PURFLEET (EX) RAMAGBS

Purfleet Shooting Range
RSPB Rainham
Essex

Historic Building Report

Oxford Archaeology

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Prepared by:	Jane Phimester
Position:	Archaeologist - Building Archaeology
Date:	11th June 2004
Checked by:	Jon Gill
Position:	Project Officer - Building Archaeology
Date:	11th June 2004
Approved by:	Julian Munby Signed.
Position:	Head of Building Archaeology
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Building Location	Tank Hill Road, Purfleet, Essex

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Oxford Archaeology
Janus House
Osney Mead
Oxford OX2 0ES
t: (0044) 01865 263800
f: (0044) 01865 793496
e: info@oxfordarch.co.uk
w: www.oxfordarch.co.uk

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PURFLEET SHOOTING BUTTS
RSPB RAINHAM
ESSEX

HISTORIC BUILDING RECORDING AND INVESTIGATION

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SUMMARY

Oxford Archaeology (OA) carried out historic building recording and analysis as part of a wider programme of archaeological investigation at Aveley Marshes in Essex. This area is an example of a 20th century military landscape, within which lie Aveley Blockhouse and Purfleet Shooting Range, the latter forms the focus of this report. These structures broadly reflect one phase of construction in the early 20th century with later additions in the mid-20th century to protect structures located to the rear of the stop butts. The blockhouse is an example of a rare defensive structure and is therefore of national importance. The shooting range is relatively complete and is of importance in depicting a different style of construction to other ranges in England.

Subsequently an archaeological watching brief was carried out by OA during the demolition of the shooting range, only the southernmost eight bays were retained and preservation in situ. This work revealed no evidence of earlier archaeology below the standing structures.

1 INTRODUCTION

1.1 Location and scope of work

1.1.1 Oxford Archaeology (OA) has been commissioned by The Royal Society for the Protection of Birds (RSPB) to undertake a programme of historic building investigation and recording at Purfleet Shooting Range, Aveley Marshes, Essex (NGR TQ 540 970). Figure 1 shows the general location of the site, figure 2 provides further detail. The shooting range consists of three separate lengths of stop butts in addition to a number of contemporary structures. These include the First World War blockhouse, and a number of buildings associated with the range itself. The programme of works include the demolition of a large proportion of the stop butts (target one, located at the southern end of the south stop butt, is to be retained), in addition to the scheduling of the blockhouse. The report has been required by Essex County Council under Planning Policy Guidance 15 (PPG15) due to the significant interest of these structures to the understanding of England's military landscape.

1.1.2 Purfleet shooting range dates from the early 20th century when the War Department purchased land for a rifle range (OA 2001). The three separate lengths of stop butts share the same characteristics; target, mantlet and stop butt. The purpose of the stop butt is to catch bullets which pass over the target, which would be operated by the target markers housed within the mantlet. These structures are significant because they are different in terms of construction from other ranges.

1.1.3 Aveley Marshes are located in Thurrock in the County of Essex and the range is located in the centre of the marshes. The site is bounded by the London, Southend and Tilbury and CTRL (Channel Tunnel Rail Link) railway corridors to the north, the disused army camp and range munitions to the east, the River Thames to the South, and Wennington Marsh to the west.

1.2 Aims and Objectives

1.2.1 The aim of the building investigation and recording was to create for posterity a record of the buildings concentrating on their structure, fabric and form.

1.2.2 More specific objectives include:

- To comprehend the significance of the site within the history of England's defence strategy
- To understand the purpose, workings and relationship of the site components
- To determine the phasing of the structures to appreciate the development of the site within an historical context

1.2.3 An archaeological watching brief (as agreed with Richard Havis, the Essex County Archaeologist) was also undertaken during the demolition of the stop butts. The aim was to determine if earlier structures exist on the site of the present structures, and to ascertain whether archaeological remains survive below the existing shooting range footings.

1.3 Methodology

1.3.1 The building recording was undertaken at Level II as defined in *Recording Historic Buildings: A Descriptive Specification* (RCHME, 1996). This consisted of three main elements: a drawn survey, a photographic survey and a written, descriptive record.

1.3.2 The drawn survey compromised a plan (scale 1:2000), figure three, of the stop butts and mantlets. Figure four is a sample of the east and south elevation relating to the central stop butts.

1.3.3 The photographic survey was undertaken using 35 mm black and white prints and colour slide film. This consisted of general pictures of the structures to illustrated their inter-relationships, as well as a more detailed focus on the individual components. Emphasis was placed on areas in which the fabric of the buildings was exposed to provide interpretation of their construction and purpose.

1.3.4 The written record was a descriptive, analytical survey to complement the other elements of recording. This was based on the site visit as well as previous surveys of the area undertaken by Oxford Archaeology and The Morton Partnership Ltd. (detailed in Appendix 1).

1.3.5 A site visit was undertaken on the 8th, 29th October and 11th November 2003 by the OA Building Survey Department. The project archive will be deposited with the County Museum Service (see Appendix II for details of the archive).

1.3.6 A watching brief was also carried out between November 11th 2003 and January 13th 2004 during the demolition of the stop butts. The works consisted of the complete demolition of the northern and central ranges. The southernmost eight bays of the south range (target one) were stabilised and shored prior to preservation in situ.

