PURFLEET (EX)

RACOST BS

Cordite Store
RSPB Rainham
Tank Hill Road
Purfleet
Essex

Historic Building Investigation and Recording

Oxford Archaeology

March 2004

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Cordite Store, RSPB Rainham, Tank Hill Road, Purfleet, Essex

HISTORIC BUILDING INVESTIGATION AND RECORDING

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SUMMARY

Oxford Archaeology (OA) carried out archaeological and historical analysis of the First World War cordite store at Purfleet, Essex. This was undertaken as an archaeological condition of planning approval granted to the Royal Society for the Protection of Birds (RSPB) prior to scheduled works at the site. Cordite was an important development in the late 19th century revolutionising military propellants and warfare. The cordite store was constructed in 1909 and played an important role during the First World War. There are few examples of such substantial cordite structures and the store at Purfleet is therefore of considerable archaeological interest. The most substantial surviving feature of the store is the earth embankment. It is probable that the cordite store was a brick structure which also housed an underground storage area. Unfortunately there is limited archaeological evidence remaining indicating the exact size and form of the structure.

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) prior to a series of works undertaken at the former cordite store located at RSPB Rainham, Tank Hill Road, Purfleet, Essex. The proposed plan of works is part of a wider scheme of improvements presently being undertaken within the reserve. The overall form of the site is to be maintained with modifications according to health and safety requirements. A layer of topsoil is to be added to the central area enclosed by the embankments. The proposals include the addition of a viewing platform on the west embankment for use by the general public. This 20th century military structure will thus be integrated as a natural feature of the landscape and reserve.

1.1.2 The structure covered by the current works (TQ5497 7910) lies on the north bank of the River Thames, to the north west of the Mar Dyke. Aveley Marshes are located in Thurrock in the county of Essex, the cordite store lies 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 cordite store was constructed in c.1909 for the use of the powder magazine. Tall earth embankments are the only elements of the site to substantially survive today. The cordite store once stood within these and was a large yellow brick building. This has now been demolished and little evidence remains indicating its exact size, structure or form. The structure was camouflaged by netting during war time which was anchored by large concrete blocks lying at the external foot of the embankment. The parameters of the site are marked by wire fencing measuring c.100 m by 83 m. Two large tunnel openings running through the eastern embankment allowed both vehicular and rail access. Extant evidence shows that a rail track ran internally along the northern parameters of the site to facilitate the transportation of cordite. An

additional underground storage area was housed beneath the cordite store which has since been infilled.

1.2 Archaeological and historical background

1.2.1 Purfleet's military landscape dates to the 18th century when in 1750 the need for a new powder magazine in the Thames Estuary was recognised. The developments were prompted by massive explosions at Woolwich and Erith. Purfleet was an obvious choice being a safe distance from London and well connected, lying on the north bank of the Thames. It has been said that the gunpowder used by both sides during the American Civil War came from Purfleet. Many ships came to pick up their powder supplies, including the Bounty and the Endeavour, before embarking on their famous voyages. Further structures developed throughout the 18th, 19th and 20th centuries in accordance with the demands of the world wars. These include a proof house, a hospital, a blockhouse and military barracks. The 20th century rifle range and eight magazine stores located to the north west and south of the cordite store have been previously recorded as part of the improvement scheme (OA 2004).

1.2.2 The cordite store, constructed in c.1909, was built for the use of the powder magazine. Cordite was first patented in 1889 and was quickly adopted as the principal service propellant. It virtually superseded gunpowder within the next decade. It revolutionised military propellants and in turn presented armament manufacture with the opportunity to develop smaller and more powerful weapons. Traditionally, gunpowder had been used during warfare, however this did not store well, was dirty and produced smoke. Cordite is a smokeless powder consisting of nitroglycerin, nitrocellulose and 5% vaseline which is pressed into cords resembling brown twine. It is still used today (Brown 1999).

1.2.3 The First World War resulted in an unprecedented expansion in cordite, so important was the supply of such explosives that it has been dubbed the 'chemist's war'. Output rose from 26 tons per week at the outbreak of war to 140 tons per week within a year. In 1914 there were ten cordite factories in operation but by 1935 this had been reduced to three. These were Waltham Abbey, Holton Heath and a section at Ardeen (Cocroft 2000). Such factories had the facilities to store cordite at different stages in the manufacture process, however it was the final product which was stored at Purfleet. The close vicinity of Purfleet to London meant that it was in an ideal position to receive cordite from factories such as those at Woolich. The location of the store on the bank of the River Thames and its railway connections meant that cordite could easily be transported to meet wartime demands. The construction of the store in c. 1909 falls between the discovery of the powder and the first world war. The construction of the cordite store can therefore be seen as a result of these two forces.

1.3 Aims and Objectives

1.3.1 The general aim of the building investigation was to create for posterity a record of the cordite store prior to the alterations concentrating on the building's structure, construction, history and use.

1.3.2 More specific objectives are to:

- Record the individual surviving components of the site to facilitate an understanding of the site in its entirety
- 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 comprehend the significance of the site within the history of England's 20th century 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 site was recorded in its current form before the start of the 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 cordite store was completed by Oxford Archaeology Geomatics Department on the 1st, 2nd and 3rd March 2004. This consists of an overall plan of the site (1:200) (fig. 2), a north / south cross section of the earth embankment (fig. 3), a profile of a concrete block (fig. 4) and an elevation of the larger north tunnel (fig. 5). Scale drawings were undertaken of features of particular interest including the reinforced concrete blocks located around the parameters of the site. All drawings were traced onto archivally stable permatrace and descriptive annotation added to indicate construction, purpose, features of interest and evidence relating to its use. 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 the site and any features of specific interest. 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 photograph and any further detail.

