

London Gateway Logistics Park Infrastructure Stanford-le-Hope Essex



Archaeological Trench Investigation Report

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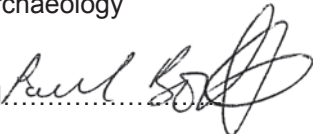
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**LONDON GATEWAY LOGISTICS PARK INFRASTRUCTURE,
STANFORD-LE-HOPE, ESSEX
ARCHAEOLOGICAL TRENCH INVESTIGATION**

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NON-TECHNICAL SUMMARY

Oxford Archaeology (OA) was commissioned by London Gateway Park Development Limited (LGPDL) to carry out a trench investigation in connection with the London Gateway Park Infrastructure development, which involves raising the ground levels by at least c 1.7m, creation of a plot access road leading from the A1014 Manorway, associated drainage and services, and contractors' compounds and stockpile areas. The drainage works covered included the excavation of large swales and ponds alongside the access road route.

The site is located in a reclaimed marshland landscape within the parishes of Corringham and Stanford-le-Hope, Essex (TQ 71800. 81940), which is covered by deep alluvial sediments laid down by River Thames since the end of the last Ice Age.

The London Gateway development occupies the site of the former Shell Haven Oil Refinery. The construction of the refinery in the course of the 20th century resulted in the filling and levelling of historic creeks and drainage channels, and deposition of a variable thickness of made ground, as well as very extensive ground disturbance caused by the installation of piled building foundations, pipelines, services, storage tanks, etc.

The trenches were focused predominantly along the line of a drainage swale, in the vicinity of a possible Roman salt-working site, which was reportedly found during development of the former oil refinery in the 1960s.

The investigation was completed between the 17th and the 25th February 2014. The majority of trenches were excavated to a target depth of 0m OD, which is the maximum depth of the Swale. Seven out of nine trenches encountered alluvial deposits, but the investigation failed to find any evidence for the reported saltern, or any other archaeological features or finds. A test pit at the reported location of the Roman saltern was excavated through made ground and alluvium to -3.9m OD, which should have been sufficiently deep to identify any Roman saltern deposits present, but none were found.

1 INTRODUCTION

1.1 Introduction

- 1.1.1 This report details the results of an archaeological trench investigation arising from the development by DP World London Gateway (LG) of road and drainage infrastructure in connection with development of the London Gateway Logistics Park, in Stanford-le-Hope, Essex (Fig.1).
- 1.1.2 The report describes the archaeological results from the excavation of a series of 9 trenches, along the line of a large drainage swale, the only element of the Park Infrastructure development that required archaeological investigation.

1.2 Project planning background

- 1.2.1 The LG Logistics Park development is permitted pursuant to a Local Development Order which was made by Thurrock Council on the 7th November 2013. The resulting London Gateway Logistics Park Local Development Order (LGLP LDO, hereafter 'the LDO') supplants the previous outline planning consent and provides planning consent for the proposed commercial buildings, associated infrastructure and site preparation works. An Environmental Impact Assessment (EIA) was prepared to inform the LDO, which included a chapter on Cultural Heritage and updated baseline studies (Thurrock Council/ DP World London Gateway, 2013b).
- 1.2.2 For development to benefit from the planning consent provided by the LDO it must accord with a number of compliance documents, in particular a Design Code (DC) and Code of Construction Practice (CoCP) (Thurrock Council/ DP World London Gateway, 2013b). In relation to archaeology, Section J of the CoCP requires that the archaeological impact arising from a construction design has to be assessed by a suitably qualified and experienced archaeologist. The resulting 'Archaeological Project Design' (APD) comprises an assessment of the archaeological impact of the proposed construction works, and proposals for any mitigation measures that may be required. An APD was prepared for the Park Infrastructure works by DP World's Archaeological Contractor (Oxford Archaeology) in accordance with Section J of the CoCP (Thurrock Council/ DP World London Gateway, 2013b). It was validated by the LG Archaeological Liaison Officer (Gill Andrews) and the archaeological statutory consultee for the LG Park, Richard Havis (Senior Historic Environment Consultant, Essex County Council).
- 1.2.3 In January 2014 London Gateway Park Development Limited (LGPDL) submitted a Prior Notification to Thurrock Council for construction of the Logistics Park Infrastructure, to which the APD was attached as supporting documentation. The construction work covered by the notification included raising the ground levels by at least c 1.7m, creation of a plot access road leading from the A1014 Manorway, and associated drainage and services. Temporary works covered by the Prior Notification included creation of contractors' compounds and stockpile areas (compounds normally to be located in areas of existing hardstanding). The drainage works covered included the excavation of large swales and ponds alongside the access road route.

1.3 Location, geology and topography

- 1.3.1 The development is located within the ancient parishes of Corringham and Stanford-le-Hope, Essex (TQ 71800 81940) (Fig.1).
- 1.3.2 The site lies in an area covered by superficial deposits mapped by British Geological Survey (BGS) as 'Tidal Flat' deposits. These comprise clay silt and peat deposits, laid down by the River Thames since the end of the last ice age. The underlying solid geology is the Palaeocene Lambeth Group, consisting of shelly sands with lignite or coarse gravel (BGS 2014).
- 1.3.3 The site lies within a formerly inter-tidal alluvial floodplain of the River Thames. Following the systematic construction of sea walls in the early 17th century the marine influence within the floodplain areas of the site is likely to have been considerably reduced. The reclaimed marshland landscape is characterised by relatively flat natural topography (Fig. 2). Historic settlements are predominantly focussed on the higher ground of the river terrace, c 2km to the north-west of the LG Park.
- 1.3.4 The Park Infrastructure works lie entirely within the boundary of the former Shell Haven Oil Refinery. The development of the refinery in the course of the 20th century resulted in the filling and levelling of historic creeks and drainage channels in the Park area, and the deposition of a variable thickness of made ground, as well as very extensive ground disturbance caused by installation of piled building foundations, pipelines, services, storage tanks etc. The refinery buildings have now been entirely demolished. The refinery ground level typically lay at c 1.5 – 2.5mOD. For comparison, the pre-refinery reclaimed marshland surface typically lay between c 0.5 and 1.5mOD.
- 1.3.5 The preliminary phase of development in each plot in the Park involves raising the ground level by at least c 1.7m using dredged sand. In the western part of the Logistics Park Infrastructure site, broad embankments have been formed using this material, on either side of an existing swale.

1.4 Archaeological background

- 1.4.1 Key London Gateway baseline studies covering the Park Infrastructure area include a desk-based assessment, completed as part of the LDO Environmental Impact assessment (Thurrock Council/ DP World London Gateway, 2013a) and a Geoarchaeological 'deposit model' report (OA 2012). These technical reports set out the finalised results of baseline investigations in the Port and Park area. The deposit model has shown that the entire Port and Park area were occupied by intertidal mudflats and salt marsh from c 6500 BC (during the Mesolithic period when the site was inundated by rising sea levels) until the early 17th century, when the marshlands in the area were subject to large scale systematic reclamation through the construction of sea walls. The Holocene alluvial deposits that infilled the floodplain area between c 6500 BC and the 17th century are c 12-15m thick and well-preserved Mesolithic land surfaces may be present at the base of the sequence. The overlying alluvium generally has little or no potential for the discovery of settlement archaeology. However marine and marshland finds - such as boats, wharves or salterns of various dates - could be encountered in an exceptional state of preservation due to waterlogged conditions - in particular along lines of former major creeks (Fig. 2).
- 1.4.2 After reclamation in the 17th century the site continued to be used predominantly for

grazing livestock until the late 19th century. The Thameshaven Branch Line of the London, Tilbury and Southend Railway, which forms the southern boundary of the Park, was built in 1854. It was initially used for passenger traffic (mainly tourists boarding paddle-steamers to Margate) and subsequently as a transshipment point for imported cattle destined for the London markets. In the late 19th and early 20th centuries large explosives factories and oil storage and refinery sites were developed, attracted by the railway, the strategic location of the site in relation to London, the deep sea anchorage at Shell Haven, and the remoteness of the location from centres of habitation.