1.3.7 The watching brief consisted of two elements:

- *Monitoring*: Initially this consisted of twice weekly site inspections, this was later reduced to weekly inspections, as the level of impact on potential archaeology was determined.

- *Recording:* A photographic record as well as a written record was kept during the demolition. This followed procedures as detailed in the OA Field Manual (Ed.D Wilkinson 1992) and IFA guidelines.

1.3.8 The scope of the watching brief is detailed in *Purfleet Shooting Range, Essex, Archaeological Watching Brief Report* (OA 2004). The findings have also been incorporated within this report.

2 HISTORICAL BACKGROUND

2.1.1 Purfleet shooting range and Aveley blockhouse lie within the historic military landscape of Aveley Marshes. Within this context these structures are the most dominant extant features. To the west of Mar Dyke, is a group of buildings including anti-aircraft magazines, guard posts and the earth traverse of a cordite store all dating to the early 20th century (OA 2001).

2.1.2 In 1859 the National Rifle Club was established, this was to encourage the newly-founded Rifle Volunteer Companies to practice their marksmanship. This initiated the construction of many rifle ranges around the country; examples include the Trent Range, Nottinghamshire (1895) and Lincolnshire (1901). There was a general feeling in the army that the experience of the South African War (1899-1902) had exposed serious weaknesses in the marksmanship, and general shooting ability of the British soldiers (OA 2001).

2.1.3 The 1897 OS maps at 25 inches to the mile (PRO papers: WO78/3666) reveal no trace of a range at Purfleet. Although local tradition would have it otherwise, there is no documentary evidence to suggest that the Purfleet magazine ever made use of range facilities west of the Mardyke. It was in 1906 that the War Department purchased land at the Purfleet for a rifle range. In 1910, the Purfleet Rifle Range is first mentioned in Kelly's Directory as being available for use by both regular and territorial units. The 25 inch Ordnance Survey map of 1920 (Fig. 5) first depicts the three ranges of gun butts this also clearly shows the tramways running to the east of the structures. (OA 2001)

2.1.4 During both world wars there was considerable air defence action, this was firstly due to the fact that the Magazine/Range complex represented a target for aerial attack in its own right. Secondly, it lay alongside a main bomber-route to London. In March 1916, gunners at Purfleet, possibly located in the Blockhouse, shot down a Zeppelin airship. In April 1941, an anti-aircraft gunpit was hit by a bomb, four gunners were killed and the mounting wrecked. In June 1944, a flying bomb was shot down by Purfleet guns (Dobinson 1996).

3 DESCRIPTION

3.1 Introduction

3.1.1 The recording programme is focused on the three ranges of stop butts contained within the Purfleet Shooting Range. These are categorised as the southern, central and northern ranges. The blockhouse is a separate entity located to the south of the shooting range and north of the rail tracks. Previous research by OA has been undertaken of Rainham, Wennington and Aveley Marshes (2001) that provide a more holistic assessment of the landscape.

3.2 Summary of phasing

3.2.1 The stop butts and blockhouse both date from the early 20th century although the exact date of construction is not known. The stop butts are thought to reflect two phases of construction.

3.2.2 The south range relates to the first phase, this is indicated by the lower parapets and the elevated target numerals (Plate 1). Within this the southern most end (bays one to eight) which are now preserved in situ relate to an earlier build (Plate 2). This is indicated by the use of a different brick, a deep frogged brick stamped 'MARSTON'. Sequential bays butt target one at a slightly different alignment. These bays, as well as the north and central ranges, are constructed from deep frogged brick stamped 'LONDON BRICK'.

3.2.3 The central and north ranges demonstrate a second phase when the parapets were extended, to which the target numerals were directly attached. Examination of the materials and construction suggest a date of c.1940, at this time a number of the red brick box foundations were also infilled at the rear. This was to protect structures built to the north-west of the stop butts.

3.2.4 The blockhouse reflects one phase of construction with the second phase occurring in the late 20th century with the infill of the doors and windows due to health and safety regulations.

3.3 The Butts

3.3.1 The three lengths of Butts face south-east and contain five groups of targets, these are evident on the 1920 Ordnance Survey 25 inch map (Fig 2). The southern range accommodates targets one and two, the central range target three and the northern range targets four and five. Target one is to be retained as an example of 20th century shooting range. Each shares the same three elements and basic physical characteristics:

- Stop Butts
- Targets
- Mantlets

3.3.2 The **Stop Butt** is a high bank facing the mantlet and targets which is designed to catch bullets which pass by, over, or through the target (Plate 3). Beyond the Butts

is a Danger Zone where spent bullets can still land. The higher the Butts, the shorter the Danger-zone.

3.3.3 Figure 4 illustrates the construction of the stop butts. The butt is supported on concrete raft foundations and a base of open red brick boxes (Plate 4). The south east facing brickwork lies opposite the mantlets, these are reinforced with wooden planking to take the impact of the bullets. A number of the external opening have been infilled at a later date with breeze blocks and in some instances a further layer of red brick added (Plate 5). In other places, thick iron plates have been fixed as shields. The purpose of these was to protect the buildings located to the rear of the butts. A further example is in the southern range where to the rear of bays three and four lies a concrete slab foundation. Here two steel plates have been fixed to the rear of the brickwork to protect the building which is now lost.