2.2.3 Written descriptions of the cordite store 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 work 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 is rectangular in layout (c.100 m by 83 m) and contained within a wire fence with reinforced concrete supports. The earth embankments lie c. 60 m to 80 m inward from the fence and are the only elements that survive substantially today. At the exterior foot of the embankments and facing the fence are a series of concrete blocks with iron rails or loops protruding from their surface. These are of three types and are thought to have been used to anchor camouflage netting acting as a defence mechanism during the first world war.

3.1.2 The area with the embankment measures c.31 m by c. 50 m with access provided via two tunnels running through the east embankment (Plate 1). A larger north tunnel allows entry by rail (tunnel 2), while the smaller tunnel permitted vehicular access (tunnel 1). Internal earthworks at the foot of the north embankment suggests that the rail track once ran into the cordite store meeting a buffer at the foot of the west embankment. A further five concrete blocks situated along this alignment are thought to be associated with the rail track.

3.1.3 There is little extant evidence suggesting the size, structure and form of the cordite store. Historical evidence and areas of debris indicate that this was a large yellow brick structure with a hipped roof. A further underground storage area is located beneath the cordite store, although this is now infilled.

3.2 External Description

3.2.1 A wire fence with upright reinforced concrete supports surrounds the parameters of the site (Plate 2). This would not only have acted as a boundary for the site but prevented access by unauthorised personnel. The main threat to security was from the air therefore a fence was the last line of defence. A simple wirelink mesh fence capped with barbed wire was a standard feature of military sites. The fence at Purfleet is now largely redundant as it remains extant in only a number of areas.

3.2.2 Beyond the south west corner of the wire fence, a sentry post survives intact. This is a square red brick building with a pre-cast concrete loophole in each of its four faces. The large cordite store presented a target as it was set against the Thames and easily detected from the air. Such posts, which are also evident around the perimeter of the Rifle Range, provided a means of defence.

3.2.3 Access to the site is via a service road connecting to Tank Hill Road (A1090). At the exterior of the site this runs in a north / south direction through the southern tunnel (tunnel 1) allowing access to the interior of the embankments and the cordite store (Plate 3). The alignment of the road is contemporary with the construction of the

cordite store and would originally have been concrete with a thin layer of asphalt. In 1939 the road was extended in a westerly direction providing access to the eight magazine stores (OA 2004). The service road was a common feature of such sites being necessary to allow trucks and lorries to dispatch ammunition to and from the cordite store and magazines.

3.2.4 Dual access to the cordite store was provided by a rail, this ran through the north tunnel (tunnel 2). Little extant evidence today exists of the track due to vegetation overgrowth and the relaying of the tarmac road. To the northeast of the site beneath the tarmac road a small section of the trackway is evident (Plate 4). The track is running in a northwesterly direction and the contours of the land suggest that the rail track ran to the opening of tunnel 2 from this point. This rail track was also linked to the second world war magazines as sections of trackway exist to the south west between the two groupings of these structures (OA 2004).

3.2.5 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. The cordite factory at Gretna, Cumbria is a good example of the use of rail in the transportation of cordite. Rail was used to link the variety of factory and storage buildings and from here cordite paste was moved 4.3 miles by standard gauge line to the cordite ranges at Mossband (Cocroft 2000). At Purfleet, the main public (Midland) railway ran along the eastern edge of the site. The tramway ran from the sidings into the cordite store, to the eight magazines and out again to cross the Mardyke to enter the (now demolished) 18th-century powder magazines. 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).

3.2.6 The earth embankments of the most substantial surviving feature of Purfleet cordite store. Following experimentation with U shaped free standing concrete traverses in the late 19th-century, earthwork mounds were again regarded as the most effective means of absorbing debris. The effectiveness of earth embankments is illustrated in 1909 with the publication of the HM Inspectors of Explosives Annual Report. This published a table illustrating the safe distance a danger building should be from surrounding buildings. These were halved if adequate earth mounds or traverses were provided. The object of the embankment was to provide additional protection against enemy attack and explosions. In the event of an explosion embankments directed the force upward thus preventing it from travelling horizontally to other nearby buildings (Bowditch & Hayward 1996).

3.2.7 The embankments at Purfleet are substantial measuring c.17 m to 24 m in width (fig. 3). The size of the embankments is indicative of the vast store and the large quantity of cordite that was held within the brick walls. Evidence from exposed areas shows that the method of construction was through the erection of stone walls that were later infilled with earth (Plate 5). At the time of construction the Purfleet embankments are likely to have been turfed, although considerable overgrowth has

obscured any evidence of this today. The eight Second World War magazines to the south east of the site have similar embankments although at a smaller scale.

3.2.8 At the base of the embankments and facing the perimeter fence are a series of concrete blocks which fall into three separate typologies. The layout of the blocks is as shown on the site plan (fig. 2). Most commonly these have iron bars extending from the block surface, although two have large iron loops projecting towards the earth embankments. The blocks are unusual, it is thought that the purpose was to harness a large netting cover. The blocks acted as an anchor securing a steel chain which was used to hold this defence mechanism.

