.	604931.8	164802.6
169	N/A	N/A	N/A	06/08/2010	N/A	Surface find.	604972.1	164702.1
170	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604928.8	164400.4
171	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604910.4	164465.9
172	N/A	N/A	N/A	03/08/2010	N/A	Negative.	604931.4	164813.7
173	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604931.7	164484.8
174	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604961.7	164497.3
175	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604965.1	164638.0
176	N/A	N/A	N/A	11/08/2010	N/A	Surface find.	604899.2	164286.2
177	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604909.6	164381.1
178	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604910.8	164500.7
179	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604930.5	164468.8
180	N/A	N/A	N/A	10/08/2010	N/A	Negative.	604956.3	164424.0
181	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604952.0	164444.1
182	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604975.2	164735.4
183	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604928.7	164766.1
184	N/A	N/A	N/A	06/08/2010	N/A	Negative.	604950.3	164800.2
185	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604975.2	164753.3
186	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604931.4	164497.0
187	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604922.4	164649.1
188	N/A	N/A	N/A	12/08/2010	N/A	Surface find.	604943.9	164264.0
189	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604931.6	164500.5
190	N/A	N/A	N/A	03/08/2010	N/A	Negative.	604933.1	164838.2
191	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604973.8	164697.3
192	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604969.2	164601.7
193	N/A	N/A	N/A	09/08/2010	N/A	Negative.	604931.6	164502.0

15 APPENDIX 4: OASIS FORM

OASIS ID: preconst1-85293

Project details

Project name	LONDON ARRAY ONSHORE WORKS, GRAVENEY, KENT ME13 9EF: AN ARCHAEOLOGICAL INVESTIGATION
Short description of the project	An archaeological investigation was undertaken by Pre-Construct Archaeology Ltd on land at Cleve Hill, Graveney, Kent ME13 9EF as part of the onshore works for the London Array offshore wind farm development. The earliest deposit encountered on site was the natural London Clay. Rising at the southern end of all four trenches, it was overlain by a deposit of sand demonstrating the alignment of an ancient Swale foreshore. Sealing this, and present throughout all four trenches, was a deposit of estuarine clay which attests to the repeated flooding and eventual silting-up of the marshland environment. Within Trench 3 were found two oak branches that were located atop the estuarine clay and may represent the remnants of a probable fish trap. A timber sample from one of the pieces has been radiocarbon dated to AD430 (±30). The alluvial deposits which sealed the feature were clearly divided into two separate phases separated by sandy clay, which attests further to the repeated episode of flooding which eventually resulted in the location of the site being turned over to land. It is possible that the structure located during the UXO survey is a remnant from the dummy harbour of Operation Starfish, although this conclusion is purely hypothetical with little evidence to go on. The ordnance recovered from the site reflects the role that it played as part of Operation Starfish during the Second World War. The 20mm shells were indicative of strafing of the area by German fighter planes. An undated posthole was also found.
Project dates	Start: 03-08-2010 End: 01-10-2010
Previous/future work	Yes / Not known
Any associated project reference codes	KCHG 08 - Sitecode
Type of project	Recording project
Current Land use	Cultivated Land 1 - Minimal cultivation
Monument type	FISH TRAP Early Medieval
Monument type	POST HOLE Uncertain
Monument type	CONSTRUCTION CUT Modern
Significant Finds	TIMBER Early Medieval
Investigation type	'Part Excavation','Test-Pit Survey','Watching Brief'
Prompt	Planning condition

Project location

Country	England
Site location	KENT SWALE GRAVENEY WITH GOODNESTONE Cleve Hill, Graveney, Kent
Postcode	ME13 9EF
Study area	54.90 Hectares
Site coordinates	TR 0511 6412 51.3385159703 0.945113023564 51 20 18 N 000 56 42 E Point
Height OD / Depth	Min: 0.29m Max: 0.55m

Project creators

Name of Organisation	Pre-Construct Archaeology Ltd
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Project brief originator	Gifford
Project design originator	Helen Moore
Project director/manager	Chris Mayo
Project supervisor	Guy Seddon
Type of sponsor/funding body	Utility Company
Name of sponsor/funding body	London Array Ltd

Project archives

Physical Archive recipient	Local museum
Physical Contents	'Ceramics','Wood'
Digital Archive recipient	Local museum
Digital Contents	'Environmental','Stratigraphic','Wood'
Digital Media available	'Images raster / digital photography','Images vector','Spreadsheets','Survey','Text'
Paper Archive recipient	Local Museum
Paper Contents	'Environmental','Stratigraphic','Wood'
Paper Media available	'Context sheet','Diary','Matrices','Miscellaneous Material','Photograph','Section','Unpublished Text','Plan'