- 1.4.3 The Port and Park areas largely correspond with the former Shell Haven Oil Refinery, which was subject to very extensive development and expansion during the 20th century, and which has disturbed or buried most surface historic landscape features. The refinery was identified as a key defence site during WW2 and various features, such as pill-boxes and anti-aircraft defences were constructed from 1939-45. The industrial and WW2 heritage of the site was mitigated by recording prior to demolition - there are no surviving early industrial buildings or WW2 defence features within the site.
- 1.4.4 No designated archaeological sites are present within the Park Infrastructure site boundary. The LDO EIA gazetteer (Thurrock Council/ DP World London Gateway, 2013a) identifies the following known non-designated historic environment features within or very close to the boundaries of the Park Infrastructure development (Fig. 2):
 - OA 52, NGR: 571766, 181921 (Fig.2): Potential Romano-British salt production site, with unconfirmed reports of a boat. The same site is referred to in both the HER (7102) and NMR (417007), although with differing locations (see further detail below). The HER location coincides with a post-medieval enclosure at the terminal of the historic Manor Way track, which documentary evidence suggests was constructed in c 1640. The track seems to have been jointly built by the owners of Old Garlands Farm and Little Garlands, following a lawsuit brought by the owner of Curry Marsh, to maintain access through the marshes for grazing sheep.
 - OA 53, NGR: 571831 182044 (Fig. 2): Site of World War II gun emplacements, built over by post-war oil refinery development.
 - OA 98, NGR: 573218 182210 (Fig. 2): Site of World War II pillbox, built over by post-war refinery development.
 - OA 220, NGR: 571993 181981 (Fig. 2): Naptha Minus Complex - Oil refinery plant, now demolished. Constructed in the 1980's/90's to extract the lightest gases during the refining process.
 - OA 224, NGR 752498 182090 (Fig. 2); Five riveted cylindrical oil storage tanks, now demolished. Probably dating to World War II period or immediately after. Shown on 1960 OS plan in group of 11 tanks.
 - OA 226, NGR: 571805 181953 (Fig. 2): Crude Distiller 1 oil refinery plant, now demolished.
- 1.4.5 Apart from these near-surface sites, archaeological remains could be deeply buried within the floodplain deposits, and could range in date from the Mesolithic to the 19th century. The deposit model referred to above, covering the floodplain areas of the LG Port and LG Park (OA 2012), was not designed to detect archaeological sites directly; rather it provides a framework for predicting the most likely locations for significant sites, and for assessing past and future construction impacts within the

floodplain.

- 1.4.6 The LDO study area was divided into four zones of differing archaeological potential, based on the deposit model, which represents an assessment of the risk of important archaeological remains being present, and the likely need for mitigation. The zones are illustrated on Figures 2 and 3:
- 1.4.7 **Zone 1** (coloured green on Figures 2 and 3) forms the eastern side of the LDO area. This zone has generally low potential due to distance from historic centres of settlement (prior to the late 19th century). The deposit model indicates that the Holocene alluvium in this zone is characterised by greater marine influence than the western side, with more likelihood that deposits have been reworked and any archaeological sites eroded. This zone includes a single known archaeological site of medium value (OA 95, Reedham/ Buttons Farm – site of a 17th century or later marsh farm).
- 1.4.8 **Zone 2** (coloured yellow on Figures 2 and 3) forms the central area of the LDO area. There are no known important surviving heritage assets within this zone. The only recorded gazetteer entries are former oil refinery structures of 20th century date. Most of this zone has been subject to extensive previous development, although in the northernmost plots the impacts have been relatively slight and some traces of marshland features can be seen on recent aerial photographs pre-dating the current ground-raising. The deposit model suggests that the alluvial sequence has been less subject to marine erosion, indicating slightly higher archaeological potential than Zone 1.
- 1.4.9 **Zone 3** (coloured orange on Figures 2 and 3) formed the western side of the LDO. It was extensively developed from the 1960s as part of the north-western expansion of the Shell Haven Oil Refinery. The underlying gravel topography indicates an area of slightly higher elevation in this zone, indicating relatively higher potential for Mesolithic sites to be present at depths of c 12 – 15m. In the centre of the zone is a location of known archaeological interest, clustered around the head of an unnamed creek (the site includes the possible Roman saltern and a 17th to 19th century enclosure and probable wharf at OA52). This site is likely to have been extensively disturbed by previous development but intact archaeology may survive in patches, particularly at depth. The south-western area of the former oil refinery includes small areas of relatively undeveloped pasture along the western edges of the LDO area. Within these plots the alluvium, and any archaeological deposits that it might contain, is likely to be largely intact due to the lack of ground disturbance in the past.
- 1.4.10 **Zone 4** (coloured red on Figures 2 and 3) falls outside the LDO area immediately to the west, apart from the location of Carter's Lagoon, which is within the boundary. The archaeological potential here is high as the land has not been subject to previous development and known significant archaeological sites lie in close proximity. The zone is also in relatively close proximity to historic settlements on the adjacent river terrace. The former marshland along the terrace edge, in particular the vicinity of the suspected 13th-17th wharf on Carter's Creek, has exceptionally high potential for the discovery of medieval and post-medieval marine finds such as wharves or boats, but are not directly affected by the Park Infrastructure proposals, with the exception of Carter's Lagoon. A separate trench investigation of the Carter's Lagoon footprint did not encounter any archaeological features in the upper alluvium (OA 2014b). Historic landscape features survive extensively as earthworks in this zone, including sea walls associated with Carter's Creek (probably early 17th century in origin).
- 1.4.11 **Possible saltern (OA52):** In the centre of Zone 3, just outside the Park Infrastructure boundary to the south, lay a possible site of high archaeological importance, located

at the head of an unnamed historic creek. It is described in the Essex County Council HER as a possible Roman saltern (OA52). This site was included in the County Sites and Monuments Record (predecessor to the HER) at an uncertain date before 1963 and no information is available beyond the brief HER entry. The entry refers to evidence for salt-making, finds of 3rd century Roman pottery and unconfirmed reports of a boat, found at a location within 'Shell Haven West', presumably during construction work. Unfortunately there is no information on the depth at which the finds were uncovered, or their extent. If the reported Roman date is correct, the finds are likely to have been buried by a significant thickness of alluvium. The fact of its discovery suggests that the site is likely to have been subject to significant disturbance. However, salterns can cover extensive areas and substantial elements of the site may survive intact. This is the only heritage asset recorded within the LG Park which pre-dates the reclamation of the marshes in the early 17th century. If it survives at all, and if it is genuinely Roman in date, this site would be of high value due to the waterlogged conditions, in particular if the report of a Roman boat was correct.