3.2.9 Prior to the war only a few steps were taken to provide protection against attack from the air, however by the time of the First World War, air detection was a major issue. Contemporary photographs reveal that little in reality could be done to hide such large sites with freshly dug earthworks and railway lines. Most buildings were painted in camouflage patterns or disguised with a netting cover. While this made target recognition at a low level more difficult, the protection this offered was more psychological than actual. Second World War military buildings were increasingly sturdy, constructed from concrete with flat roofs. The brick build hipped roof cordite store at Purfleet acts as contrast to such later developments. It is illustrative of the increase in defence intelligence learnt through the duration of the world wars.

3.2.10 The concrete blocks are of three typologies, all are constructed from reinforced concrete.

3.2.11 ***Type 1*** - this is rectangular in form measuring 3.22 m by 1.50 m and 0.74 m in depth (fig. 4) (Plate 6). Twelve blocks lie at the base of the north bank and a further twelve lie parallel to these at the base of the south bank. Each block is constructed from two separate reinforced concrete blocks which are considerably larger in size than block types 2 and 3 (see below). The rear of the two blocks is at a slightly higher level and the front edge slopes upward from the first block at a 45 degree angle.

3.2.12 An iron bar which extends from this angled surface is constructed from two separate bars that are connected by a base plate (Plate 7). The iron bar measures 0.28 m in length and 0.13 m in depth. A hole is evident in the base plate of the iron bar and a further two holes are extant in the front concrete block. The first is on the surface of the front block and follows the same alignment as the hole running through the iron bar. The second hole continues this alignment and is found at the base of the front concrete block (Plate 9).

3.2.13 The unusual construction of the block was to enable a steel chain to pass through the block and harness the camouflage roof. The alignment of the holes suggests that this passed through the iron bar (hole 1) and a second hole on the surface of the block (hole 2). It then followed a diagonal alignment through the block and was finally secured at the base of the block (hole 3). The iron bar is built within the concrete block ensuring that the construction was sturdy to enable such large netting to be secured.

3.2.14 ***Type 2*** - this block is rectangular in form measuring 2.35 m by 1.24 m at a height of 0.32 m (Plate 10). There are a total of sixteen such blocks with eight located on the

south embankment and a further eight on the north embankment. These are constructed from one block only and are considerably smaller in size than block type 1.

3.2.15 The front edge of the block is angled at 45 degrees and houses an iron bar which extends 0.26 m. This bar is of the same typology as previously described. An iron hook is evident at the base of the concrete block extending 0.16 m (Plate 11). This block served the same purpose as block type 1 and was used to secure a steel chain that passed through the hole in the iron bar.

3.2.16 ***Type 3*** - this is rectangular in form measuring 2.70 m by 1.74 m and is a height of 0.76 m (Plate 12). Only two blocks of this type are evident which lie parallel at the centre of the base of the east and west embankments. The block is constructed from one build with the outer edge at a sloped angle of 45 degrees. The inner face (nearest the embankment) houses an iron loop which extends 0.40 m from the concrete block (Plate 13). The loop is large (circumference 0.13 m) and built into the concrete. This was to ensure that it had the capacity to secure the steel chain used to anchor the camouflage netting.

3.2.17 The three different types of blocks and the associated layout is attributed to the requirements of the site and camouflage netting. The north and south embankments are longer than that of the east and west so that a greater number of blocks were required. These are also larger in size to ensure they have the capacity to anchor the netting. Likewise, block type 3 is considerably larger than block type 2. This ensured that there was additional support at the east and west embankments where there are fewer blocks.

3.2.18 There are variations of the three types described, in particular the most westerly blocks on the north and south embankments vary in form. The block on the south bank, for example, is larger with the iron bar extending from the centre. Explanations for these variations are likely to be associated with the requirements of the camouflage netting, however, as this is no longer extant it is impossible to identify these. At the base of both blocks are drainage pits; consequently an alternative explanation may be attributed to problems associated with draining the marshy landscape.

3.2.19 The two drainage pits evident on the north embankment are square (0.76 m by 0.78 m) brick lined recesses. An iron pipe is evident in the westly pit supporting the fact that these were used for drainage. A further pit (0.84 m by 0.73 m) of similar form is extant on the south embankment containing a large ceramic pipe (Plate 14). The exact course of these pipes is impossible to ascertain without excavation although it is likely that they run beneath the embankments allowing water drainage from the area within the cordite store. In storing cordite (and any ammunition) maintaining a dry environment is vital and therefore an effective drainage system in such geology would have been of paramount importance.

3.2.20 The cordite store also houses underground storage facilities which have previously been infilled and as a result it is not possible to assertain the full extent of this area. External debris and internal pictures suggest that the area was filled with yellow

brick. It is possible that the yellow brick was utilised from the demolition of the cordite store to fill this area. The top of the access tunnel to this area is visible at the entrance to tunnel 1 on the east embankment (Plate 15) (fig. 2). This measures 1.07 m in length and 0.50 m in height and is therefore sufficient in size to allow access by a single person only. The ground level declines from this entrance to the east of the blocks at the foot of the embankment. Extant evidence suggests that the tunnel is contemporary with the construction of the cordite store (Plate 16). The entrance tunnel has concrete lintels with yellow brick walls, it is therefore probable that the cordite store was of a similar build.