3.3.4 Four pre-cast concrete units lie horizontally across the brick walls of the box structures, these elevate twelve steps to provide a sloping stepped platform (Plate 6). The central range differs in having 3 concrete beams and fifteen steps. A layer of concrete was placed on top, which with the concrete units provided the deck structure for the sand bed. The sand bank is at a 45 degree angle facing the south-east, its purpose was to reduce ricochets, the sand served to absorb bullets.

3.3.5 A brick buttresses runs along the rear of the butts, this is faced with timber boards, also to minimise ricochets. Attached to the buttresses of the rear wall are steel or iron 'T' sections built onto the brickwork of the parapets. Large wooden cut-out numerals appear above and label each target, when seen from the firing positions. Such numerals are evident on the southern range of gun butts (Plate 7). Numerals on the central and southern range are not elevated above the boards but directly attached (Plate 8). In such examples the level of the rear buttresses has been extended in a second phase of construction. The fabric is of concrete that has been poured between wire meshing, these are faced with one horizontal layer of wood planks and one vertical layer. An example is evident in the central range where the parapet has been extended and then reduced to its original height between bays thirteen and fourteen. The sporadic change in height occurred as a result of construction to the rear of the stop butts, such structures required protection from gun fire (Plate 9).

3.3.6 At Purfleet the lengths of the three stop butts from south-west to north-east are:

- Numbers 1 and 2 measure 160 m (175 yds)
- Number 3 measures 130 m (140 yds)
- Numbers 4 and 5 measures 260 m (280 yds)

3.3.7 The height of the ranges vary, as a consequence of safety regulations it was not possible to gain exact measurements. The lower ranges measure approximately 6 m (20 ft) in height, the extensions to these are an approximate further 3 m (10 ft).

3.3.8 Particular features of the three ranges of stop butts that are noteworthy are:

3.3.9 *Southern range:* this comprises thirty eight bays, at the junction of bays eight and nine there is a change in direction of the shooting butts. The reason for this is

unclear, although indicates a later phase of construction (as described in 3.2.4). The wall dividing the two lengths is of solid masonry with the piers at either end becoming wider (700 mm), the wall therefore has a broader foundation. It is also noteworthy that target one (bays one to eight) differ as openings are evident in the cross walls which have reinforced concrete lintels. This was to reduce weight in the end bays, the reason that this feature was not continued in later phases is unclear. It is possible that this was later thought an unnecessary requirement.

3.3.10 *Central range:* this comprises thirty four bays. As detailed, the significance of this range is that the south end is higher and reduces in height between bays thirteen and fourteen.

3.3.11 *North range:* this is considerably longer than the other ranges comprising seventy four bays with a slight change in direction at the junction between bays thirty-seven and thirty-eight.

3.3.12 At Purfleet, the Stop Butts are unusual, this is a consequence of the instability of the marshy land, so that a much lighter construction was employed. Most ranges have solid earth banks, usually with a clay core, covered in earth, and with a deep layer of sand on the front face. The Trent Range's 90 m (300 ft) long Stop Butt was 10 m (35 ft) high, 28.5 m (95 ft) deep at its base, and contained 45,000 tons of earth (Iliffe and Baguley 1975).

3.3.13 The **Targets** were timber frameworks fitted with counter-weights and raised and lowered manually by the 'target-markers'. These are thought to be contemporary with the construction of the stop butts. The targets had pulley wheels attached, and the action is that of opening and closing a sash-window. A tramway, introduced onto ranges in the 1890s, provides the capability of moving targets. At Purfleet the wooden tramway lines survive *in situ* (Plate 10), pulley wheels from the target frames are also extant although none remain *in situ* (Plate 11). The number of targets classes Purfleet as of average size within the military landscape of England. Trent, for example, contains one target and Kilworth eight.

3.3.14 The **Mantlet** is a covered way, backed by a brick and concrete wall, and a thick bank, the roof is supported by ironwork. These are also thought to be contemporary with the stop butts and reflect one phase of construction. Seats and telephone points are extant which the target markers utilised in operating the equipment. These vary in number, a total of nine are contained within the northern mantlet at 28 m 80 cm intervals. The job was to raise the target, mark hits using a long wooden pointer, lower the target and patch holes as necessary, prior to repeating the sequence.

3.3.15 The mantlets are constructed on concrete foundations with a depression to the east to accommodate the tramway (Plate 12). The fabric is curved steel or wrought iron backing plates, which is supported with intermediate support stanchions and enforced to the rear with brick and concrete. An extensive bank consisting of a bottom fill of sand and an upper layer of earth, extends south east *c.*5 m at a 45 degree angle. At both ends of the mantlets the earth is contained within two stretches of iron sheeting. The earth bank would have been added following the construction of the mantlet. It

is noteworthy that at other ranges such as Middlewick Range, Essex, the target numbers are set in the grass slope backing the Mantlets, not high on the Stop Butts.

3.3.16 Additional structures have been accommodated in the southern end of the three mantlets. In the southern range this consists of a group of three WC units with bricked walls and a corrugated iron roof. The central range houses a singular WC, with brick walls and felt covered roofing extending back to the ironwork. The north range also contains three WCs of a similar construction to the southern range.