- 1.4.12 The reported location of OA52 coincides with a post-medieval earthwork enclosure shown on the 1863 (first Edition) OS map at the terminal of the 'Manor Way' (OA71), a 17th century trackway leading from the direction of Great Garlands through the marshes to the Thames (Fig. 2). This coincidence might suggest that 17th century artefacts and timbers were mistakenly identified as Roman, although it is not uncommon to find medieval and later marshland sites built on top of Iron Age and Roman saltern mounds, taking advantage of existing elevated ground within the marshes.

- 1.4.13 **Military, industrial and transport archaeological features:** The earliest phases of industrial development at Shell Haven lay to the south of the Thameshaven Branch Line, outside the LDO boundary (in the LG Port area). Within the Park Infrastructure boundary, three identified heritage assets are former oil storage and refinery structures (OA220, 224 and 226 Fig. 2), reflecting the 20th century industrial development of the floodplain at Shell Haven. Both have been demolished since 1999. Remains of oil refinery structures survive extensively as below ground features within the Park area but are considered to be of negligible value as they are not well preserved. A programme of groundworks was undertaken in 2011-12 to remove below-ground obstacles from the former refinery site before re-development, following previous remediation work carried out by Shell. Extensive drawn and photographic records of the refinery exist in the Shell archives, rendering archaeological recording redundant. The surviving refinery buildings were photographed prior to demolition of the complex to supplement the Shell archives.

- 1.4.14 A further three potential archaeological features within the Park Infrastructure boundary comprised defensive features dating from World War II, during which the refinery was identified as a key defence site. These include gun emplacements (OA54), pillboxes (OA51 and 98) and anti-glider ditches (OA110), none of which survive as standing structures (Fig. 2). Some below-ground traces may survive, but their poor state of preservation means that their value is negligible.

2 AIMS AND METHODOLOGY

2.1 Aims

- 2.1.1 The aim of the investigation was to understand the likely impact, if any, of the development on the upper alluvial sequence and mitigate any impacts through archaeological recording of significant remains that may be encountered. Further information was also to be recovered on the geostratigraphy of the upper alluvial sequence.
- 2.1.2 The investigation was to determine the presence/absence, extent, date range, condition and complexity of any archaeological remains which may survive, and assess the associations and implications of any remains encountered with reference to the historic landscape. It also aimed to determine the potential of the site to provide palaeoenvironmental evidence, and the implications of any remains with reference to economy, status, utility and social activity, including consideration of the likely range, quality and quantity of the artefactual evidence present.
- 2.1.3 A specific objective was to clarify the significance and state of preservation of the reported Roman saltern (OA52), even though it lay slightly outside the impact zone of the Park Infrastructure drainage swale, to inform future management of the site.

2.2 Methodology (Fig. 2)

- 2.2.1 The investigation was completed accordance with the APD (OA 2014a). Consultation with the Park Infrastructure design team, including a review of design drawings, indicated that the majority of excavation groundworks for the Park Infrastructure would be at a superficial level, and would not impact upon surviving archaeological deposits. Ground-raising using dredged material provides a protective layer at least 1.7m thick. However, deep excavations along the line of a large drainage swale were expected to penetrate through the made ground and into intact alluvial sediments and therefore had the potential to encounter significant archaeological remains near the top of the alluvial sequence (Fig. 3).
- 2.2.2 Although the possible Roman saltern (OA52) lay just outside the impact zone of the proposed swale to the south (Fig. 4), it was considered desirable to clarify the significance of the site itself through trenching, to inform future management of any surviving archaeology. Nine archaeological trenches were excavated in total, of which Trenches 3 - 8 inclusive were focussed in the general vicinity of OA52, with the aim of identifying any saltern deposits that might be present, as they can extend over a wide area. Eight of the trenches were excavated along the line of the swale, and one (Trench 5) was located on the reported location of OA52.
- 2.2.3 The target depth of Trenches 1 - 4 and 6 - 9 was 0m OD, the maximum depth of the Swale. The surface of the alluvium in this area is generally encountered between c 0.5 and 1.5m OD. It was considered possible that archaeological features, such as former salterns and historic sea walls, might be encountered at shallower depth where mounded earthwork deposits survive underneath the modern made ground. A test pit in Trench 5 was excavated to the maximum reach of the machine bucket arm in order to clarify the significance of OA52.

3 RESULTS

3.1 Introduction and presentation of results

- 3.1.1 The investigation was completed in the field between 17th and 25th February 2014. No archaeological features or artefacts were encountered in the course of the evaluation, and no deposits suitable for palaeoenvironmental analysis were encountered.
- 3.1.2 The following section summaries the results of the evaluation. The location of the trenches is shown in Figure 2. Archaeological descriptions are presented in the context inventory (Appendix A), and within the descriptive text where they are integral to the interpretation of the context in question. The results of specialist studies are summarised in the main text and fully detailed in Appendix B.

3.2 Conditions during fieldwork

- 3.2.1 Overall the evaluation was undertaken in good weather conditions with occasional heavy rain. Ground conditions were wet with soft ground making access into the trenches being considered dangerous.
- 3.2.2 Most of the originally planned locations had to be relocated slightly to the north to avoid an existing drainage channel, with the exception of Trench 5.
- 3.2.3 Unstable excavation sides prevented access into the trenches for recording purposes. Provisional plans were made to create safe access into the trenches by battering the trench edges, but this was dependant on the identification of potentially significant archaeological deposits, which did not in fact emerge.
- 3.2.4 Due to the depth of excavation required to reach the underlying alluvium, deep test pits were excavated in several trenches where ground conditions permitted, as detailed below. Where more than one test pit was excavated they are they are designated Trench 6A, 6B etc in the context inventory. Several test pit locations were abandoned when they encountered solid obstacles, such as piles.

3.3 Sediment sequence

- 3.3.1 Made ground deposits had to be removed in all trenches to expose the underlying alluvium. The depth and character of the made ground was variable depending on former land-use within the oil refinery site, typically c 1.0-1.5m. The upper 1-2m had also been extensively disturbed throughout much of the site by obstacle removal and decontamination work carried out since decommissioning of the refinery.
- 3.3.2 Minerogenic blue-grey clay silt deposits (alluvium) with occasional organic lenses were encountered at variable depths, depending on the extent and depth of disturbance. The upper level of alluvium in relatively undisturbed areas varied between c 1.45m OD and c 0.5m OD. No peat deposits were noted during the trenching.
- 3.3.3 The deepest of the trenches (Trench 5) was excavated to -3.9m OD.

3.4 General distribution of archaeological deposits

- 3.4.1 No significant archaeological features or artefacts were identified during the evaluation. Trenches 2, 3A and 5 coincided with concrete piles remaining from the

Shell Haven oil refinery.