3.2.21 There is no extant evidence to assist in the interpretation of this underground area. It is unlikely that it was used in the storage of cordite as such ammunition would require a dry environment. Also, because of problems associated with the hoisting of ammunition such underground storage areas are rare. It is possible that this area was used as a storage facility for goods other than ammunition although lack of evidence means that its exact role within the site is impossible to identify. A alternative explanation is that this underground area is associated with the drainage of the cordite store which would have been a major consideration in the marshy geology.

3.3 Internal Description

3.3.1 The internal layout of the cordite store is difficult to determine due to insufficient archaeological evidence (fig. 2) (see plate 1). The area within the embankments is largely an open space providing little indication of the size and form of the building. It is possible that the building occupied the entire internal area of the cordite store and that the rail track entered the store turning in a loop to exit (see 3.3.7). A more probable interpretation is that the cordite store occupied a smaller central area within the embankments. The rail track and the road (extending from the tunnels) therefore stood externally from the cordite store.

3.3.2 Local knowledge suggests that the building was constructed from yellow brick and internal debris supports this interpretation. Two further pieces of archaeological evidence support this view and suggest that the cordite store also had a concrete frame. Firstly, the underground entrance reflects this construction (3.3.20). Secondly, a concrete platform located at the centre of the foot of the west embankment appears to be the base for a concrete support pillar. Concrete was commonly used in the construction of buildings at this time. In 1890 the Explosives Inspectorate inserted a clause in all new licenses stating that magazines were to be built of good Portland cement. Historical evidence reveals that a magazine constructed in 1910 at Purfleet was built only to floor level in ferro-concrete and the remainder in brick. It was feared an entirely ferro-concrete magazine would provide too much resistance to explosion. It is therefore highly probable that both these materials were incorporated into the construction of the cordite store at Purfleet (Bowditch & Hayward 1996).

3.3.3 Local knowledge also indicates that the cordite store had a hipped roof, it is possible that this was of corrugated iron. The report published by the HM Inspectors of Explosives Annual Report (1909) provides an indication of the materials used in the construction of military buildings. This suggests that corrugated iron was the ideal roofing material as slates, tiles and tarred felt carry fire. Corrugated iron was

commonly used for roofing since its introduction in the 1820s / 1830s as it was cheap, light and non-inflammable. At Chilworth, during the refurbishment of the cordite factory in 1890, corrugated iron was adopted not only for roofing and infilling walls but for entire buildings (Cocroft 2000). At Woolich and Gosport, however, magazines of a similar structure housed slate roofs. Due to lack of archaeological evidence it is not possible to confirm the roofing material used.

3.3.4 Floors in military buildings in the early 20th century would generally be of asphalt. Doors would open outward and double doors were often used as an additional security measure. It was common practice to separate storage structures into bays by internal walls. It is probable that the cordite store had windows and skylights which were often of wire reinforced glass which were dulled so that the deleterious effects of sunlight could be avoided. Electricity would have been utilised at Purfleet following its introduction into explosive buildings in the 1880s. Iron switch and fuse boxes, fixed to the exterior of the buildings, would have been used to carry the transmission lines. Lights may have been inserted into roofs and housed in glass globes, contained within sealed bulkhead lights or specially shielded fluorescent tubes (Bowditch & Hayward 1996).

3.3.5 Two reinforced concrete access tunnels provide entrance to the cordite store through the east embankment (fig. 2) (see plate 3). This was a common feature of military buildings with such substantial embankments (Cocroft 2000). Tunnel 1 provides vehicular entrance and is uncovered measuring 2.83 m in height. As a result of vegetation overgrowth further construction detail is difficult to identify, although it appears that the tunnel has several reinforced concrete side supports.

3.3.6 Tunnel 2 is considerably more substantial in size providing access to the cordite store by rail (fig. 5). The tunnel sides slope upwards at a 45 angle to meet a horizontal cover (Plate 17). This is constructed from four north / south reinforced concrete beams which provide a platform for 22 beams orientated east / west. The tunnel is supported at the sides by c.8 reinforced concrete pillars which are a thickness of 0.12 m (Plate 18).

3.3.7 There is no evidence of the rail track at the earth base of tunnel 2 or within the cordite store. Extant earthworks provide evidence of the line of the track that ran from the tunnel along the northern edge of the site at the base of the embankment (Plate 19) (fig. 2). At the foot of the west embankment the track is met by a concrete buffer. The area of the buffer visible measures 4.16 m in length but unfortunately its full extent was not possible to ascertain due to vegetation overgrowth (Plate 20). It is possible that the rail track entered the cordite store and turned in a loop within the structure. Extant earthworks suggest that this track turned to the west before the buffer, it proceeded in a circular direction looping back to meet the track before the entrance of tunnel 2. A series of earthworks extending to the west close to the tunnel entrance support this interpretation. A series of double doors within the cordite store would have reduced the dangers associated with sparks created by the course of the train. This latter interpretation is less likely as simply meeting the buffer would have been easier, safer and a more cost effective method.

3.3.8 Five concrete blocks at the foot of the northern embankment are associated with the rail track. These are rectangular in form (1.62 m by 0.61 m) with a height of 0.60 m. A large screw extends upright 0.10 m from the surface of the block (Plate 21) and two indentations are evident on both sides of the projecting screw (Plate 22). It is possible that a loading / unloading platform was attached to the screws which has left the extant recesses in the surface of the blocks. There are no further remains to provide evidence of the exact purpose and form of these structures.

