PURFLEET (EX) RAMAGBS

Magazine Stores
RSPB Rainham
Tank Hill Road
Purfleet
Essex

Historic Building Recording

Oxford Archaeology

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Magazine Stores, RSPB Rainham, Tank Hill Road, Purfleet, Essex

HISTORIC BUILDING INVESTIGATION AND RECORDING

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SUMMARY

Oxford Archaeology (OA) has carried out an archaeological and historical analysis of eight magazine stores in Purfleet, Essex. This was undertaken as an archaeological condition of planning approval granted to the Royal Society of the Protection of Birds (RSPB) for the demolition of all eight structures. These form a 20th century component of the military landscape of Aveley Marshes, which dates back to the 18th century. The magazines are independent detached structures, constructed from reinforced concrete, used to store anti-aircraft ammunition during the Second World War. They are typical structures of this period, reflecting an economy of design and use of materials. While the magazines are neither listed nor scheduled they are of importance in understanding the local military landscape and the wider field of twentieth century military archaeology.

1 INTRODUCTION

1.1 Background and scope of work

1.1.1 Planning permission has been granted to the Royal Society for the Protection of Birds (RSPB) for the demolition of eight military magazine stores at RSPB Rainham subject to an archaeological condition. These structures are a component of the military landscape of Aveley Marshes which dates back to the 18th century. The report has been required by Essex County Council under national planning policy 15 (PPG15) due to the significant interest of these structures to the understanding of England's military heritage.

1.1.2 The structures covered by the current works lie on the north bank of the River Thames, immediately to the west of the Mar Dyke (TQ 5495 7899). Aveley Marshes are located in Thurrock in the County of Essex, the magazines lie on the eastern parameters of the marshes (Fig 1). The site is bounded by the London, Southend and Tilbury and Channel Tunnel Rail Link (CTRL) 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.

1.1.3 The eight magazine stores were built in 1939 to store anti-aircraft ammunition. They are independent detached structures, four orientated NE-SW and four NW-SE. Each of the eight stores have nine pairs of back to back storage bays and two entrances at both ends allowing access to the two sides. There is an outer skin of blast walls reinforced by large earthen embankments, which surrounds the inner core of storage bays. There was formerly asbestos sheet roofing between the blast walls and core but this has now been entirely lost (or removed). At each of the four corners of each building is a loading platform which would have allowed easy transportation of ammunition by lorry and rail. Small sections of rail tracks are extant between the two groupings of buildings, which would have provided connection to the main rail line. A tarmac road provides access to the site.

1.2 Archaeological and historical background

1.2.1 Purfleet's military landscape dates to the 18th century when five grand gunpowder magazines were constructed in the 1760s (these have since been demolished) (Gullery & Pattison 1996). At this time Purfleet was the government's main depot for gunpowder storage and was pivotal to British military supply in the later Georgian and Victorian periods (Cocroft 2000). The 1st edition ordnance survey map (1873) (Fig 2) depicts the gunpowder magazines (with wharf), barracks, proof range and house. Further structures developed in the 20th centuries including a large Cordite store, a blockhouse (now scheduled) and shooting range (OA 2001) (OA 2004).

1.2.2 The Purfleet magazine stores, constructed in 1939, form part of the World War II defence strategy of Britain. By the time of the Munich Crisis in 1938, an awareness of the inevitability of war meant that defence structures were erected throughout the United Kingdom. The British landscape was transformed by a vast and rapid programme of building (Dobinson 2000). Purfleet was an obvious choice with a well developed military presence and was geographically advantaged. It was well situated, being a close distance from London (Saunders 1989), and well connected lying on the north bank of the Thames and west of the railway network.

1.2.3 The purpose of a magazine store was to receive and store ammunition before issue to service units, they were built to safeguard valuable finished munitions from accidental damage. In the 20th century magazines were built to a standard form although these were adapted to meet requirements and geography (Lowry 1995). Military archaeology at this time reflects an economy of design and use of materials. Unlike the grand magazines of the Georgian period there was little architectural embellishment. Concrete was used throughout for construction with corrugated iron roofs, large earthen mound embankments and loading platforms. The National Explosives Company at Hayle in Cornwall laid out the earliest know group of surviving concrete magazines. All magazines were serviced by a standard-gauge rail connection and a concrete access road. The actual plan of the magazines varied according to the specific requirements and geography of the site (Cocroft, 2000).

1.3 Aims and Objectives

1.3.1 The general aim of the building recording was to create for posterity a record of the eight magazines prior to their demolition concentrating on the building's structure, construction, history and use.

1.3.2 More specific objectives are to:

- Record the surviving features of the structures to gain a further understanding of the military function of the buildings
- Identify and record evidence of the earlier military operations
- To determine the phasing of the structures to appreciate the development of the site within an historical context
- To understand the relationship and development of the structures in the context of the overall operations of the site

- To comprehend the significance of the site within the history of England's defence strategy

2 METHODOLOGY

2.1 Scope of Analysis

2.1.1 The building recording was undertaken at Level II as defined in the Royal Commission on the Historical Monuments of England (*RCHME,* 1996). The structures were recorded in their current form before the start of demolition works, this consisted of three principal elements: survey plans, a drawn record, a photographic record and a written record.

2.2 Fieldwork methods and recording

2.2.1 The base survey for the present programme of archaeological recording was previously commissioned by Bettridge, Turner & Partners (Structural Engineers). This survey includes a detailed typical plan of one magazine with elevations (1:100) and an overall plan of the site (1:1250) showing the relationship of all eight magazines. The plans were traced onto archivally stable permatrace and descriptive annotation added to indicate construction, structural breaks, evidence relating to the building's use and other features of interest. The recording followed IFA Standards and Guidelines using conventions outlined in *Recording Historic Buildings: a descriptive Specification* (RCHME, 1996).