3.3.17 The gap between the mantlet and stop butt is not uniform, the reason for this is unclear. The measurements are:

- Targets 1, 2 and 3 – 18.5 m (20 yds)
- Targets 4 and 5 – 4.5 m (5 yds)

3.4 Other features of the range

3.4.1 **The Firing Positions** can be seen receding from the Butts line at 93 metre (100 yds) intervals. These are evident on the 1920s Ordnance Survey 25 inch map, shown in figure five. Until the 1980s, rifle firing was carried out from kneeling or standing positions. With the introduction of firing from a prone position, came the need for shooting rests in the form of low earth banks. Low posts set in the ground provided bases for the field-telephones to communicate with the target-markers, and with safety sentries. Targets 3 and 4 have positions for firing up to 555 m (600 yds), but on targets 1 and 2 it was possible to fire from up to 925 m (1000 yds) away. The most usual range for rifle-shooting was, and is 370 m (400 yds).

3.4.2 **The Tramway** was linked to the public (Midland) railway that ran up the eastern edge of the site. The Range had its own station for bringing troops into the Camp. This tramway served the butts, carrying moving targets but never troops. When trains entered the Range a War Department crew took over the civilian one. The posts of the Railway Company's gates still exist; as do the WD marker-posts alongside the former railway-line.

3.4.3 Other extant structures include the latrine block, this is a gabled brick built structure dating to the opening of the range in 1910. At the rear of the central range of stop butts is a redbrick structure measuring 3 m in height and 5.44 m in length. The windows and doors providing access to the building have been recently infilled and its exact purpose is unclear. It is thought this was constructed at a later phase, being contemporary with the heightening of the stop butts.

3.5 The Blockhouse

3.5.1 This is a circular tower built primarily as a submarine look-out. It was also equipped with an anti-aircraft gun, for which there is a hold-fast on the upper platform. A full survey of the blockhouse was not required as part of this report, however due to its historical and national significance, as well as its close proximity to the stop butts, a brief depiction of the structure is provided.

3.5.2 The Blockhouse dates to the early twentieth century and it is first shown on the 1920 OS 25 inch map (marked as a blockhouse). In 1916 the anti-aircraft defences of Purfleet consisted of a 3" 20 cwt. gun, and two 1 pounder pom-poms on garrison carriages. The 3" gun is likely to have been placed on Beacon Hill, therefore one of the pom-poms could have been this tower. There is a photograph, taken in 1916, of gunners outside what appears to be the blockhouse after they had shot down a Zepplin (Dobinson 2000).

3.5.3 Access was not possible at the time of survey as a water drainage system was in the process of construction. This meant that the structure was surrounded by a depression of water that was not possible to cross.

3.5.4 Investigations by OA in 2001 found that the blockhouse measures 4.5 m in height, and *c*.6 m (20 ft) in diameter. It stands on a battered concrete plinth sloping away from the structure and appearing to extend down to a hexagonal shaped raft foundation. This was covered with a layer of to act as a damp course that extends up the side of the building as it dressed in concrete. The blockhouse is a mass concrete structure with walls approximately 330 mm wide. It is covered with a render finish marked out to simulate stone ashlar work, however this is now extensively damaged. Access is provided by a door at ground level, the open top platform was reached by a ladder through a hatch in the ceiling of the ground floor compartment. Five embrasures are evident on the ground floor, two of these have iron shields which have a central loophole closed by a small moveable shutter.

3.5.5 This tower is thought to be unique and is therefore of national importance within the military landscape of England. Under statutory regulations the blockhouse is to be scheduled by English Heritage. The marshland in which the blockhouse stands means that there is high potential that the tower is severely damaged by flooding. The tower is in effect acting as a well and collecting water, signs of water seepage were noted around the base of the doorway.

4 DISCUSSION AND CONCLUSION

4.1.1 The stop butts are also of importance in depicting a different style of construction in comparison with other ranges. As described in 3.3.13 most ranges have solid earth banks, usually with a clay core, covered in earth and with a deep layer of sand on the front face. This difference in design was a result of the need to ensure the butts were lighter in weight because of the marshy land on which they were constructed. Targets one to eight in the southern range are to be maintained, thus providing an example of the earliest phase of construction of the rifle range. These will also serve an archetype demonstrating the working relationship between the different structures described within this report.

4.1.2 Purfleet Rifle Range is also of importance because they are relatively complete and possesses a reasonable level of homogeneity. The structures provide an example of the operation of a twentieth century rifle range and it is therefore a significant feature within the military landscape of England.

4.1.3 Following discussions during the watching brief the decision was made not to break and remove the concrete raft foundations. This was in order to reduce the risk of affecting any archaeological remains potentially existing below the range structures.