3.3.9 Two posts are also evident along the base of the northern embankments at the same alignment as the concrete blocks. These have a square brick base (0.26 m by 0.26 m) with wooden posts extending upright from the surface. It is possible that a greater number of these posts once existed and have since been destroyed. These are thought to be associated with the rail track although lack of extant evidence means that the exact purpose and form is uncertain.

3.3.10 A rectangular platform is evident at the centre of the base of the west embankment (Plate 23). This has a rectangular concrete base (3.05 m by 0.60 m) at a depth of 0.12 m with an iron platform (2.52 m by 0.32 m) bolted to its surface. A number of iron screws are evident around this area. The exact purpose of the platform is uncertain as there are insufficient archaeological remains to ascertain its role within the cordite store. It is probable that this is the base of a concrete pillar used as a structural support.

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 Two there has been a sense of the historical importance of England's defence heritage. The military landscape of Aveley Marshes is an excellent example of the development in military defence over the course of three centuries. The cordite stores, constructed from concrete and brick, stands as an example of the development in the construction of military buildings during this period. It is less elaborate than the architecturally embellished grand red brick magazines of the 18th century. Yet, the store was more ornate that the simple reinforced concrete magazines built for the Second World War. The cordite store is illustrative of the profession in defence intelligence gained in the 20th century.

4.1.2 The cordite store at Purfleet is of significant archaeological interest and is unusual in its size and position. Such stores were often accommodated within cordite factory complexes and smaller in size. The lack of archaeological evidence means that it is impossible to ascertain its exact size, structure and form and therefore further comparison is problematic. Research of secondary sources indicates that the use of concrete blocks to anchor the large camouflage netting is unusual. Furthermore the underground storage area indicates that the cordite store is of considerable interest.

4.1.3 The First World War has been dubbed the 'chemist's war' and the cordite store at Purfleet supports this interpretation. Cordite revolutionised military propellants and presented armament manufacture with the opportunity to develop smaller and more powerful weapons. The fact that such vast structures were required to store the ammunition illustrates its impact on warfare at this time. Cordite stores, such as the

example at Purfleet, were essential in ensuring demand was continually met during the Great War. The invention of such chemicals can be paralleled to that of nuclear weapons during the Cold War.

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APPENDICES

APPENDIX 1 BIBLIOGRAPHY AND REFERENCES

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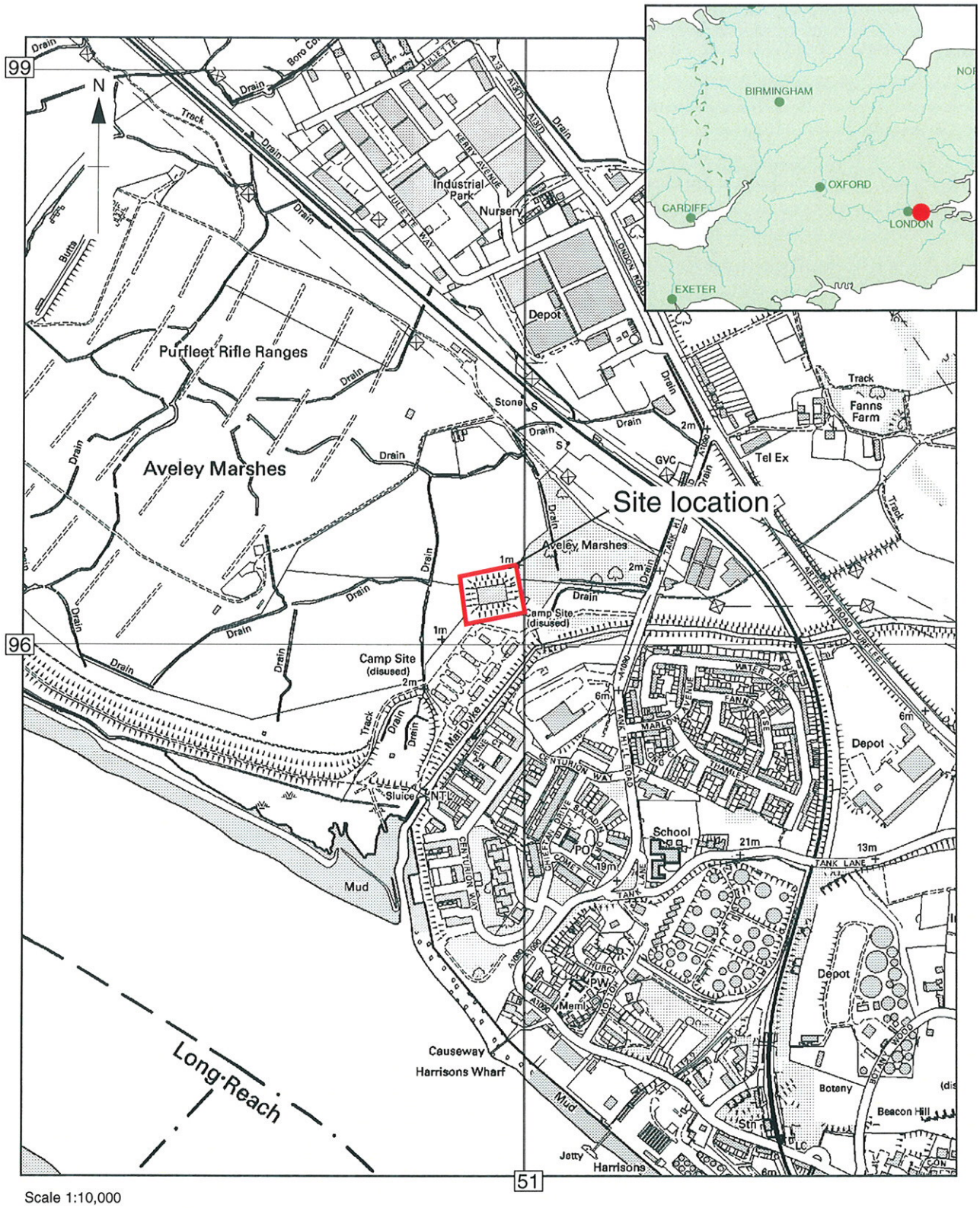
APPENDIX 2 SUMMARY OF SITE DETAILS