2.2.2 Photographs were taken using 35mm film (black and white prints, colour slides) and include general shots of structures (external and internal) and specific details. Flash lighting was used to illuminate dark interiors and a scale used where appropriate. All films included a chalk board indicating the film number and site code. Photographic record sheets where used to indicate the location and direction of each shot and any further detail.

2.2.3 Written descriptions of the magazines were made as part of the annotated drawings. Additional analytical and descriptive notes were taken as appropriate to compliment elements of the record.

2.2.4 In addition to the main site recording a short programme of historical research was also undertaken. This research was based on principal secondary sources, including research undertaken by English Heritage (EH) and The Council of British Archaeology (CBA) cataloguing military defence and explosive manufacture structures during the world wars.

3 DESCRIPTION

3.1 General Form

3.1.1 The site comprises eight separate magazine bunkers, 4 orientated NE-SW and the other four SE-NW. Each is linked by a set of access roads and there would also originally have been rail tracks connecting the site but these have been almost

entirely lost. Each magazine is rectangular in form with outer blast walls surrounding inner core walls. Four rectangular access tunnels extend through the core and blast walls at opposite ends of the two sides. Four rectangular loading platforms of varying sizes are situated at the exterior of each access tunnel. Within the core walls two pairs of nine back to back storage bays are separated by a central spine wall. Small 'piers' lie opposite the bays in alignment with the partition walls, these once held a horizontal trackway used to transport the ammunition from the storage bays to the loading platforms.

3.2 External Description

3.2.1 All eight magazines are constructed entirely from reinforced concrete panels (Plate 1). This was used in the construction of military magazines from 1890 when the Explosives Inpectorate reported that all magazines were to be built of good Portland cement concrete. Previously red brick had been used as it was feared that a ferro-concrete magazine would provide too much resistance to an explosion (Cocroft 2000). Concrete is a cheap and durable building material, which was an important consideration in 1939 at the onset of war.

3.2.2 Outer blast walls surround the inner core walls of the magazines (Fig 5) measuring 23.1 m by 12.3 m at a height of c.4.8 m. This feature is standard of magazines during the Second World War, the purpose was not only to contain an explosion, but also to protect its contents from an external threat (Plate 2). In reality, such blast walls served only to safeguard valuable finished munitions from accidental damage, they would probably have offered insufficient containment to withstand the full force of the whole magazine exploding (Cocroft 2000)

3.2.3 Five reinforced concrete triangular buttresses placed at c.4 m intervals (Plate 3) support each length of the outer blast walls. The area between the buttresses has been infilled by earth extending to c.0.5 m below the height of the blast walls. As a result the full extent of the buttresses is not visible. All magazines types constructed at this time would have had earth banked against them, this provided additional protection against enemy attack and explosions. Some of the most substantial bombproof magazines were covered by earthen mounds, such as those at Chorley and Swynnerton. Purfleet is typical of later magazines, such as those at Elstow, which are free standing with no overhead cover beyond the concrete roof slab (Cocroft, 2000).

3.2.4 The flat roof of each magazine is constructed from reinforced concrete and only extends over the inner core. The passageways between the tall inner core walls and the lower blast walls are now open but they would almost certainly formerly have had a pitched roof cover (probably of asbestos sheeting). This has since been removed, presumably as a result of health and safety requirements. There is evidence that something has been removed from the top of the core walls but there are no clear signs of sockets at the top of the blast walls. Flat concrete roofs were common as a constructional expedient as they afforded some protection from incendiary bombs (Lowry 1995).

3.2.5 Access to the magazines is provided by four rectangular openings, two lying at each end of the magazine (Plate 6). Each opening has the form of a short tunnel measuring

1.2 m by 1.9 m, the walls are at a 45 degrees gradient meeting a flat concrete roof, which extends c.1.9 m from the outer wall. An earth embankment extends to the height of the tunnel roof.

3.2.6 Second World War magazines were often semi-sunken in order to provide additional protection. However where the water table was too high, as at Aveley Marshes, they were constructed on the surface (OA 2004). Exposed flooring in magazine A showed that the walls had been sunk to a depth of c.0.27 m only.

3.2.7 A 1 m tall loading platform is located adjacent to each access tunnel, each of which is also made from reinforced concrete (Plate 7). These have a box style construction with four outer faces on which a concrete 'lid' was placed. Ammunition would have been transported from the storage bays inside each magazine along a trackway (detailed below) to the external loading platforms from where the ammunition would then have been loaded onto trucks or rail wagons. There are three sizes and positions for the platforms (Fig 4) possibly partially based according to the type, size and weight of ammunition in storage also arranged to allow easy access for trucks and/or rail wagons. Generally those platforms at the front of the bunkers are immediately adjacent to the main structure and roughly square while those platforms at the rear are further (c.3.8 m) from the magazine store. This would allow trucks or wagons to back in without being obstructed by the front platform.

3.2.8 Access to the site is provided by a service road, this would originally have been concrete with a thin layer of asphalt (Plate 9). This runs from the site entrance, between the site two groupings of magazines and to the northwest of the NW-SE group of magazines. This was a common feature of such sites, being necessary to allow trucks/lorries to dispatch ammunition to and from the magazines (Cocroft 2000).

3.2.9 The access road has in recent years been re-layed obscuring the contemporary network of rail tracks, which is now extant in two areas only, as indicated in figure 4 and Plate 10. The orientation of the extant tramway suggests that these once ran between the magazines meeting the loading platforms, its exact path however is unconfirmed as extensive vegetation overgrowth has destroyed such evidence. A softwood stake (0.30 m by 0.30 m) is evident against a number of the loading platforms. This has a sloped side probably acting as a buffer against the tram carriages (Plate 11). Such buffers are evident only on loading platforms located a distance from the magazine entrance. It is therefore probable that these were used to store such ammunition that required removal by train, this is likely to be a result of the size and weight of the ammunition.