3.5 Trench descriptions

- 3.5.1 **Trench 1** contained no archaeology. It was excavated to a depth of 2.30m and intact alluvium was found at 2.29m OD.
- 3.5.2 **Trench 2** contained no archaeology. Intact alluvium was encountered at the east end at 1.45m OD. Concrete piles and foundations were found in the west end.
- 3.5.3 **Trench 3** comprised two 6m x 2m test pits, neither of which contained archaeology. Test pit 3a (eastern end of trench) encountered the top of the alluvium at 0.57m OD. Test pit 3b (western end of trench) encountered alluvium at 0.72m OD.
- 3.5.4 **Trench 4** comprised two 6m x 2m test pits, neither of which contained archaeology. Test pit 4a (eastern end of trench) encountered alluvium at 0.16m OD. Test pit 4b encountered alluvium at 1.42m.
- 3.5.5 **Trench 5** was excavated outside the line of the drainage swale to investigate the reported location of the possible Roman saltern. A layer of recently deposited sand was first removed down to 1.8m OD (2m depth) to form a working platform for the machine. The full 20m length of the trench was then excavated. A test pit was continued to the maximum reach of the machine bucket. The surface of the recently deposited sand prior to excavation was at 3.8m OD and the maximum depth reached was -3.9m OD, a total depth of 7.7m.
- 3.5.6 Intact alluvium was encountered at variable levels, 1.5m OD at the highest point. It had been piled through in some locations, but survived largely intact between the piles. The alluvium encountered throughout was minerogenic grey silty clay with no obvious organic horizons. The full thickness of Holocene alluvium in this part of the site is typically c 12m (up to c 15m in some locations) so the deposits encountered form part of the upper alluvium.
- 3.5.7 No sign of briquetage, worked wood or other artefacts was seen during excavation of the alluvium in the spoil heaps or sections. As no archaeology was observed in the spoil arisings, manual access into the trench was not attempted (the sides were very unstable). Visibility was otherwise relatively good as the trench did not flood significantly during excavation. Two soil samples from the alluvium in Trench 5 were returned to OA for sieving, to check for the presence of briquetage or other artefacts.
- 3.5.8 **Trench 6** contained no archaeology and was excavated to a depth of only 0.7m OD as it was constrained in the depth of excavation by surrounding spoil heaps. No undisturbed alluvium was seen. The trench working area was divided into two test pits, which encountered only demolition rubble.
- 3.5.9 **Trench 7** contained no archaeology. The top of the alluvium was only seen at the east end, at 0.6m OD.
- 3.5.10 **Trench 8** contained no archaeology. The top of the alluvium was seen at 0.92m OD at the east end and 0m OD at the west end. Concrete piles were present at the west end and the top of the alluvium appeared truncated.
- 3.5.11 **Trench 9** encountered only made ground to 0m OD. No archaeology was found.

3.6 Finds summary

- 3.6.1 No finds were recovered, other than modern material. The fragments of ceramic building material proved to be modern brick, made in the Fletton fabric, typical of the

London Brick Company and produced throughout the 20th century.

3.7 Environmental summary

- 3.7.1 Two samples were taken during the evaluation. Sample 1 (context 501) and 2 (context 501) were taken from the machine bucket as access to Trench 5 was not possible due to the depth of excavation. Both of the samples were taken with the primary aim of recovering finds such as briquetage which might provide evidence of a saltern. Sample 1 was taken at a depth of 4m, comprised dark grey clay silt (2.5Y 4/1) and contained only small seeds and degraded organic material. Sample 2 was taken at a depth of 7.7m and was dark grey clay silt (10YR 4/1). It contained a small quantity of slag, mortar and ceramic building material of modern date, which are certainly modern intrusive material, possibly having been pushed into the ground by piles or picked up inadvertently by the machine bucket. Also present was a small number of rush seeds and several fragments of fuel ash slag and a small number of marine bivalves.

4 DISCUSSION

4.1 Reliability of field investigation

- 4.1.1 The work was undertaken in good weather conditions and all planned trenches were excavated. Seven out of nine trenches encountered the uppermost layers of alluvium. Only Trenches 6 and 9 did not encounter alluvium.
- 4.1.2 Access was not attempted to any of the trenches due to unstable ground conditions and the depth of excavation required to reach the alluvium. Trenches 3, 4 and 6 were dug primarily as test pits due to space restrictions. Nevertheless, visibility was comparatively good and there is a high level of confidence that saltern deposits would have been seen if present within the trenches. Iron Age and Roman salterns in the Essex marshes are generally extensive and characterised by distinctive deposits and dense artefact assemblages, principally briquetage (Biddulph *et al.* 2012).
- 4.1.3 Trench 5 was targeted on the reported location of the saltern and possible boat (OA 52) but no archaeological evidence was found to confirm the existence of either. It is possible that any Roman deposits are buried at greater depth within the alluvial sequence. However Trench 5 reached -3.9m OD, which should have been sufficiently deep to reach any Roman deposits present, especially if they originally formed a mound within the marsh. The absence of such deposits argues against the identification of OA52 as a saltern site. The site location details are poorly documented but appear to relate to an observation made during development of Shell Haven West in the 1960s. The location may have been mis-stated.

4.2 Evaluation objectives and results

- 4.2.1 The evaluation was generally successful in that it established the absence of archaeological and palaeoenvironmental remains within the impact zone of the Park Infrastructure drainage swale. The majority of trenches were excavated to a target depth of 0m OD, which is the maximum depth of the swale. The swale is the only excavation impact arising from the development that required investigation. Ground levels in the remainder of the site will be covered with a protective layer of sand, and construction impacts will be superficial.

4.3 Acknowledgements

- 4.3.1 Oxford Archaeology would like to thank Marcus Pearson, Emma Deary and Chris Wild of DP World London Gateway's Environment Team, and Gill Andrews (LG Archaeological Liaison Officer), for facilitating the works, and Richard Havis (Senior Historic Environment Advisir, Essex County Council) for monitoring and advice during the fieldwork.
- 4.3.2 Vix Hughes and Ashley Strutt carried out the investigation on behalf of OA, under the management of Stuart Foreman.

4.4 Location of archive

- 4.4.1 The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES, and will be deposited with the Thurrock District Museum in due course.

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Appendix A – Context Inventory

Trench 1						
General description					Orientation	E-W
Trench devoid of archaeology. Sequence comprised recent made ground overlying former oil refinery ground levels and made ground, all overlying deep alluvium.					Avg. depth (m)	2.30
					Width (m)	2
					Length (m)	20
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
100	Layer	-	0.50	Overburden	-	-
101	Layer	-	0.15	Buried surface layer	-	-
102	Layer	-	0.20	Sub-soil	-	-
103	Deposit	-	1.20	Alluvium	-	-
104	Deposit	-	0.25	Alluvium	-	-

Trench 2							
General description					Orientation		E-W
Trench devoid of archaeology. Sequence comprised a layer of made ground overlaying blue-grey floodplain alluvium					Avg. depth (m)		2.60
					Width (m)		2
					Length (m)		20
Contexts							
context no	type	Width (m)	Depth (m)	comment	finds	date	
200	Layer	-	1.10	Overburden	-	-	
201	Layer	-	0.10	Rubble and organic remains	-	-	
202	Layer	-	0.40	Gravel and concrete piles	-	-	
203	Deposit	-	1.20	Alluvium	-	-	

Trench 3A							
General description					Orientation		E-W
Trench devoid of archaeology. Sequence comprised layers of redeposited rubble/ made ground, overlying blue-grey floodplain alluvium.					Avg. depth (m)		2.50
					Width (m)		2
					Length (m)		6
Contexts							
context	type	Width	Depth	comment	finds	date	

no		(m)	(m)			
300	Layer	-	0.45	Clay and Gravel upcast	-	-
301	Layer	-	1.00	Clay and occasional rubble	-	-
302	Layer	-	0.35	Clay and occasional rubble	-	-
303	Layer	-	0.90	Alluvium	-	-
304	Feature	-	1.05	Concrete base with bedding sand.	-	-
305	Cut	-	1.05	Cut of 304	-	-