Site name: Cordite Store, RSPB Rainham, Tank Hill Road, Purfleet, Essex
Site code: RACOST04
Type of evaluation: Building Analysis
Date and duration of project: 1 - 26 March 2004
Location of archive: The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES.

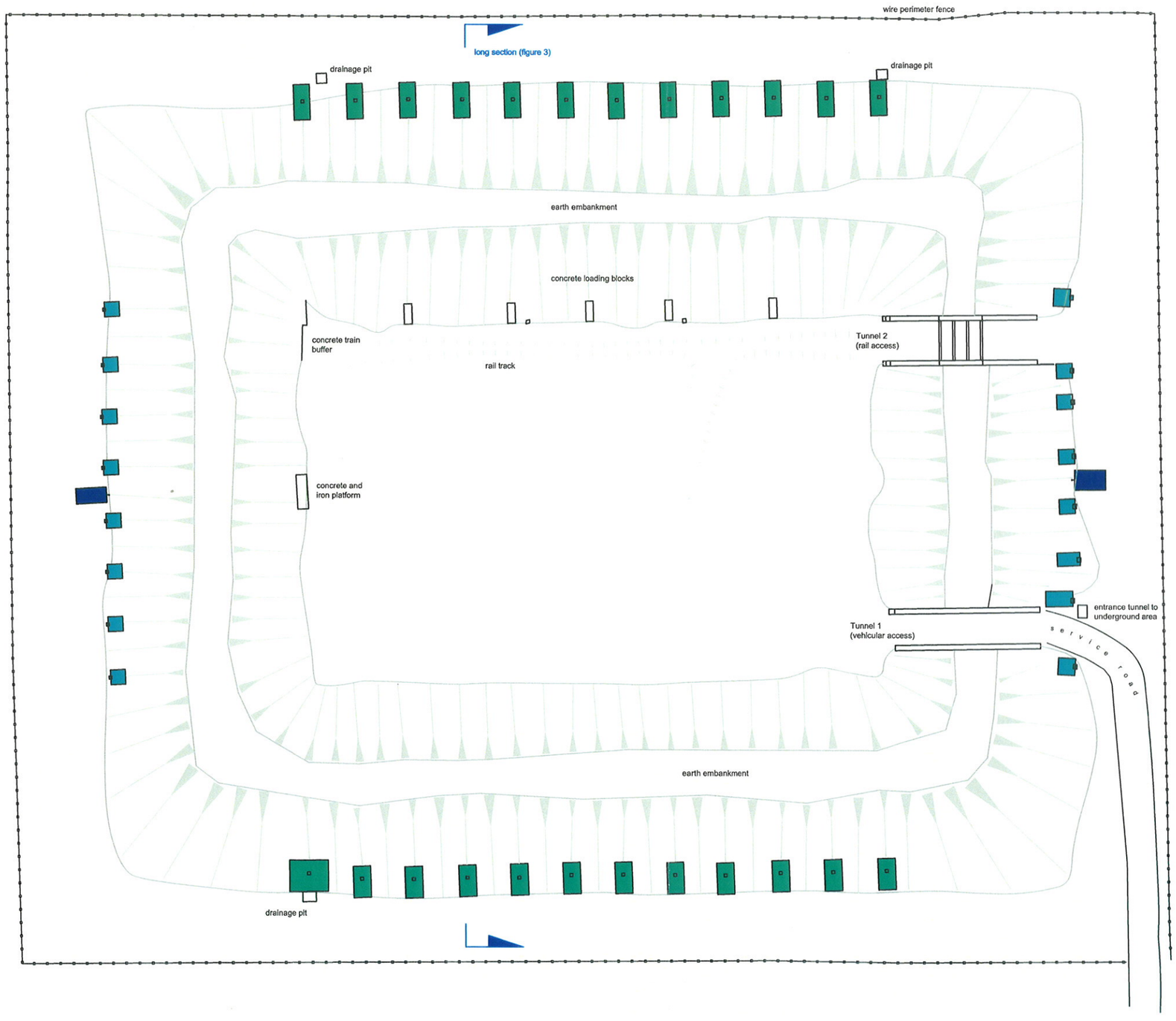
List of Archived Items

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 permitrace
Descriptive notes



Scale 1:10,000

Figure 1: Site location



Type 1 block

Type 2 block

Type 3 block

0 10m

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RACOST04

Rainham Cordite Store

Scale at A3	1:400
Drawing No.	RACOST04/oa/002/a
Date printed	25 March 2004
Drawing Title	

Figure 2:
Site plan

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

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X:\RSPB Rainham_Cordite Stores\Geomatics\CAD\current\RACOST04_current.dwg MS

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N

0 10m

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Scale at A4	1:400
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Drawing Title	

