

QINETIQ, X ENCLAVE, FORT HALSTEAD

Built Heritage Statement

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Contents

1	INTRODUCTION	1
2	LEGISLATIVE AND PLANNING POLICY FRAMEWORK	2
3	HISTORIC BUILT ENVIRONMENT APPRAISAL	7
4	PROPOSALS AND ASSESSMENT OF IMPACTS	17
5	CONCLUSION	20

Plates

Figures

1 INTRODUCTION

- 1.1 This Built Heritage Statement has been prepared to accompany a planning application for works affecting the land and buildings located within the proposed QinetiQ Enclave, Fort Halstead, Kent (referred to within this report as “the Site”).
- 1.2 The Site forms part of the wider Fort Halstead site, which includes numerous designated and non-designated heritage assets. This includes Fort Halstead, a scheduled monument, and three listed buildings. The potential impacts arising from the works subject to this application will primarily affect the setting of these heritage assets. However, the works also include the relocation of two magazines currently located within the scheduled monument.
- 1.3 This report has therefore been prepared to address the requirement under paragraph 189 of the NPPF for an applicant to describe the significance of any affected heritage assets, with consideration given to any contribution made by their settings. It also provides an assessment of how, and to what extent, the proposals may affect that significance.
- 1.4 This report includes an appraisal of the relevant legislative framework and planning policy at national, strategic and local levels, with regard to policies that relate to developments affecting the significance of built heritage assets, including listed buildings. This report also provides an overview of the history of the Site and its surroundings, an appraisal of the Site’s contribution to the significance of relevant built heritage assets and an assessment of the potential impacts of the proposed development on that significance.
- 1.5 This report satisfies the requirements of paragraph 189 of the NPPF and provides sufficient information to enable the local planning authority to reach a decision regarding the proposed development’s impacts on built heritage assets.
- 1.6 All photos, maps and plans are for illustrative purposes only. The plates provided are taken from site visits undertaken in 2019.

2 LEGISLATIVE AND PLANNING POLICY FRAMEWORK

- 2.1 The current national legislative and planning policy system identifies, through the National Planning Policy Framework (NPPF), that applicants should consider the potential impact of development upon 'heritage assets'. This term includes: designated heritage assets which possess a statutory designation (for example listed buildings and conservation areas); and non-designated heritage assets, typically compiled by Local Planning Authorities (LPAs) and incorporated into a Local List or recorded on the Historic Environment Record.

Legislation

- 2.2 Legislation regarding archaeology, including scheduled monuments, is contained in the Ancient Monuments and Archaeological Areas Act 1979, amended by the National Heritage Act 1983 and 2002, and updated in April 2014.
- 2.3 Legislation related to listed buildings and their settings is contained in the Planning (Listed Buildings and Conservation Areas) Act 1990
- 2.4 Section 66 of the 1990 Act states that special regard must be given by the decision maker, in the determination of planning applications, to the desirability of preserving or enhancing listed buildings and their setting.

National Planning Policy

National Planning Policy Framework (Ministry of Housing, Communities and Local Government, February 2019)

- 2.5 The NPPF is the principal document that sets out the Government's planning policies for England and how these are expected to be applied.
- 2.6 It defines a heritage asset as a: 'building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest'. This includes both designated and non-designated heritage assets.
- 2.7 Section 16: Conserving and Enhancing the Historic Environment relates to the conservation of heritage assets in the production of local plans and decision taking. It emphasises that heritage assets are '*an irreplaceable resource, and should be conserved in a manner appropriate to their significance*'.
- 2.8 For proposals that have the potential to affect the significance of a heritage asset, paragraph 189 requires applicants to identify and describe the significance of any heritage assets that may be affected, including any contribution made by their setting. The level of detail provided should be proportionate to the significance of the heritage assets affected. This is supported by paragraph 190, which requires LPAs to take this assessment into account when considering applications.
- 2.9 Under '*Considering potential impacts*' the NPPF emphasises that '*great weight*' should be given to the conservation of designated heritage assets, irrespective of whether any potential impact equates to total loss, substantial harm or less than substantial harm to the significance of the heritage assets.
- 2.10 Where less than substantial harm is identified paragraph 196 requires this harm to be weighed against the public benefits of the proposed development.

National Guidance

Planning Practice Guidance (DCLG)

- 2.11 The Planning Practice Guidance (PPG) has been adopted in order to aid the application of the NPPF. It reiterates that conservation of heritage assets in a manner appropriate to their significance is a core planning principle.
- 2.12 Key elements of the guidance relate to assessing harm. It states that substantial harm is a high bar that may not arise in many cases and that while the level of harm will be at the discretion of the decision maker, generally substantial harm is a high test that will only arise where a development seriously affects a key element of an asset's special interest. It is the degree of harm, rather than the scale of development, that is to be assessed.