Trench 3B						
General description					Orientation	E-W
Trench devoid of archaeology. Sequence comprised a layer of made ground overlying blue-grey floodplain alluvium.					Avg. depth (m)	2.50
					Width (m)	2
					Length (m)	6
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
306	Layer	-	0.60	Overburden	-	-
307	Layer	-	0.75	Redeposited material	-	-
308	Layer	-	0.35	Redeposited material	-	-
309	Layer	-	0.40	Redeposited material	-	-
310	Deposit	-	0.55	Alluvium (same as 303)	-	-

Trench 4A						
General description					Orientation	E-W
Trench devoid of archaeology. Sequence comprised a layer of made ground overlying blue-grey floodplain alluvium. 4A is the eastern part of Trench 4.					Avg. depth (m)	2.50
					Width (m)	2
					Length (m)	6
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
400	Layer	-	0.60	Overburden	-	-
401	Layer	-	1.0	Alluvium with concrete and steel debris	-	-
402	Layer	-	1.0	Alluvium? Possible 18 th century Reclamation.	-	-

Trench 4B						
General description					Orientation	E-W
Trench devoid of archaeology. Sequence comprised a layer of made ground overlying blue-grey floodplain alluvium. 4B is the western part of Trench 4.					Avg. depth (m)	1.7
					Width (m)	2
					Length (m)	6
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
403	Layer	-	0.6	Overburden	-	-
404	Layer	-	1.1	Dark black humic clay and debris, possibly contaminated.	-	-
405	Layer	-	0.75	Alluvium (same as 402)	-	-

Trench 5						
General description					Orientation	E-W
Trench devoid of archaeology. 1.7m recently deposited sand was first removed to create a working platform. Depths below are measured from the base of the platform. Sequence comprised made ground overlying blue-grey floodplain alluvium. Modern concrete piles seen along trench.					Avg. depth (m)	6m
					Width (m)	2
					Length (m)	20
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
500	Layer	-	1.5	Overburden	-	-
501	Layer	-	5.8	Alluvium	-	-

Trench 6A						
General description					Orientation	E-W
Trench devoid of archaeology. 6A is the eastern end of Trench 6 which had to be divided into 3 due to confined space. Only modern made ground/ rubble encountered. Alluvium not reached.					Avg. depth (m)	2.6
					Width (m)	2
					Length (m)	6
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
600	Layer	-	0.6	Overburden	-	-
601	Layer	-	1.3	Redeposited material, possibly made ground.	-	-
602	Layer	-	0.7	Redeposited material, possible made ground.	-	-

Trench 6B						
General description					Orientation	E-W
Trench devoid of archaeology. 6B is the western end of Trench 6 which had to be divided into 3 due to confined space. Sequence comprised made ground overlying blue-grey floodplain alluvium.					Avg. depth (m)	2.4
					Width (m)	2
					Length (m)	6
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
603	Layer	-	0.4	Overburden	-	-
604	Layer	-	1.15	Alluvium	-	-
605	Layer	-	0.85	Alluvium	-	-

Trench 6C						
General description					Orientation	E-W
Trench devoid of archaeology. 6C is the central section of Trench 6 which was excavated after approval to move surcharged sand layer to enable access. Excavation stopped at concrete surface.					Avg. depth (m)	2.1
					Width (m)	2
					Length (m)	18
Contexts						
context no	type	Width (m)	Depth (m)	comment	finds	date
606	Layer	-	0.25	Buried surface	-	-

Trench 7							
General description					Orientation		E-W
Trench devoid of archaeology. Sequence comprised layers of made ground overlying blue-grey floodplain alluvium..					Avg. depth (m)		2.95
					Width (m)		2.10
					Length (m)		18
Contexts							
context no	type	Width (m)	Depth (m)	comment	finds	date	
700	Layer	-	0.6	Recently laid sand and gravel	-	-	
701	Layer	-	0.8	Overburden	-	-	
702	Layer	-	0.4	Modern deposit, rubble	-	-	
703	Layer	-	1.15	Ground make up layer	-	-	
704	Layer	-	0.6	Alluvium	-	-	

Trench 8							
General description					Orientation		E-W
Trench devoid of archaeology. Sequence comprised made ground/ rubble overlying blue-grey floodplain alluvium. Concrete pile seen driven through alluvium.					Avg. depth (m)		1.84
					Width (m)		2.10
					Length (m)		17.8
Contexts							
context no	type	Width (m)	Depth (m)	comment	finds	date	
800	Layer	-	0.85	Overburden	-	-	
801	Layer	-	0.45	Redeposited material	-	-	
802	Layer	-	1	Alluvium	-	-	
803	Layer	-	0.5-1.2	Disturbed layer, dumped burnt waste.	-	-	

Trench 9							
General description					Orientation		E-W
Trench devoid of archaeology. Consists of a top layer of demolition material overlying a layer of hardcore. Alluvium not reached.					Avg. depth (m)		2
					Width (m)		2.10
					Length (m)		15
Contexts							
context no	type	Width (m)	Depth (m)	comment	finds	date	
900	Layer	-	0.6	Demolition material	-	-	
901	Layer	-	1.4	Hardcore	-	-	

Appendix B – Sample processing report

By Julia Meen and Kath Hunter

Introduction

Trench 5 was excavated to a depth of 7.7m (-3.9 OD) by machine in order to reach alluvial layer 501, which had the potential to contain material of Roman date, but which lay beneath several metres of made ground and dumped dredged material. Two environmental samples were taken from this layer, at depths of 4m (sample <1>) and 5.8m (sample <2>) below the ground surface. These samples were recovered from the machine bucket as access was not possible at this depth. The samples were taken primarily to recover finds such as briquetage which might provide evidence for a reported saltern site. Plant remains were also extracted from the samples to see if the species present provided further evidence for human activity in the area. Sample <1> was a dark grey (2.5Y 4/1) silty clay and was 20L in volume, and sample <2> was a dark grey (10YR 4/1) silty clay loam, 40L in volume.

Methodology

Both samples were processed by water flotation using a modified Siraf style flotation machine. The flots were collected on a 250µm mesh and the heavy residues were sieved to 500µm and dried in a heated room, after which the residues were sorted by eye for artefacts and ecofactual remains. The dried flots were scanned for plant remains using a binocular microscope at approximately x15 magnification and identifications made with reference to published guides and the comparative seed collection held at OAS. Plant nomenclature follows Stace (2010).

Results

Sample <2> produced a small quantity of slag, mortar and ceramic building material. The ceramic material was examined by C. Poole, who identified the fabric as modern. Sample <2> also contained a small assemblage of marine bivalves, identified by R. Nicholson. These were predominately *Macoma balthica*, with three fragments of *Scrobularia plana* and one of *Ostrea edulis* (oyster) also present. No finds were recovered from sample <1>.

Both flots were similar in composition, being mostly composed of dried out waterlogged roots and other degraded plant material. Little of this material was identifiable. Sample <1> contained several examples of waterlogged *Suaeda maritima* (seablite) and occasional *Carex sp* (sedge) seeds. Sample <2> contained a single seed of *Juncus sp.* (rush), as well as several fragments of fuel ash slag. No charred material was noted in either sample.

Discussion and Recommendations

Although few plant species could be identified from the poorly preserved plant material in the two samples, the seeds present are consistent with the sea marsh environment that would have been present at the time the alluvial deposit was accumulating. The plant remains provide no evidence for contemporary human activity.