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	LONDON ARRAY ONSHORE WORKS, GRAVENEY, KENT ME13 9EF: AN ARCHAEOLOGICAL INVESTIGATION
Author(s)/Editor(s)	Seddon, G.
Date	2010
Issuer or publisher	Pre-Construct Archaeology Ltd
Place of issue or publication	London
Description	A4 document

Entered by	Chris Mayo (cmayo@pre-construct.com)
Entered on	31 January 2011

16 APPENDIX 5: RADIOCARBON DATING CERTIFICATE



Scottish Universities Environmental Research Centre

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East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

10 December 2010

Laboratory Code	SUERC-32274 (GU-22807)
Submitter	Jon Butler Pre-construct Archaeology Ltd. Unit 54, Brockley Cross Business Centre 96 Endwell Road London, SE4 2PD
Site Reference	Cleve Hill, Graveney
Sample Reference	KCHG08
Material	Wood : Unknown
$\delta^{13}\text{C}$ relative to VPDB	-28.1 ‰
Radiocarbon Age BP	1520 \pm 30

- N.B.**
1. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.
 2. The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal3).
 3. Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :-

Date :-

Checked and signed off by :-

Date :-

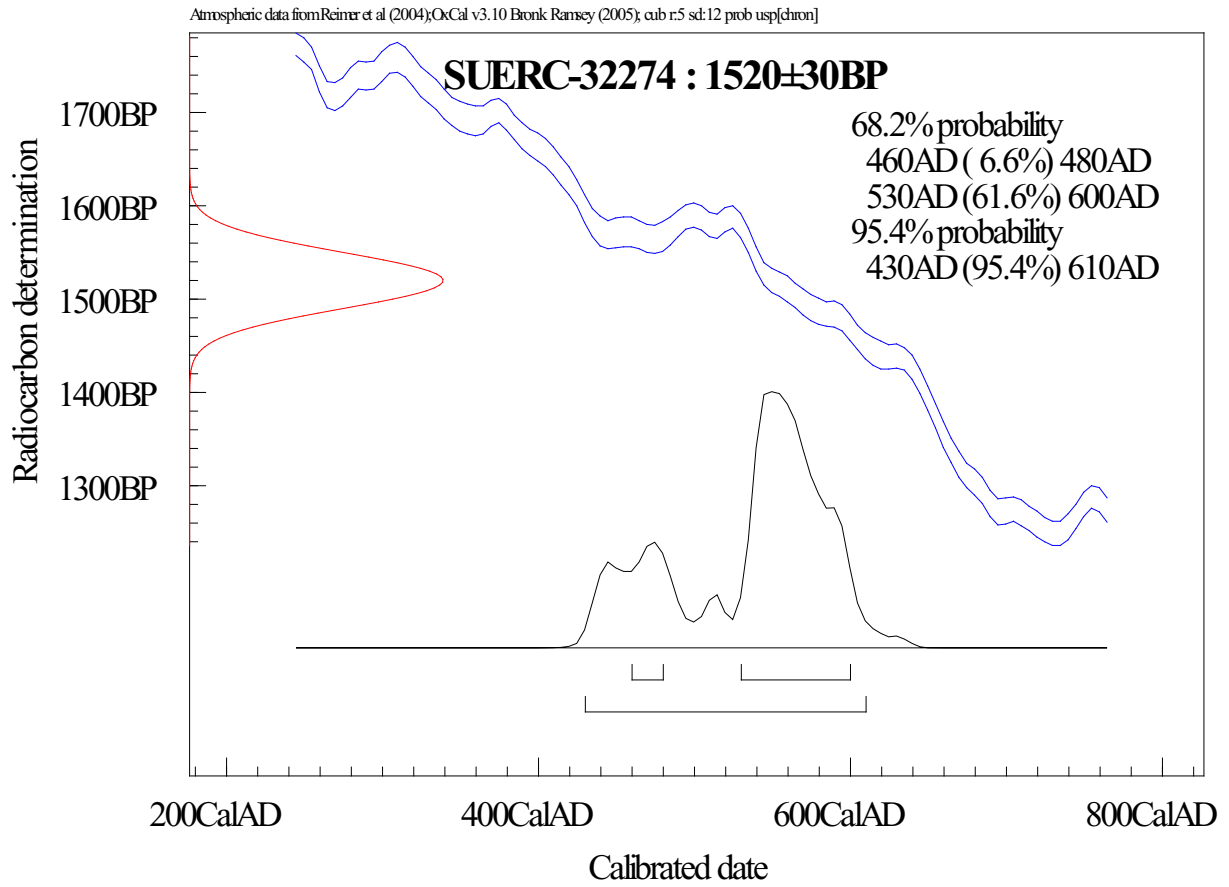


The University of Glasgow, charity number SC004401



The University of Edinburgh is a charitable body, registered in Scotland, with registration number SC005336

Calibration Plot



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