GPA2: Managing Significance in Decision-Taking in the Historic Environment (March 2015)

- 2.13 This document provides advice on numerous ways in which decision making in the historic environment could be undertaken, emphasising that the first step for all applicants is to understand the significance of any affected heritage asset and the contribution of its setting to that significance. In line with the NPPF and PPG, the document states that early engagement and expert advice in considering and assessing the significance of heritage assets is encouraged. The advice suggests a structured, staged approach to the assembly and analysis of relevant information:
1. Understand the significance of the affected assets;
 2. Understand the impact of the proposal on that significance;
 3. Avoid, minimise and mitigate impact in a way that meets the objectives of the NPPF;
 4. Look for opportunities to better reveal or enhance significance;
 5. Justify any harmful impacts in terms of the sustainable development objective of conserving significance balanced with the need for change; and
 6. Offset negative impacts to significance by enhancing others through recording, disseminating and archiving archaeological and historical interest of the important elements of the heritage assets affected.

GPA3: The Setting of Heritage Assets (Second Edition; December 2017)

- 2.14 This advice note focuses on the management of change within the setting of heritage assets. This document replaces GPA3: The Setting of Heritage Assets (March 2017) and Seeing History in the View (English Heritage, 2011) in order to aid practitioners with the implementation of national legislation, policies and guidance relating to the setting of heritage assets found in the 1990 Act, the NPPF and PPG. The guidance is largely a continuation of the philosophy and approach of the 2011 and 2015 documents and does not present a divergence in either the definition of setting or the way in which it should be assessed.
- 2.15 As with the NPPF the document defines setting as *'the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve'*. Setting is also described as being a separate term to curtilage, character and context. The guidance emphasises that setting is not a heritage asset, nor a heritage designation, and that its importance lies in what it contributes to the significance of the heritage asset, or the ability to appreciate that significance. It also states that elements of setting may make a positive, negative or neutral contribution to the significance of the heritage asset.

- 2.16 While setting is largely a visual term, with views considered to be an important consideration in any assessment of the contribution that setting makes to the significance of an asset, and thus the way in which an asset is experienced, setting also encompasses other environmental factors including noise, vibration and odour. Historical and cultural associations may also form part of the asset's setting, which can inform or enhance the significance of a heritage asset.
- 2.17 This document provides guidance on practical and proportionate decision making with regards to the management of change within the setting of heritage assets. It is stated that the protection of the setting of a heritage asset need not prevent change and that decisions relating to such issues need to be based on the nature, extent and level of the significance of a heritage asset, further weighing up the potential public benefits associated with the proposals. It is further stated that changes within the setting of a heritage asset may have positive or neutral effects.
- 2.18 The document also states that the contribution made to the significance of heritage assets by their settings will vary depending on the nature of the heritage asset and its setting, and that different heritage assets may have different abilities to accommodate change without harming their significance. Setting should, therefore, be assessed on a case-by-case basis.
- 2.19 Historic England recommends using a series of detailed steps in order to assess the potential effects of a proposed development on significance of a heritage asset. The 5-step process is as follows:
1. Identify which heritage assets and their settings are affected;
 2. Assess the degree to which these settings and views make a contribution to the significance of a heritage asset(s) or allow significance to be appreciated;
 3. Assess the effects of the proposed development, whether beneficial or harmful, on the significance or on the ability to appreciate it;
 4. Explore ways to maximise enhancement and avoid or minimise harm; and
 5. Make and document the decision and monitor outcomes.

HEAN12: Statements of Heritage Significance: Analysing Significance in Heritage Assets (October 2019)

- 2.20 This advice note provides information on how to assess the significance of a heritage asset. It also explores how this should be used as part of a staged approach to decision-making in which assessing significance precedes designing the proposal(s).
- 2.21 Historic England notes that the first stage in identifying the significance of a heritage asset is by understanding its form and history. This includes the historical development, an analysis of its surviving fabric and an analysis of the setting, including the contribution setting makes to the significance of a heritage asset.
- 2.22 To assess the significance of the heritage asset, Historic England advise to describe various interests. These follow the heritage interest identified in the NPPF and PPG and are: archaeological interest, architectural interest, artistic interest and historic interest.
- 2.23 To assess the impact to the significance of a heritage asset Historic England state that it is necessary to understand if there will be impacts to built fabric or the setting of a heritage asset and how these contribute to the heritage asset's overall significance. Where the proposal affects the setting, and related views, of a heritage asset, or assets, it is necessary to clarify the contribution of the setting to the significance of the asset, or the way that the setting allows the significance to be appreciated.
- 2.24 This enables an assessment of how proposals will affect significance, whether beneficial or harmful. It also states that efforts should be made to minimise harm to significance through the design process, with justification given to any residual harm.