The molluscs recovered from sample <2> are also consistent with this type of coastal marsh environment, with *S. plana* and *M. balthica* found in estuarine sands and mud across the intertidal to sub-littoral zones (R. Nicholson pers. comm.). These species were frequently recovered during earlier phases of archaeological work at the London Gateway site (Nicholson 2012).

The excavation of Trench 5 failed to identify the saltern which had previously been reported in this location. The small fragments of ceramic material recovered from the deepest sample

were shown to be modern and are likely to have entered the deposit through contamination from the machine bucket.

Previous investigations at London Gateway have produced significant assemblages of both charred and waterlogged plant remains. These have provided important information about both the wider environmental conditions in the area and the human activity taking place at the site, in particular regarding the utilisation of plant fuels for industrial activities in the Iron Age and Romano-British period (Hunter 2012). As no further investigations are planned at this site, no further work is recommended.

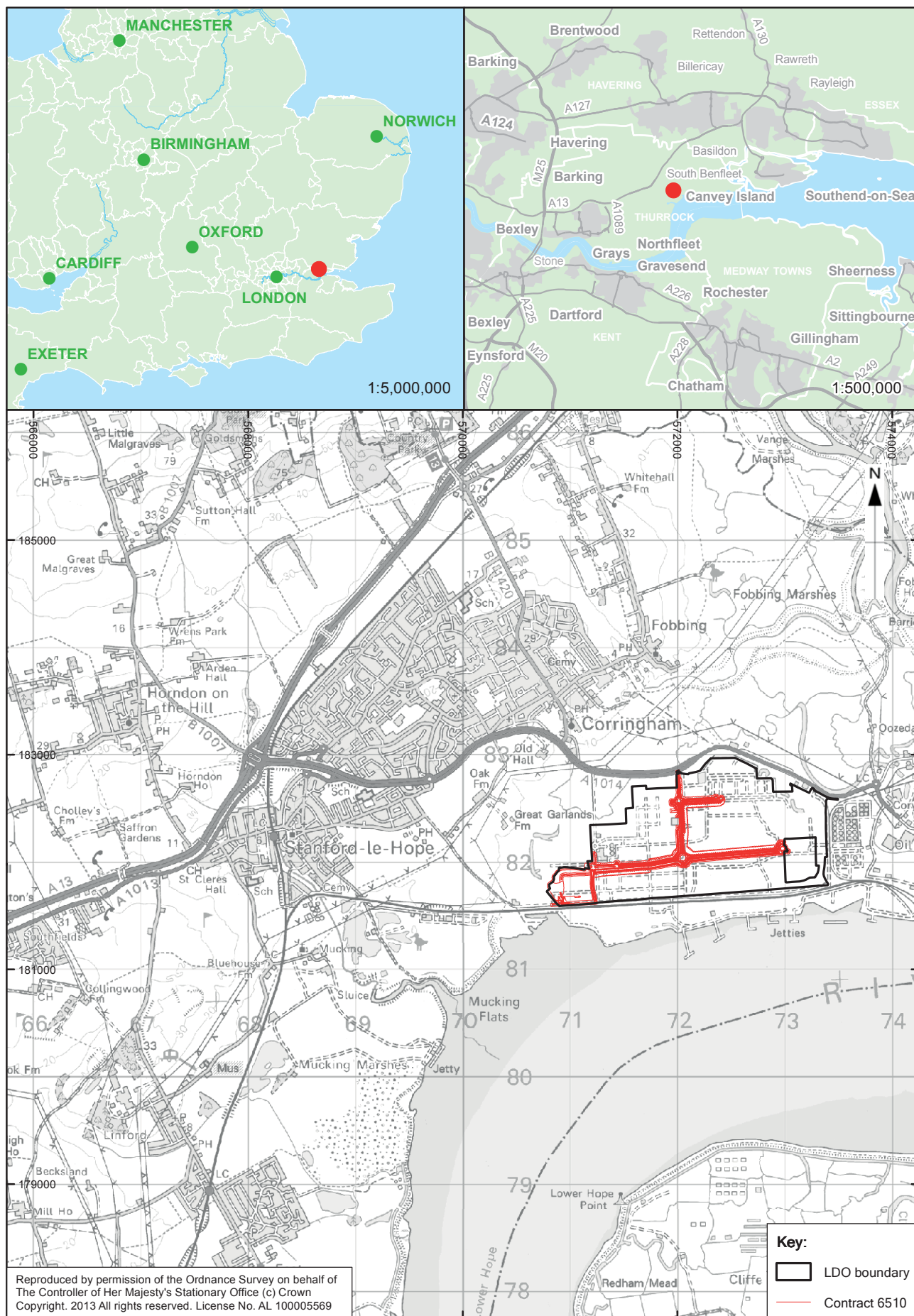


Figure 1: Site location map, showing extents of the Park Infrastructure design (red) inside the Local Development Order boundary (black)

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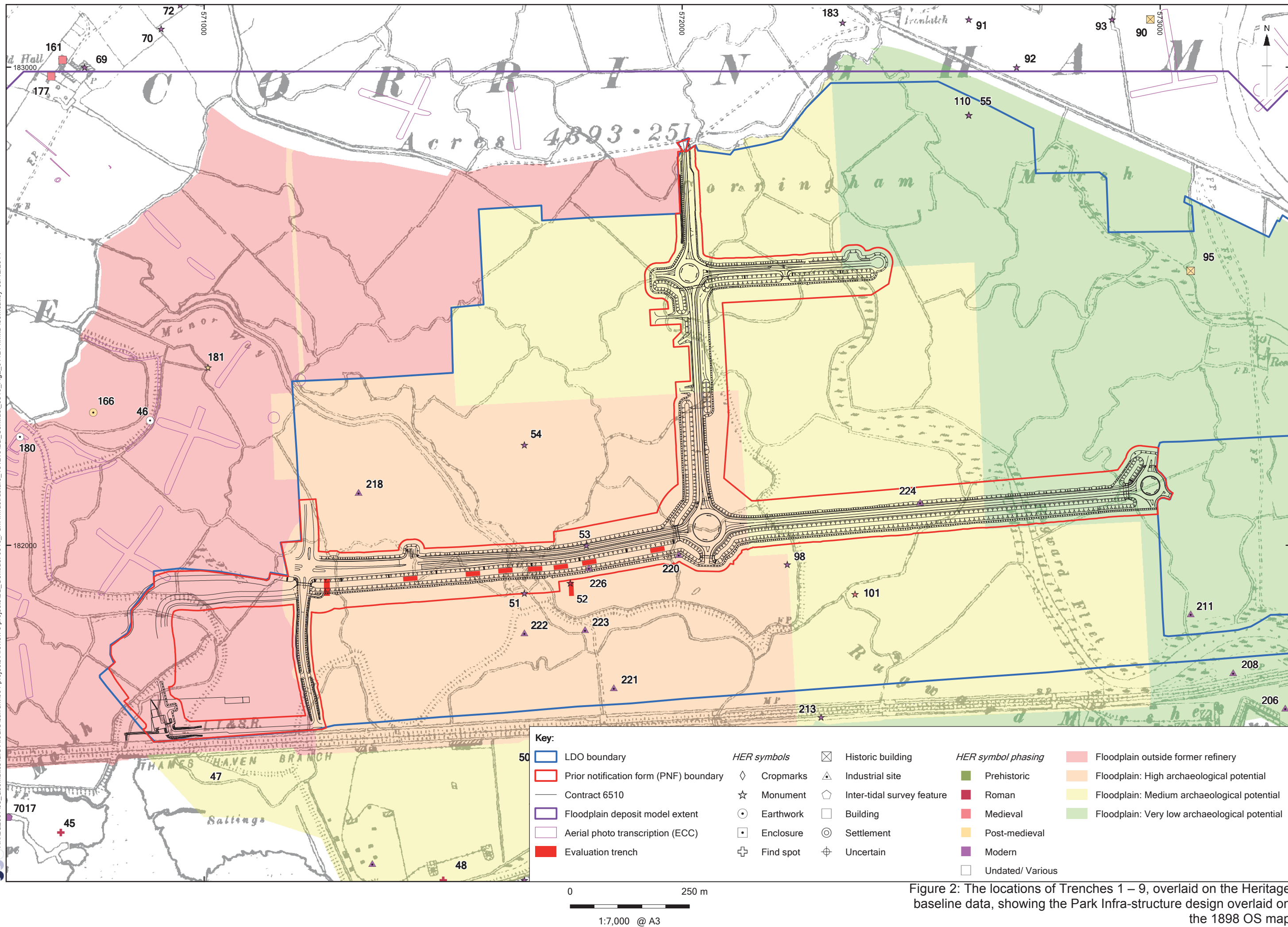