3.2.10 Proximity to a railway line was one of the principal factors in the location of a military site. Logistically it was a complex process ensuring the right quantities of ammunition arrived at the correct magazines before issue for service use. The railways were the vital link; standard gauge lines were used to eliminate double handling onto an internal tramway system (Cocroft 2000). The extant sections of tramway and historical evidence shows that the Purfleet magazines were once connected to an external rail network. The main public (Midland) railway ran along the eastern edge of the site. The tramway ran from the sidings into the Cordite Store

(located to the north east of the magazines), and out again to cross the Mardyke to enter the (now demolished) 18th century powder magazines (Gullery & Pattinson 1996). The lines and the bridge over the Mardyke can still be seen, this tramway also served the gun butts carrying moving targets. The posts of the Railway Company's gates still exist; as do the WD marker posts alongside the former railway-line (OA 2001). The 3rd edition ordnance survey map (1920) (Fig 3) shows a tramway running from a jetty on the Thames over the railtrack to a nearby chalk quarry and it is likely that the tramway connecting the military buildings operated in a similar way.

3.3 Internal Description

3.3.1 The eight magazines are uniform in plan, the core walls are situated uniformly 1 m in from the blast walls. Within this there are two sections of nine storage bays divided by a central concrete spine wall (Plate 12). Two walkways extend the full length of the building through the core and blast walls, these also provide access to the bays, in which the ammunition is stored (Plate 13). Small 'piers' lie opposite the bays in alignment with the partition walls (Plate 14). These are small reinforced concrete walls extending 0.75 m in height, each with two sockets at the top of the pier (Plate 15). It is probable that these once held a horizontal trackway; this would have been a mechanised continuously looped belt or a simple roller track that would have been used to pass boxes of ammunition from the storage bays out onto the loading platforms. An additional pier is located within the entrance lobby, and in some examples standing externally between the entrance lobby and the loading platform. In such examples the loading platform is located c.3.8 m from the entrance tunnel. This was to ensure the mechanised belt/roller track was continuously fed to the loading platforms.

3.3.2 Each magazine houses two windows on the lengths of the core walls, all are identical throughout the magazines measuring 2.93 m by 0.94 m (Plate 16). They are constructed of a simple metal frame with 'T' section glazing bars and eighteen lights. Three upper lights are contained in the central bay and each has a horizontally hung casement. These windows face the blast wall and would have allowed some additional light to enter the magazines, this was beneficial as artificial lighting presented a potential fire risk. It is probable that the glass was wired which was a technique which was generally adopted in such buildings in the first half of the 20th century (Cocroft 2000).

3.3.3 Within the magazines, electrical light fixtures are extant, switches are located on the exterior of the core walls at the four access tunnels of the magazines. This was standard practice in such buildings as it reduced the risk of fire hazards. Electrical wiring also runs along the interior of the core walls, these are housed in metal casing again to reduce potential fire risks.

3.3.4 Each magazine contains two sections of nine storage bays, these have been labelled consecutively in black paint on both sides of the bay walls from 1 to 9 and 10 to 18 (Plate 17). The sign: '*Warning: do not touch or rub out markings*' has also been painted in red on the core wall at the entrance to the storage bays.

3.3.5 Extant door fixtures illustrate that two wooden doors once existed at the four entrances of each magazine. The first was located within the tunnel entrance to the magazine, this was secured shut by a large iron hook. A second door, with lintel, was located on the core wall and was also secured with an iron hook.

4 DISCUSSION AND INTERPRETATION

4.1.1 Since the end of the 20th century, as Britain approached the 50th Anniversary of the end of World War II, there has been an increasing sense of the historical importance of England's defence heritage (Lowry 1995). Aveley Marshes is important in this understanding because the landscape depicts a good example of the development of military defence over the period of three centuries.

4.1.2 The eight magazines form part of that military landscape and provide an insight into Britain's military strategy at the onset of the Second World War. Geography played an important element, Purfleet was ideally situated, being close to London and lying on the north bank of the Thames. The railway network to the west of the magazines illustrates the importance of good transportation links during this period. The small sections of extant trackways, loading platforms and interior pulley mechanism further illustrate this point.

4.1.3 The British landscape was transformed by a vast and rapid programme of building at the onset of the Second World War (Dobinson 2000), which is reflected in the Purfleet magazines. The magazines were built to a standard form reflecting an economy of design and structure. They provide an excellent contrast to the eighteenth century architecturally embellished grand red brick magazines, which have since been demolished.

APPENDICES

APPENDIX 1

BIBLIOGRAPHY AND REFERENCES

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Gullery P & Pattison P (1996) The Powder Magazines at Purfleet *Georgain Group Journal*, Vol vi, pg. 37-52

Lowry, B (ed) (1995) *Twentieth Century Defences in Britain: An Introductory Guide* Council of British Archaeology

OAU (2001) *Rainham, Wennington and Aveley Marshes: Arcaheological Desk Based Assessment* (volumes one and two) (client report)

OA (2004) Purfleet Shooting Range, Aveley Marshes, Essex: Historic Building Report (client report)

Saunders A (1989) *Artillery Fortification in the British Isles and Ireland*. Beaufort

CARTOGRAPHIC REFERENCES

1873 Ordnance survey 1st edition 6" map (Essex old series 83)

1920 Ordnance survey 3rd edition 25" map (Essex new series 94)

APPENDIX 2 SUMMARY OF SITE DETAILS

Site name: Magazine Stores, Purfleet, Essex
Site code: RAMAGBS, TQ5495 7899
Type of evaluation: Building recording and investigation
Date and duration of project: 8th & 9th January 2004
Location of archive: The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES.