Figure 3:
Section showing north/south profile of earth embankments

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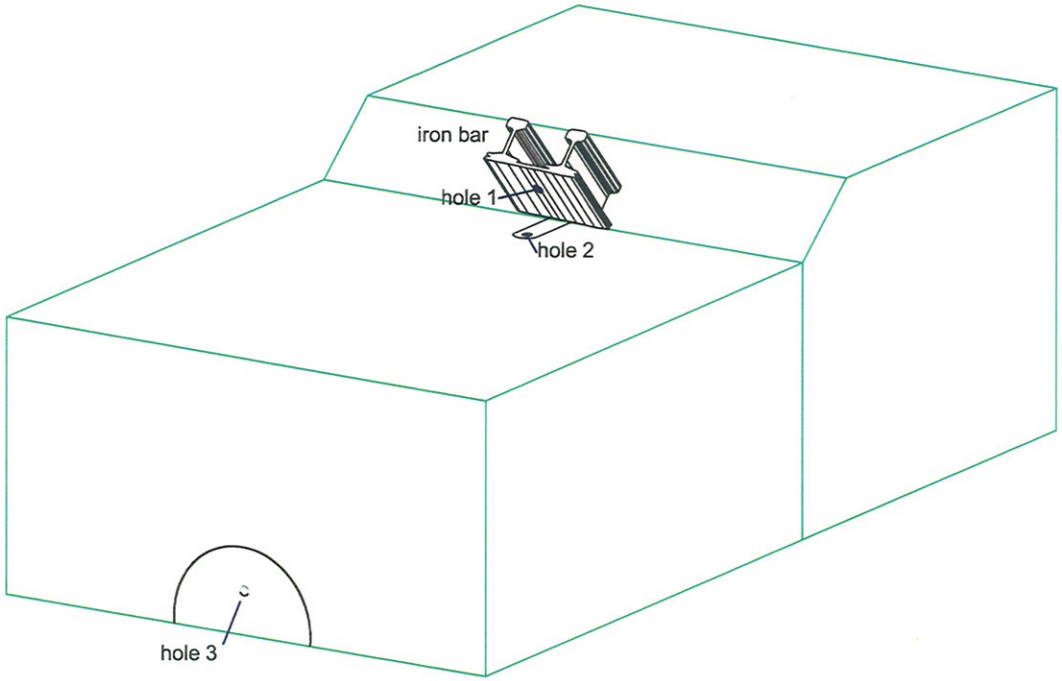

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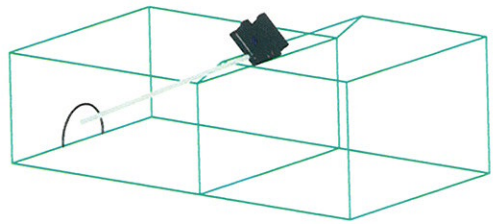

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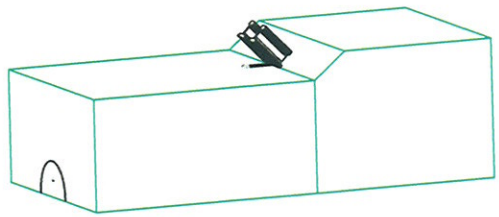

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Drawing No.	RACOST04/OA/004/A
Date printed	25 March 2004
Drawing Title	

Figure 4:
Profile of Type 1 block

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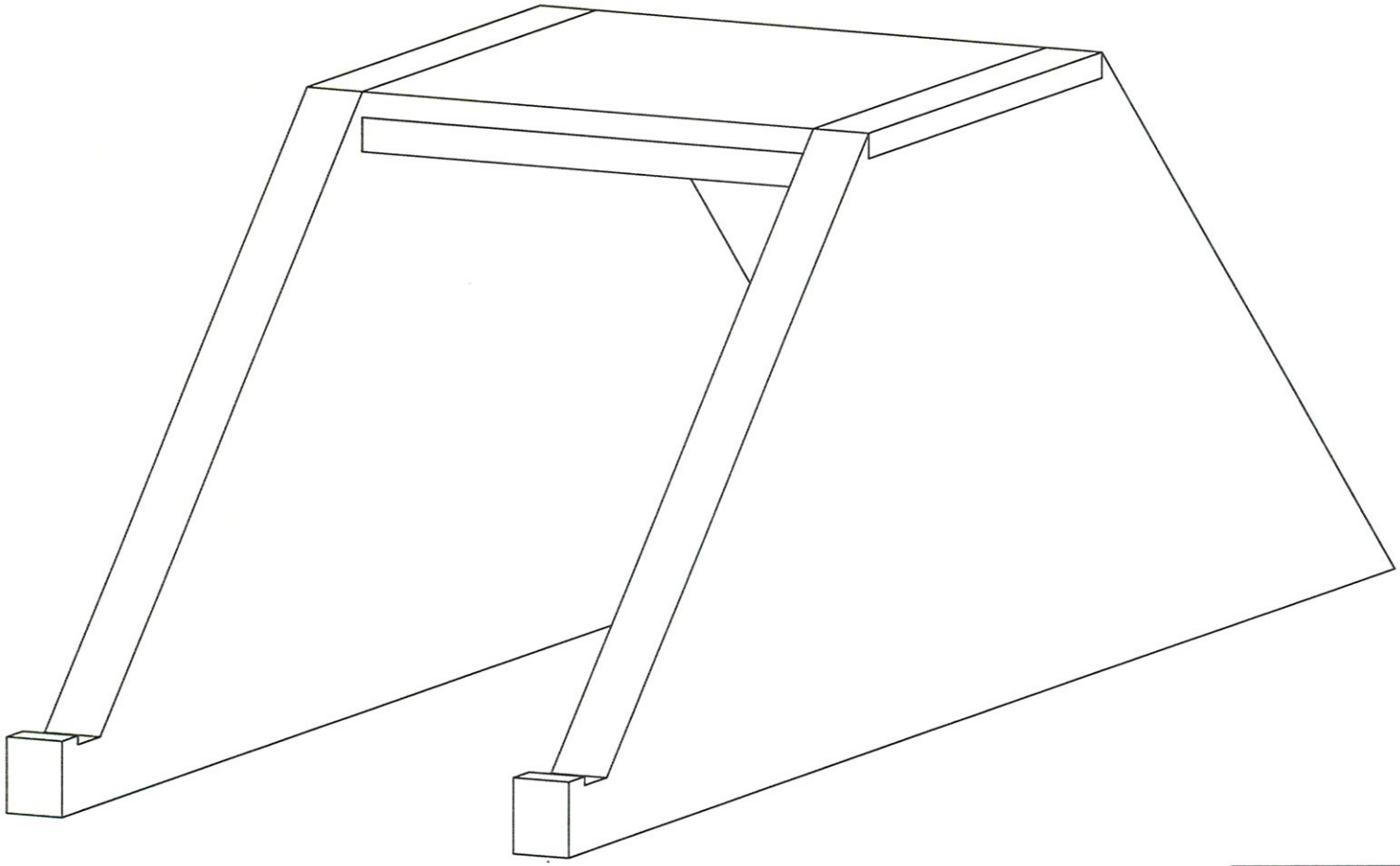