Figure 2: The locations of Trenches 1 – 9, overlaid on the Heritage baseline data, showing the Park Infra-structure design overlaid on the 1898 OS map

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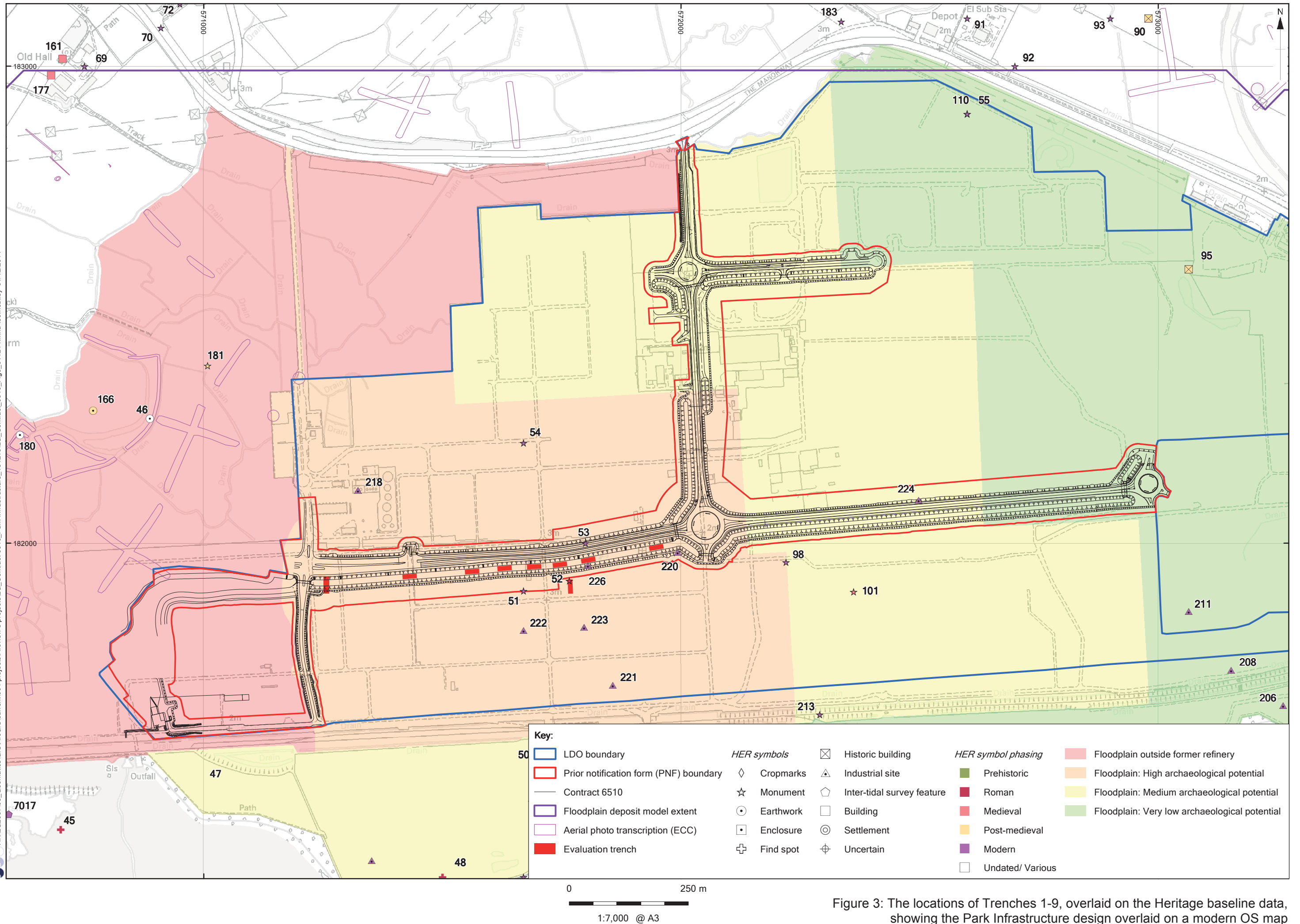
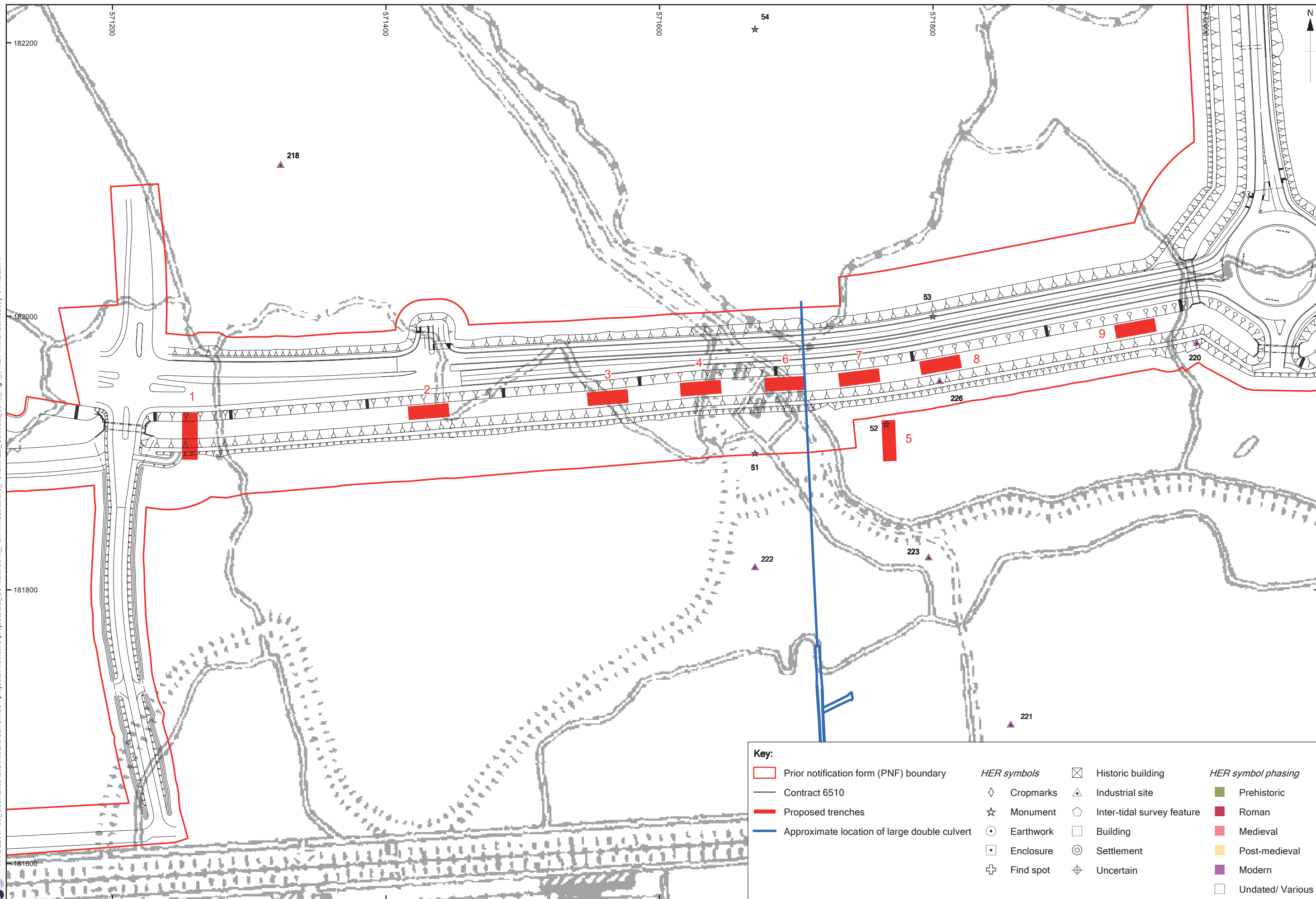