APPENDICES

APPENDIX 1 BIBLIOGRAPHY AND REFERENCES

Published sources

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OA (2004) *Purfleet Shooting Range, Rainham, Essex: Archaeological Watching Briefs Report* (Client report)

The Morton Partnership Ltd. (2002) *Feasibility Study for Victorian Shooting Butts and Mantlets at RSPB Rainham Marshes, Wennington and Aveley Marshes Nature Reserve, Essex* (unpublished report)

Cartographic Sources

Ordnance Survey 25 inch map (1920)

APPENDIX 2 SUMMARY OF SITE DETAILS

Site name: Purfleet Shooting Butts, PSPB Rainham, Essex
Site code: RWAM03
Grid Reference: TQ 540 970
Type of Evaluation: Building Recording
Date and duration of project: 8th October 2003 -January 2004
Location of archive: The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 OES. It will subsequently be deposited at Essex County Museums Service

Contents of archive:

Two films of 35mm photographic negatives (black and white prints)
Two sets of black and white photographic prints (contact sheets)
Two films of 35mm colour slides
A copy of the current report
Original site drawings to permatrace
Descriptive notes

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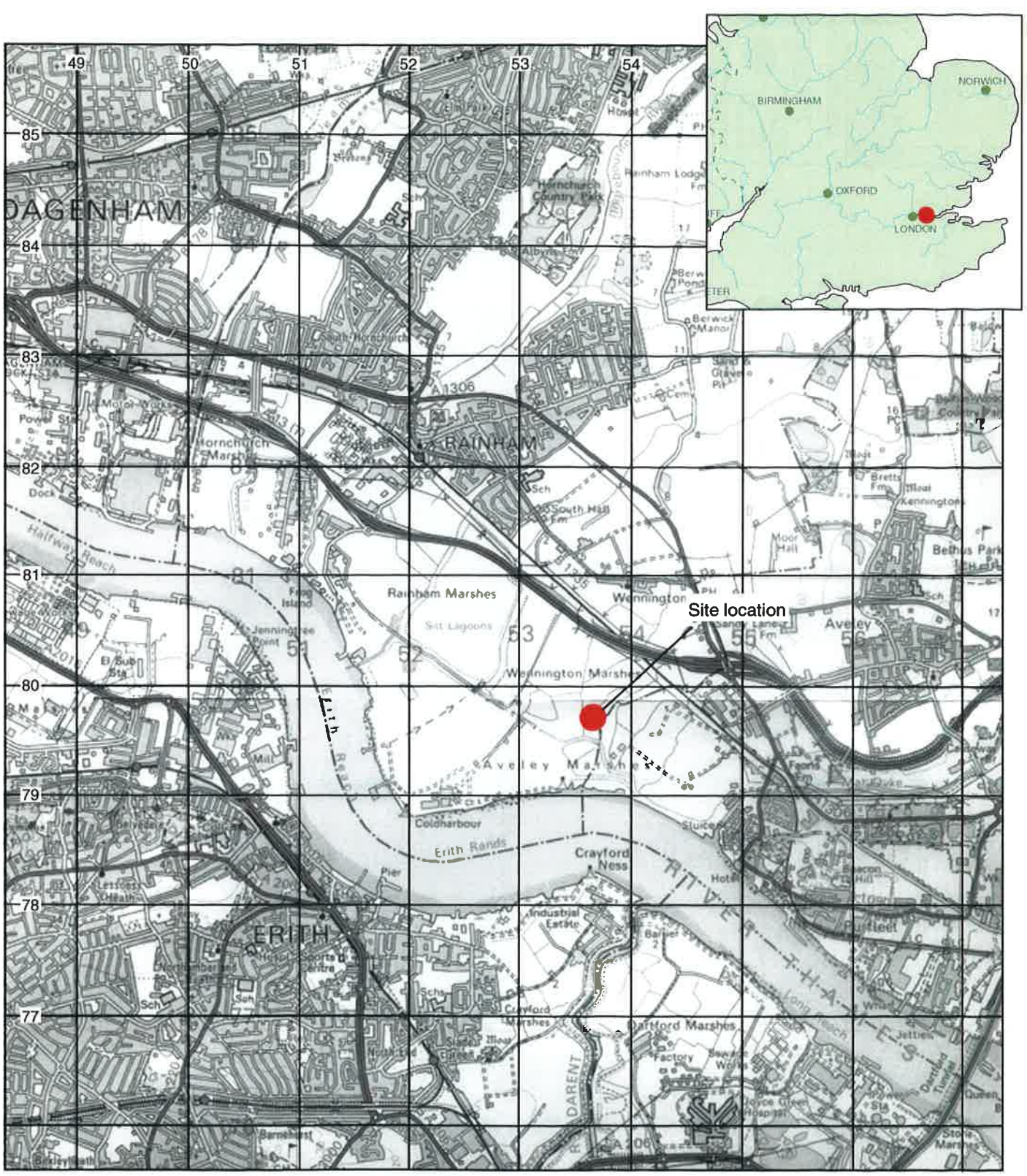