List of Archived Items:

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

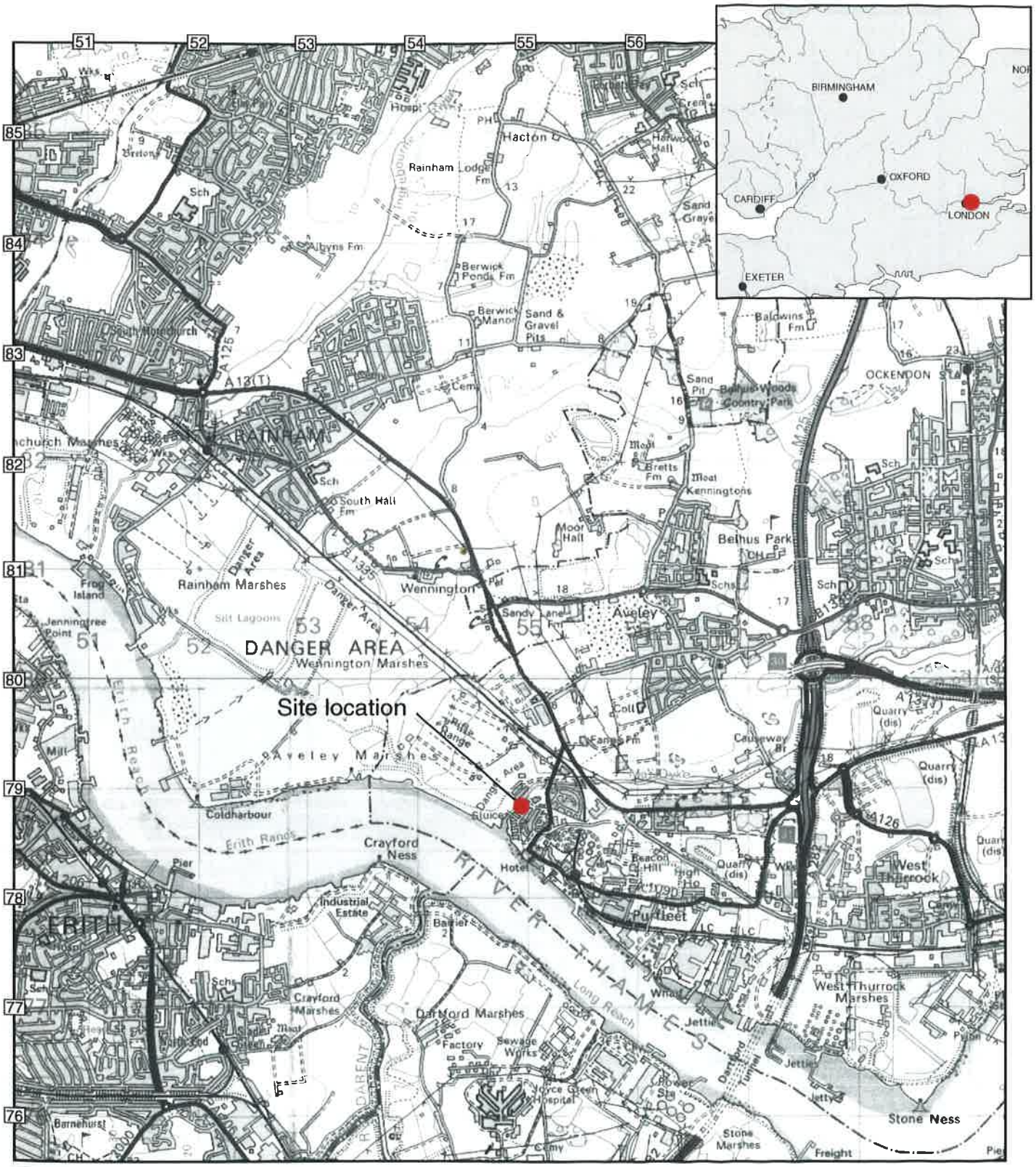


Figure 1: Site location

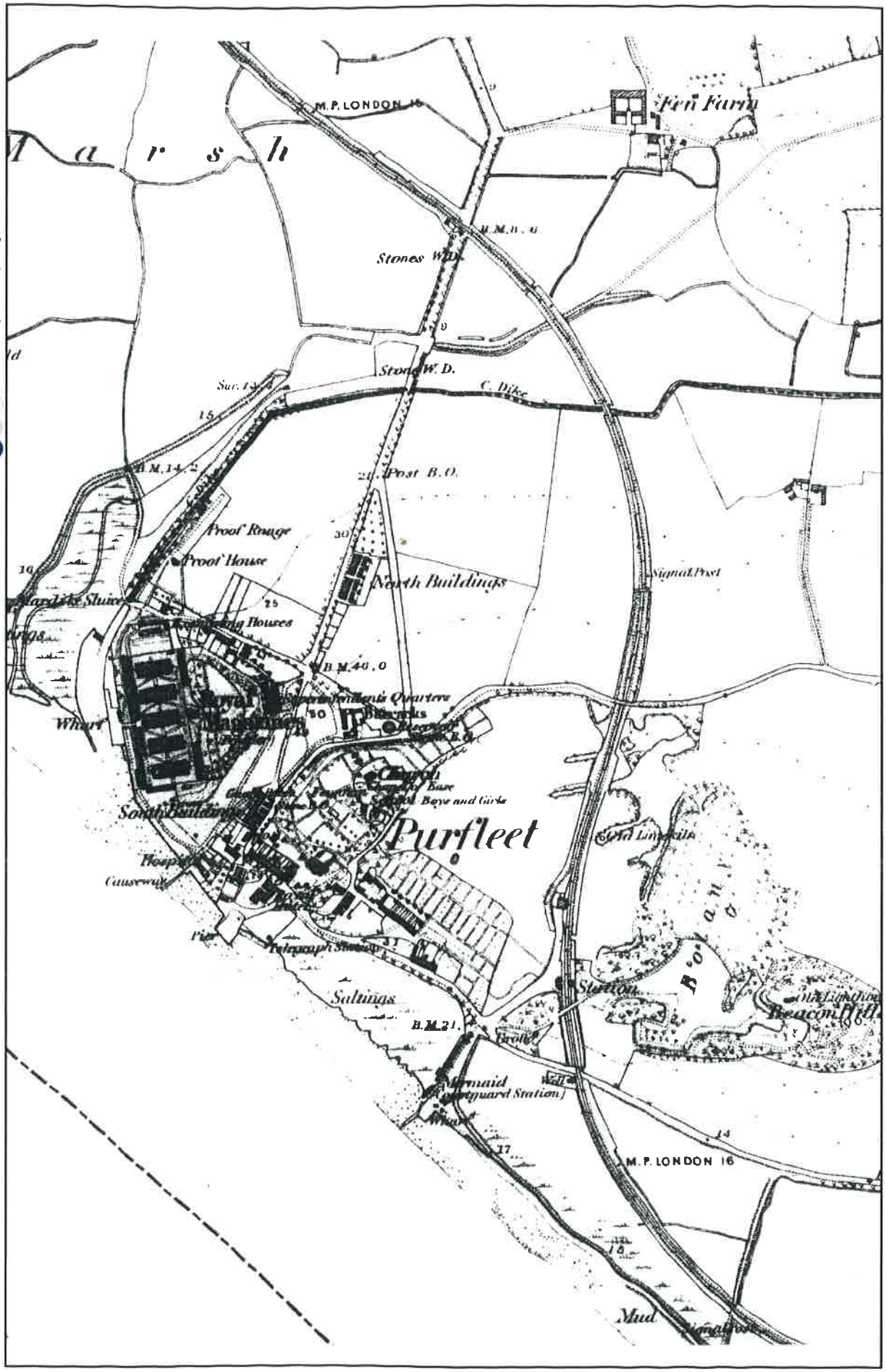