Figure 3: The locations of Trenches 1-9, overlaid on the Heritage baseline data, showing the Park Infrastructure design overlaid on a modern OS map

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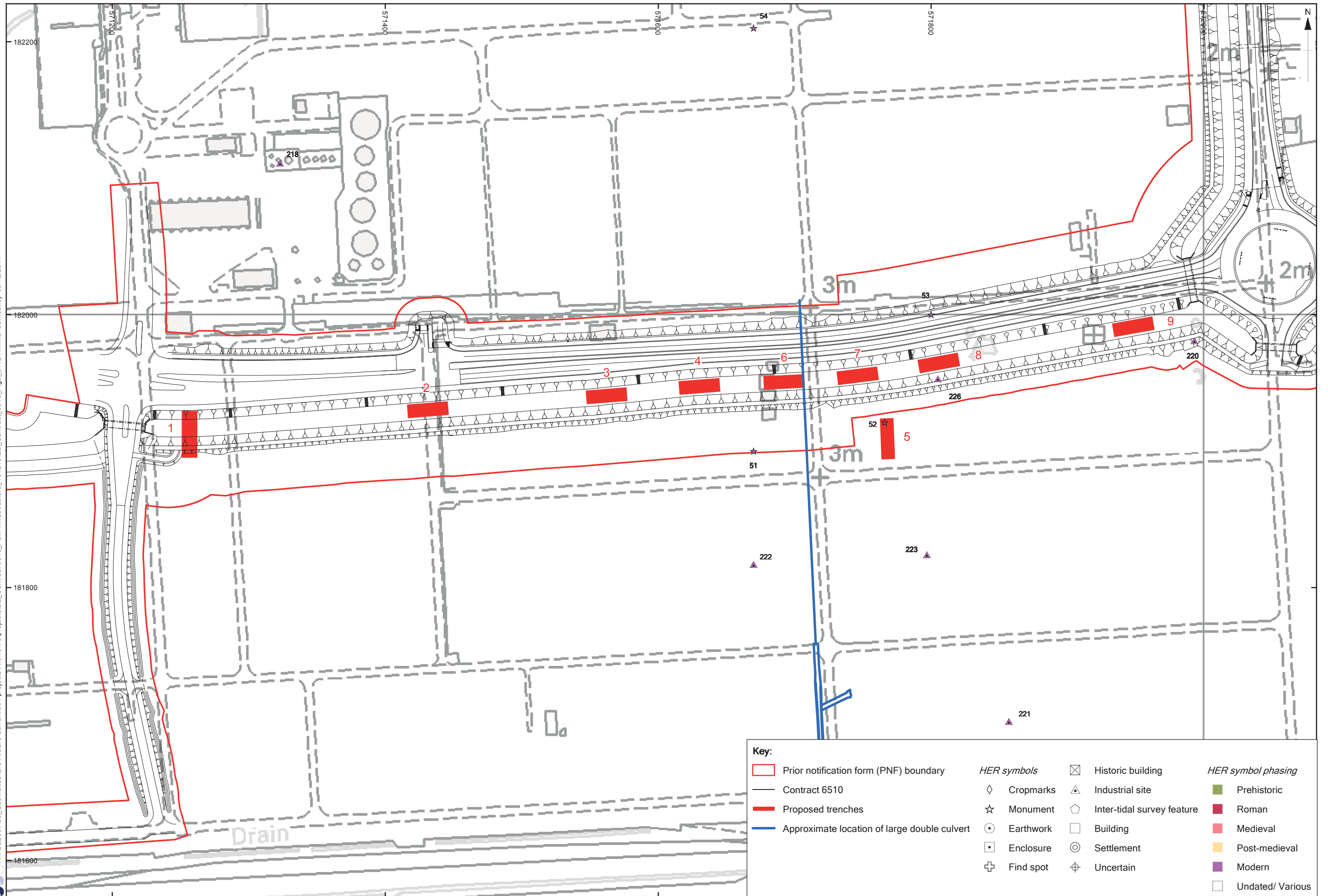
Key:

Prior notification form (PNF) boundary	<i>HER symbols</i>	Historic building	<i>HER symbol phasing</i>
Contract 6510	Cropmarks	Industrial site	Prehistoric
Proposed trenches	Monument	Inter-tidal survey feature	Roman
Approximate location of large double culvert	Earthwork	Building	Medieval
	Enclosure	Settlement	Post-medieval
	Find spot	Uncertain	Modern
			Undated/ Various

0 100 m
1:2,500 @ A3

Figure 4: Detailed locations of Trenches 1 – 9, overlaid on the overlaid on the 1898 OS map

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0 100 m

1:2,500 @ A3

Figure 5: Detailed locations of Trenches 1 – 9, overlaid on a modern OS map



Plate 1: Trench 1, oblique view north-east



Plate 2: Trench 2, oblique view south-west



Plate 3: Trench 3A, alluvium at base of trench, view east



Plate 4: Trench 3A, oblique view south-east



Plate 5: Trench 3B, south-facing section



Plate 6: Trench 4A, south-facing section



Plate 7: Trench 4B, oblique view south-east



Plate 8: Trench 5, excavating through alluvium, view south



Plate 9: Trench 5, oblique view south-west



Plate 10: Trench 6A, oblique view south-east



Plate 11: Trench 6B, oblique view south-east



Plate 12: Trench 7, view east



Plate 13: Trench 8, view west



Plate 14: Trench 9, north-facing section



Plate 15: Trench 9, oblique view south-east



Plate 16: General view east along existing drainage ditch showing recently made northern sand bank to left of shot



Plate 17: General view north-west from top of recently made southern sand bank towards Trench 7



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