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Figure 1: Site location

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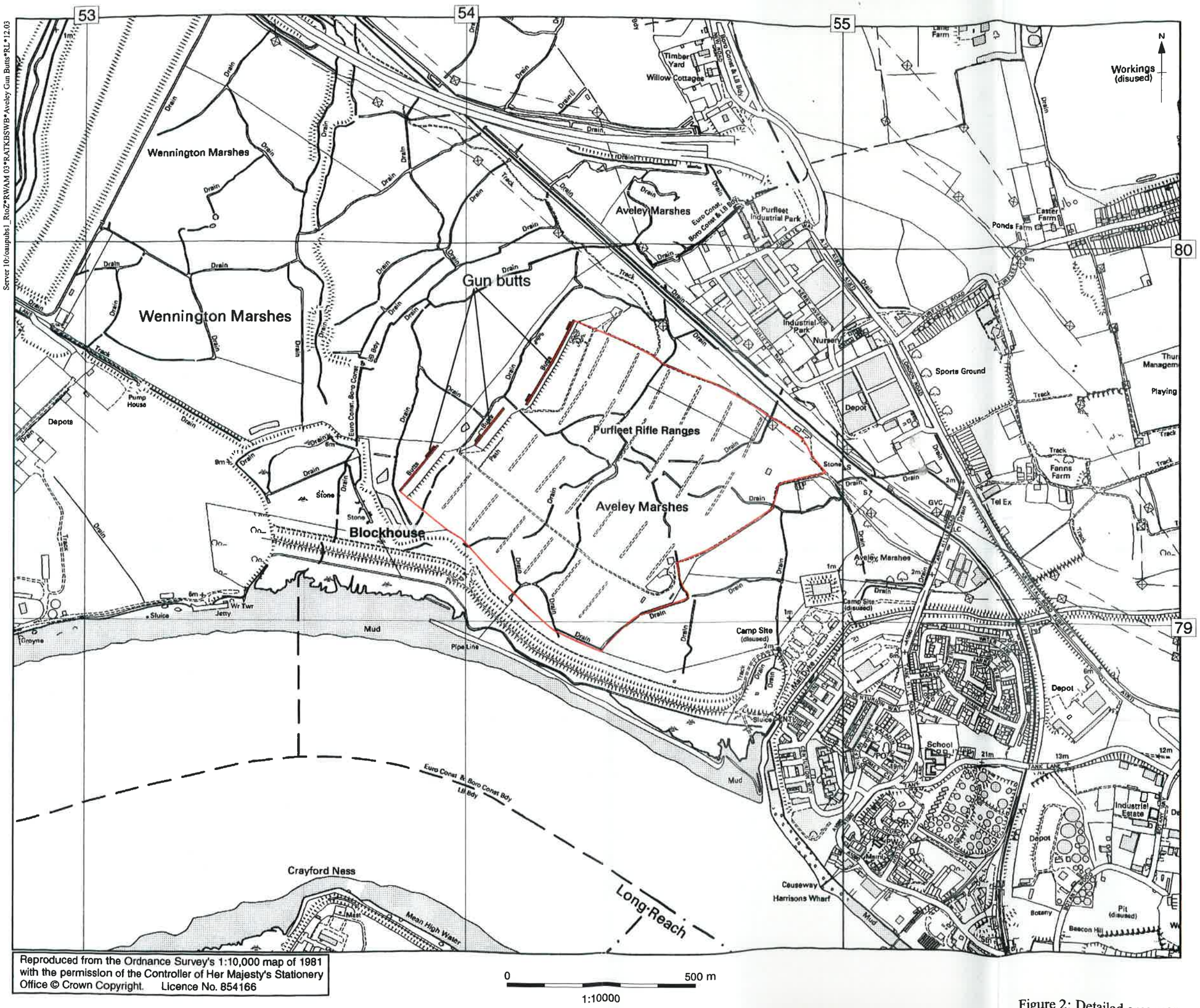

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Figure 2: Detailed area map

STOP BUTT

TARGET RANGE 5

TARGET RANGE 4

NORTH BUTT

TRAMLINE

TARGET RANGE 3

EXTERIOR STRUCTURE

CENTRAL BUTT

LATRINES

LATRINES

TARGET RANGE 2

TARGET RANGE 1

SOUTH BUTT

MANTLET

LATRINES

EMBANKMENT

Survey Data supplied by :
Matt Bradley
OXFORD ARCHAEOLOGY

N

0 50 m

Oxford Archaeology
Janus House,
Osney Mead,
Oxford,
OX2 0ES.

RATKBSWB

PURFLEET GUN BUTTS

Scale at A3	1:2000
Drawing No.	ratkbswb/oa/001/
Date printed	16/12/2003
Drawing Title	

Figure 3
Plan of Purfleet stop butts and mantlets

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email : mail@oxfordarch.co.uk
web : www.oxfordarch.co.uk