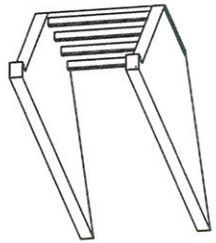

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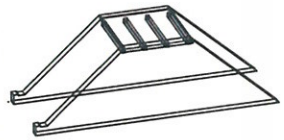

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Rainham Cordite Store

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Drawing No.	RACOST04/OA/005/A
Date printed	25 March 2004
Drawing Title	

Figure 5:
Profile of tunnel 2
(rail access)

FILE PATH AND AUTHORS

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Plate 1: East view of cordite store showing internal layout of site

Plate 2: West view showing wire fencing on eastern parameters of site

Plate 3: West view of service road and tunnel 1

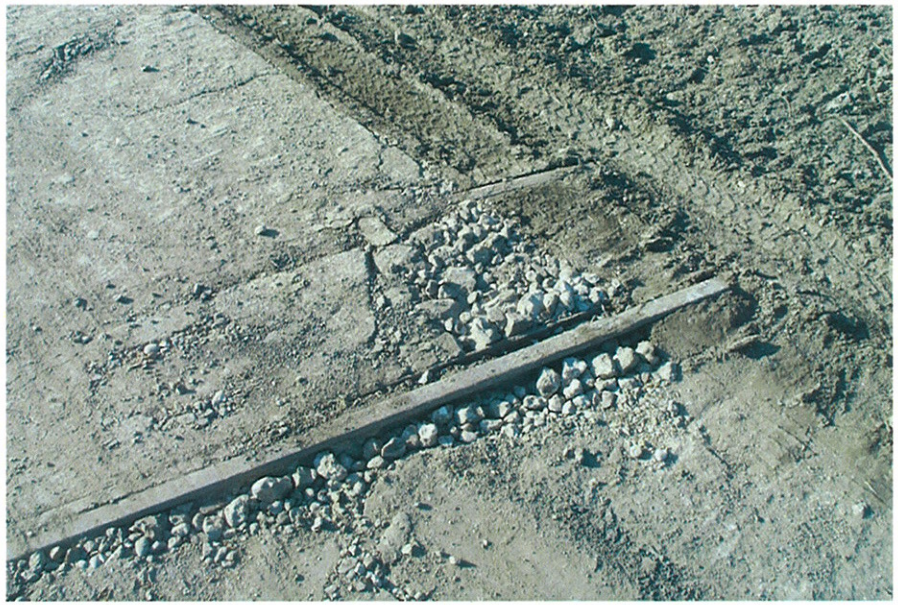

Plate 4: North view showing section of extant rail track

Plate 5: East view showing stone revetment, west embankment

Plate 6: West view of type 1 blocks, north embankment

Plate 7: North view detailing iron bar extending from type 1 block, south embankment

Plate 8: North view detailing iron bar extending from type 1 block, south embankment

Plate 9: North view detailing base of type 1 block, south embankment

Plate 10: West view showing type 2 block, east embankment

Plate 11: East view detailing iron hook extending from type 2 block, west embankment

Plate 12: South view showing block type 3, east embankment

Plate 13: South view detailing iron loop extending from block type 3, east embankment

Plate 14: North view showing south embankment drainage pit

Plate 15: South view showing underground entrance passage

Plate 16: South view showing underground entrance passage

Plate 17: East view of tunnel 2

Plate 18: South view of tunnel 2 showing reinforced concrete side supports

Plate 19: East view showing earthworks of internal rail track

Plate 20: North west view showing internal railway buffer

Plate 21: North view of internal concrete block

Plate 22: Aerial view of internal concrete block

Plate 23: West view of internal concrete and iron platform