Figure 2: Ordnance Survey 1st edition 6" map (1873)

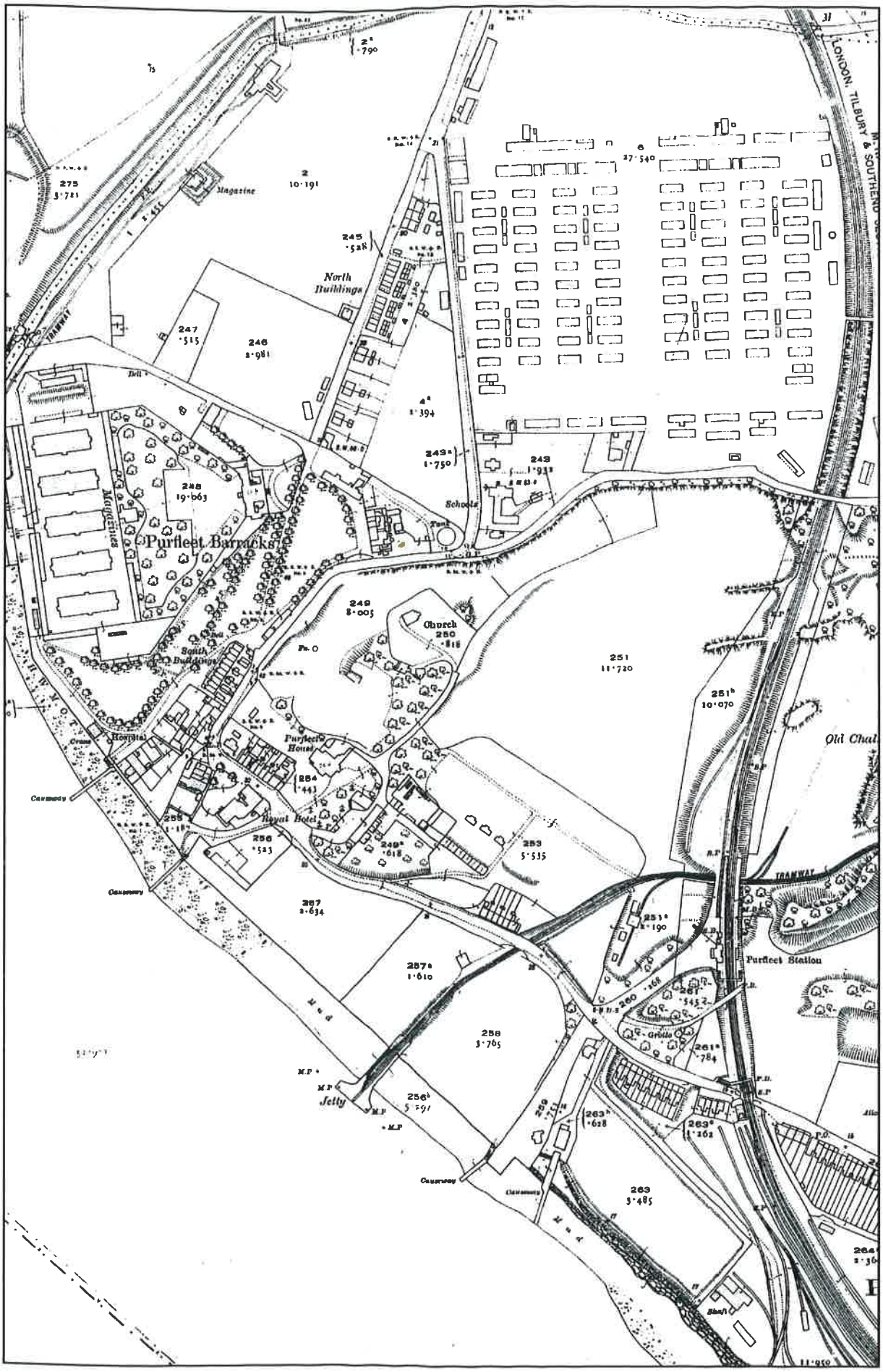


Figure 3: Ordnance Survey 3rd edition 25" map (1920)