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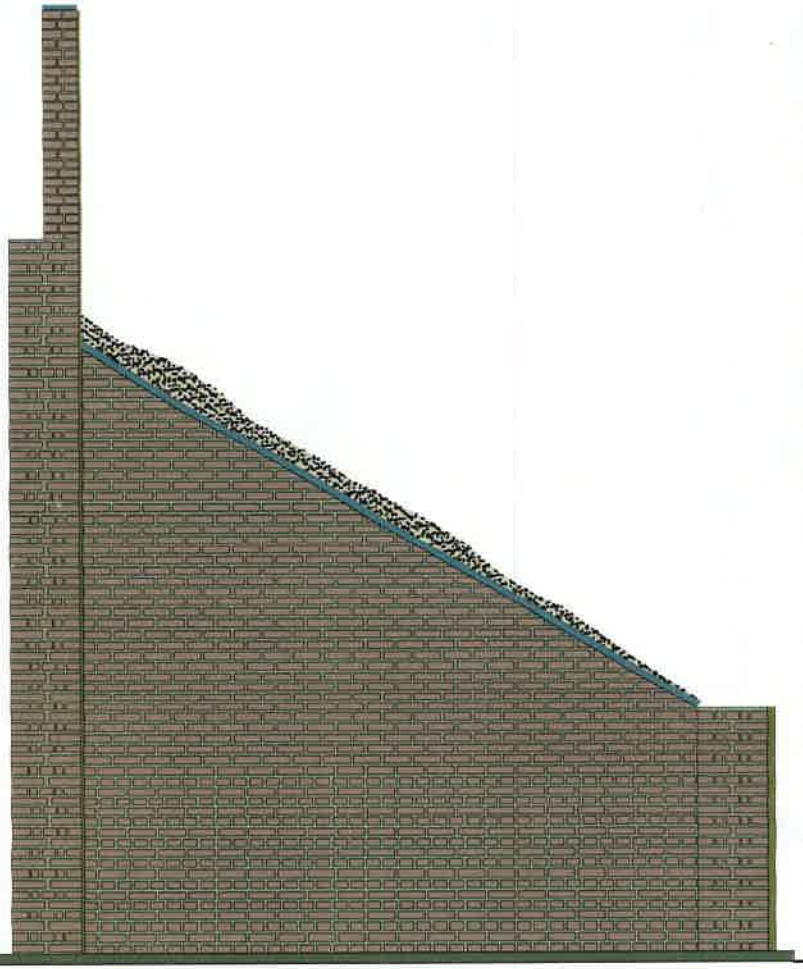
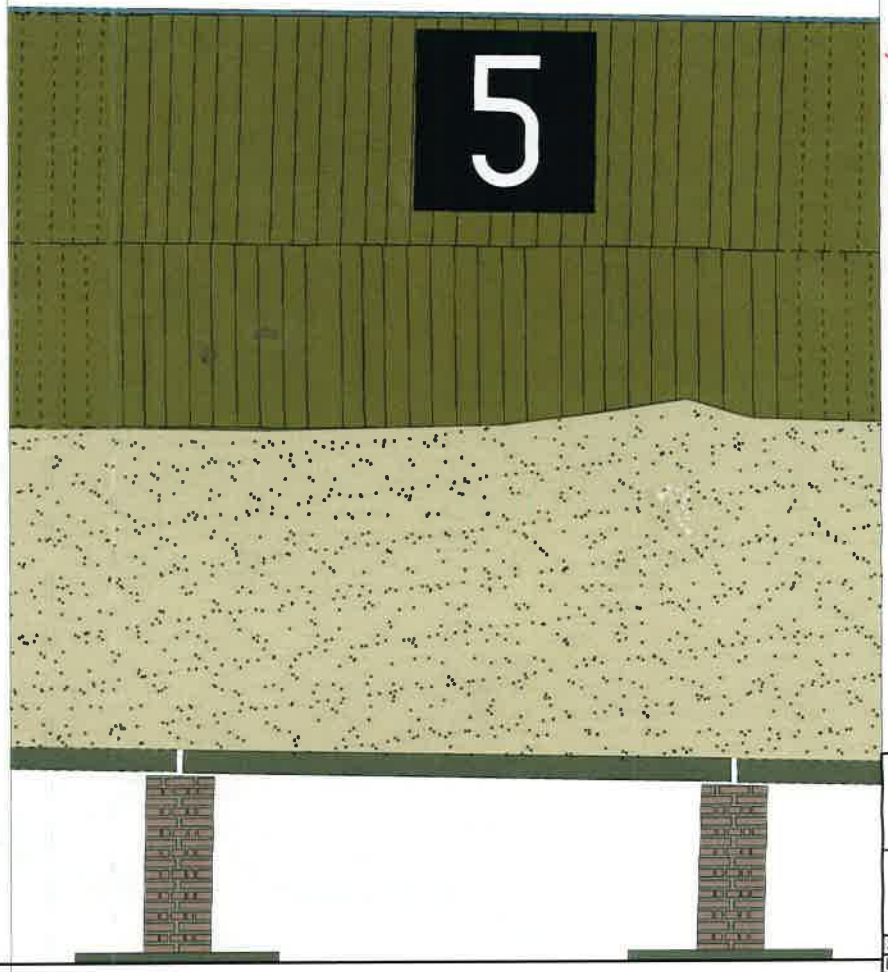
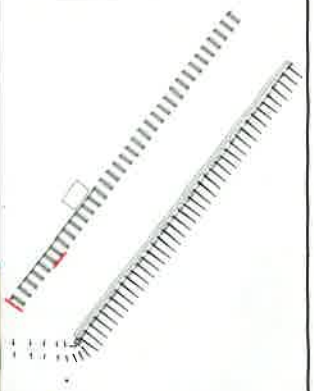


South elevation
central butts



Sample east elevation
central butts



Timber planking

Sand Bank

Concrete

Brick (pattern indicative only)

Extrapolated

Survey Data supplied by :

Matt Bradley
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0 1.5 m

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PURFLEET GUN BUTTS

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Figure 4
Current Butt - east and south sample elevation

Tel: 01865 263800 Fax: 01865 793496
email : mail@oxfordarch.co.uk
web : www.oxfordarch.co.uk