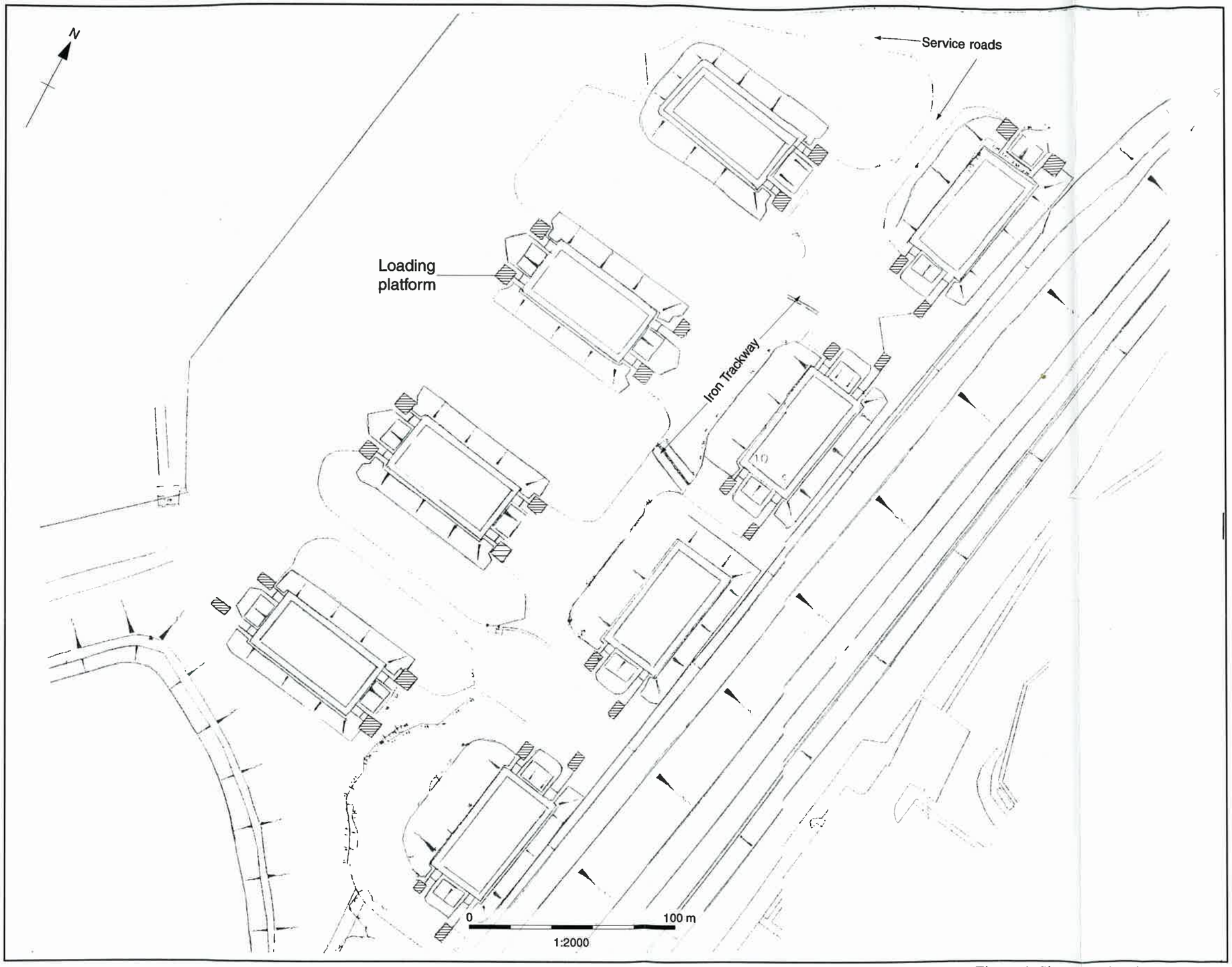


Figure 4: Site plan, showing magazines

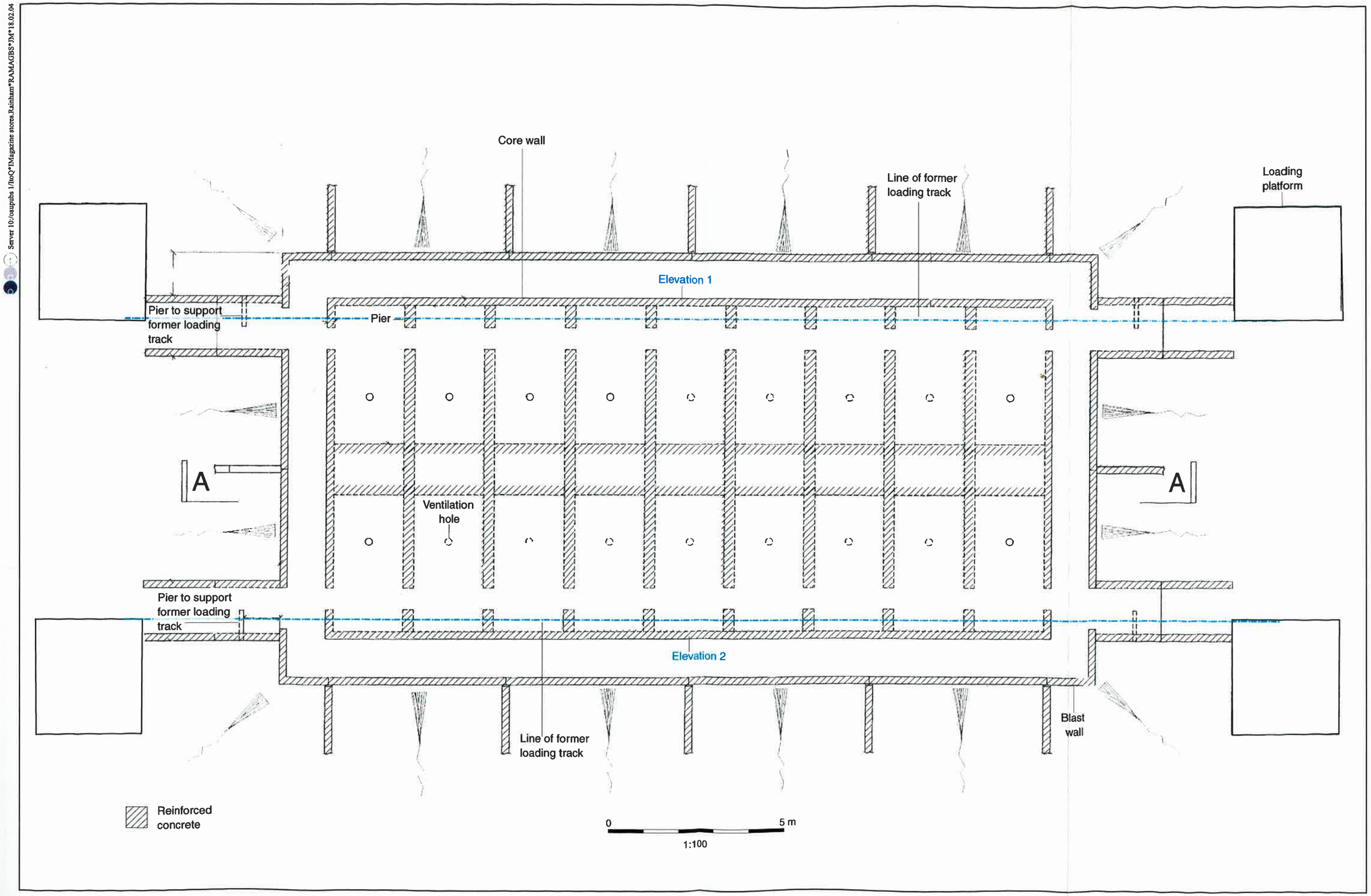
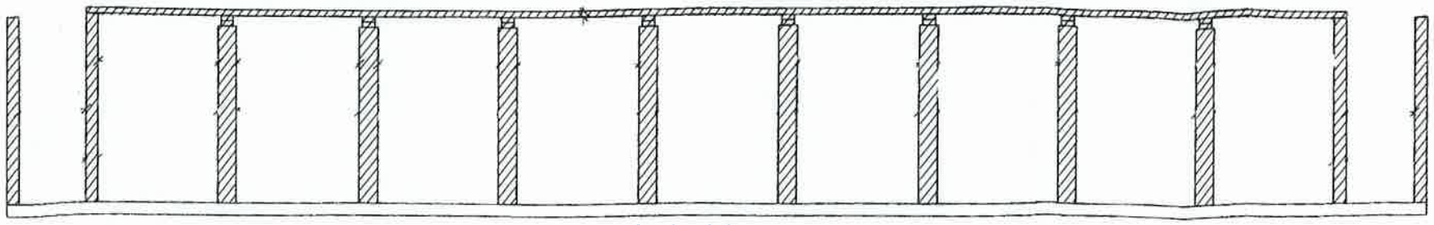
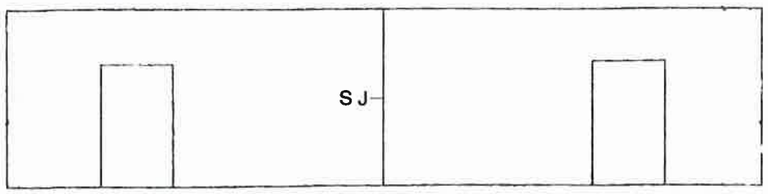