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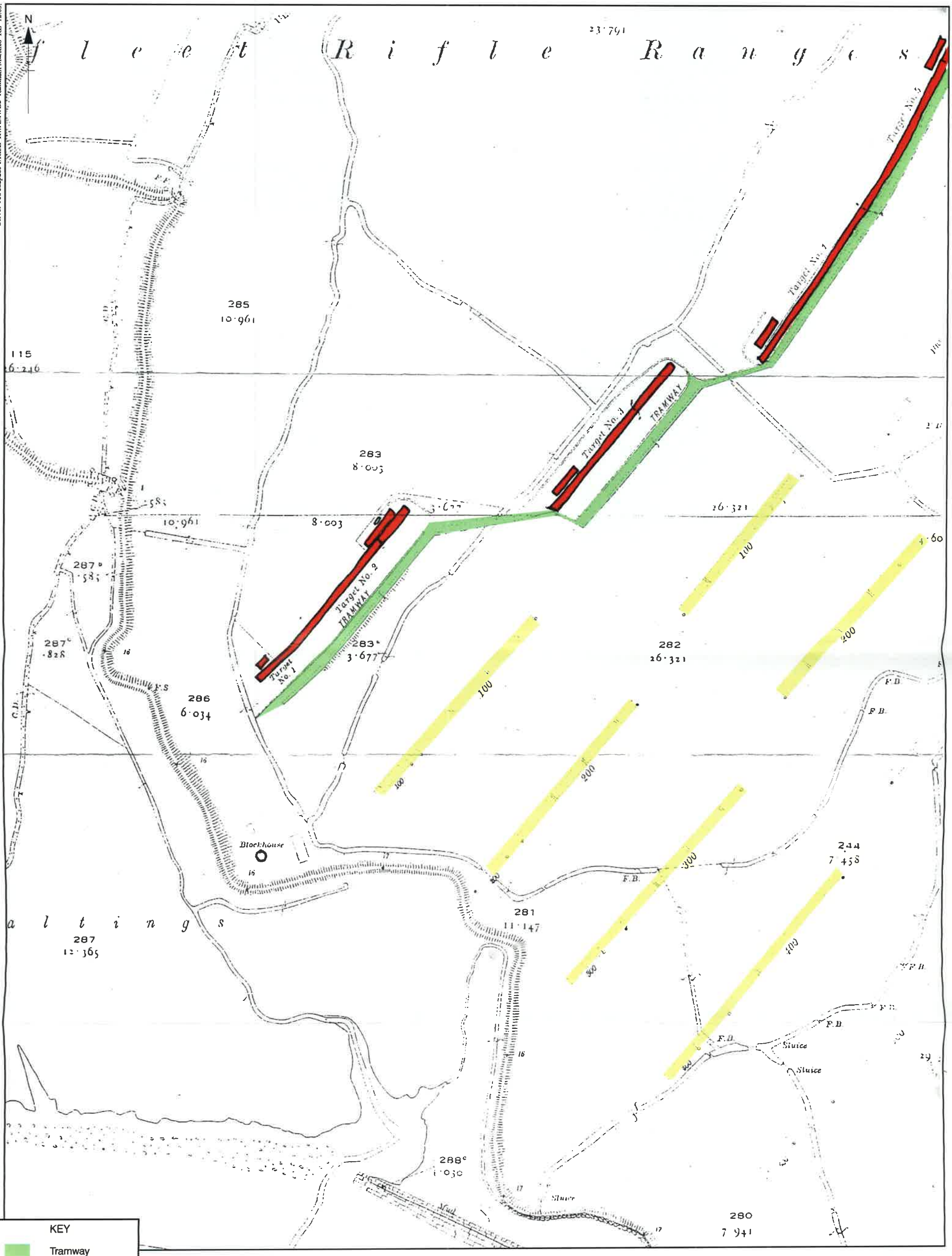

Figure 5: Ordnance Survey 25" map (1920)

Plate 1: General view of stop butts, south range

Plate 2: North elevation of stop butts, showing bay opening, south range

Plate 3: General view of stop butts and mantlet, north range

Plate 4: East elevation of stop butts, north range

Plate 5: West elevation of stop butts showing red brick fill, north range

Plate 6: South elevation showing construction detail and stop butt, north range

Plate 7: West elevation of stop butts, south range

Plate 8: Construction detail of east facing stop butt parapets, north range

Plate 9: Exterior building, central range

Plate 10: Section of extant tramway, central range

Plate 11: Mantlet showing remains of pulley mechanisms, central range

Plate 12: Oblique of mantlet phone box and bench, north range

Oxford Archaeology

Janus House
Osney Mead
Oxford OX2 0ES

t: (0044) 01865 263800
f: (0044) 01865 793496
e: info@oxfordarch.co.uk
w:www.oxfordarch.co.uk

Oxford Archaeology North

Storey Institute
Meeting House Lane
Lancaster LA1 1TF

t: (0044) 01524 541000
f: (0044) 01524 848606
e: lancinfo@oxfordarch.co.uk
w:www.oxfordarch.co.uk

Director: David Jennings, BA MIFA FSA

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Oxford Archaeological Unit
Janus House, Osney Mead, Oxford OX2 0ES