Figure 5: Plan of typical magazine block

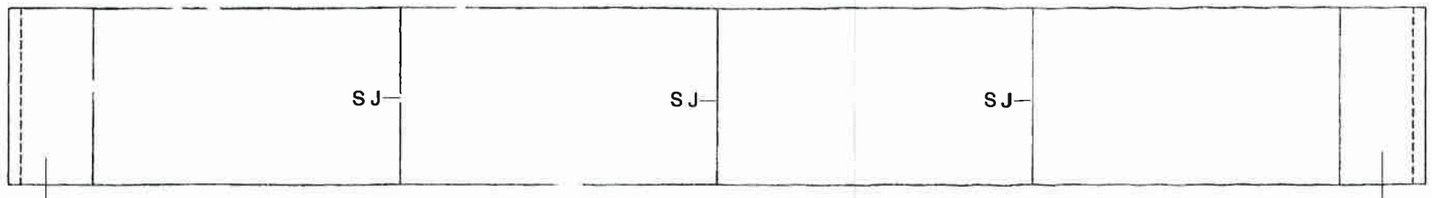


Section A-A

SJ - Straight joint between panels of concrete



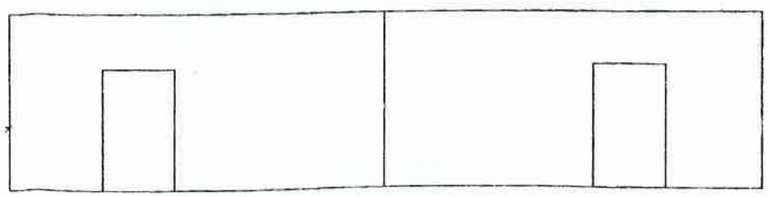
Elevation 3



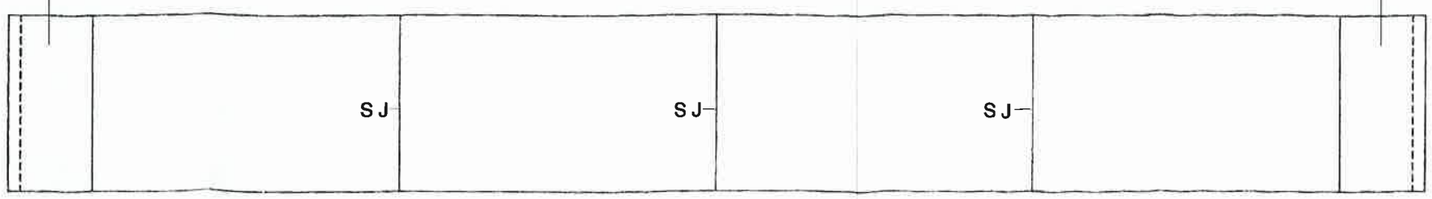
Elevation 1

Passageway

Passageway



Elevation 4



Elevation 2

0 5 m

1:100

Figure 6: Elevations of a typical block

Plate 1: North-west view, Magazine H

Plate 2: South- west view of outer blast wall, Magazine H

Plate 3: South-west view of buttress

Plate 4: East view of roof, Magazine E

Plate 5: East view of blast and core walls, Magazine E

Plate 6: North-east entrance, Magazine G

Plate 7: South-west view of loading platform, Magazine C

Plate 8: Southern end showing pier and loading platform, Magazine C

Plate 9: South-eastern view of sevice road, Magazine A

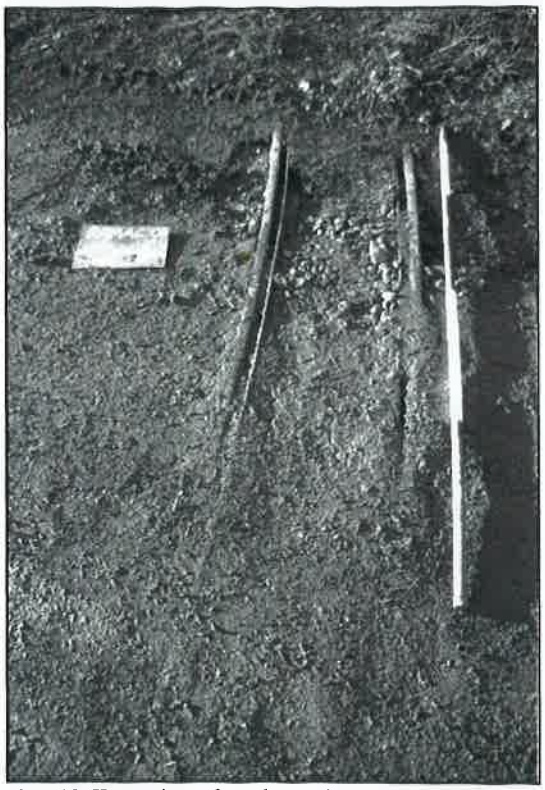


Plate 10: West view of trackway, between Magazines A and G

Plate 11: Timber post on north-west face of platform

Plate 12: East view of Bay D16, Magazine D

Plate 13: East walkway, Magazine A

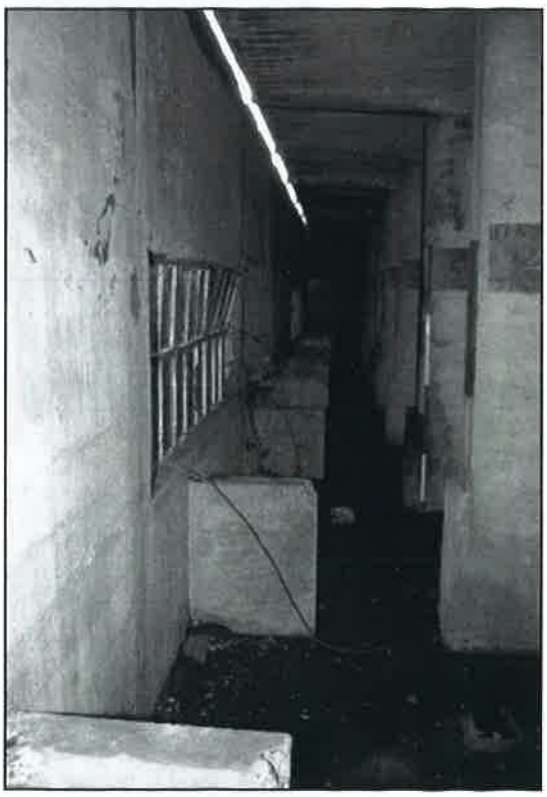


Plate 14: West walkway depicting piers, Magazine C

Plate 15: Pier located in North west corner, Magazine E

Plate 16: North view of window, Magazine H

Plate 17: South view of bay label "Bin No H8", Magazine H

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