Local Planning Policy

Sevenoaks District Council Core Strategy, February 2011

Policy SP 1 Design of New Development and Conservation

All new development should be designed to a high quality and should respond to the distinctive local character of the area in which it is situated. Account should be taken of guidance adopted by the Council in the form of Kent Design, local Character Area Assessments, Conservation Area Appraisals and Management Plans, Village Design Statements and Parish Plans. In rural areas account should be taken of guidance in the Countryside Assessment and AONB Management Plans. In areas where the local environment lacks positive features new development should contribute to an improvement in the quality of the environment. New development should create safe, inclusive and attractive environments that meet the needs of users, incorporate principles of sustainable development and maintain and enhance biodiversity. The District's heritage assets and their settings, including listed buildings, conservation areas, archaeological remains, ancient monuments, historic parks and gardens, historic buildings, landscapes and outstanding views will be protected and enhanced.

Allocations and Development Management Plan, February 2015

Policy EN4 Heritage Assets

Proposals that affect a Heritage Asset, or its setting, will be permitted where the development conserves or enhances the character, appearance and setting of the asset. Applications will be assessed with reference to the following: a) the historic and/or architectural significance of the asset; b) the prominence of its location and setting; and c) the historic and/or architectural significance of any elements to be lost or replaced. Where the application is located within, or would affect, an area or suspected area of archaeological importance an archaeological assessment must be provided to ensure that provision is made for the preservation of important archaeological remains/findings. Preference will be given to preservation in situ unless it can be shown that recording of remains, assessment, analysis report and deposition of archive is more appropriate.

Policy EMP3 – Redevelopment of Fort Halstead

[...] Redevelopment proposals would be expected to: [...] - Protect and integrate the Scheduled Ancient Monument and listed buildings into the development with improved access and setting [...].

Kent Downs Area of Outstanding Natural Beauty Management Plan, 2014-2019

HCH1 The protection, conservation and enhancement of the historic character and features of the Kent Downs landscape will be pursued and heritage-led economic activity encouraged.

HCH2 A wider understanding of the cultural, scientific and artistic importance of the Kent Downs landscape and its historic character will be supported in part to inform the interpretation and management of the AONB.

HCH3 The preparation and use of best practice guidance for adapting the historic and cultural environment to climate change will be supported.

HCH4 Opportunities to develop contemporary artistic, historic, cultural and scientific interpretation and celebration of the landscape and people of the Kent Downs will be pursued.

HCH5 The application of high standards of design sympathetic to cultural heritage within the AONB, identified in guidance including the AONB Landscape Design Handbook, Kent Downs Farmstead Guidance and any relevant Village Design Statements and Neighbourhood Plans, will be pursued.

Sevenoaks District Historic Environment Review, December 2017

2.25 The document sets out a Historic Environment Review for Sevenoaks District Council to form the basis for conservation and heritage local planning in the District and to provide guidance to be followed in the future.

2.26 With regards to military heritage in the District, it identifies that:

‘there is an opportunity for 20th century war heritage to offer an important heritage tourism and educational resource. Heritage trails, for example the Battle of Britain Trail which takes people to various sites and monuments across south-eastern Kent, helps improve knowledge and grow appreciation of our war heritage [...] There is an opportunity for the formal identification of heritage assets associated with 20th century war heritage within the planning system with the best designated for further protection at a local level [...] Opportunities for collaboration between the general public, enthusiasts and stakeholder groups could be sought to strengthen the evidence base of 20th century war heritage. This could include working together to identify related heritage assets or to improve the documentation of their social and economic history.

3 HISTORIC BUILT ENVIRONMENT APPRAISAL

Historic Development

- 3.1 The 1844 Tithe map (Figure 1) and apportionment show the Fort Halstead site as undeveloped woodland, owned by Charles Polhill.
- 3.2 On 11th March 1889 the London Defence Positions Scheme was adopted by the Government, in response to the perceived threat of invasion by France and Russia, and a lack of confidence in the Royal Navy's ability to protect the country. The scheme was devised to protect London from the anticipated directions of the attack; to its north-east, east and south.
- 3.3 Fort Halstead was one of thirteen purpose-built mobilisation centres (Figure 2) which were to be linked by trenching and intended to be used as an armament and tool store, which in the event of invasion could be used to equip local volunteer forces. Most of the centres were fortified and some, such as Fort Halstead, would have been able to take an active part in defence by virtue of its location and the ability to mount field artillery or machine guns (as exemplified by the inclusion of gun emplacements at Fort Halstead).
- 3.4 The War Office bought 9 and $\frac{3}{4}$ acres of land at Halstead between 1890 and 1891, plans for the Fort were drawn up in 1894 (Figure 3) and it is likely that the Fort was constructed between 1895 and 1897 (Griffiths 1984, 4). Figure 4 is an illustration showing the Fort as it may have appeared on completion.
- 3.5 The Fort is not shown on the 1896 Ordnance Survey map (Figure 5) although a clearing within the woodland is depicted and the two semi-detached caretakers' cottages (now known as A14) are shown outside of the Fort boundary. The caretaker's cottages provided accommodation for a caretaker and a labourer who were responsible for the care and inspection of the Fort and its contents. Such accommodation was provided at all of the mobilisation centres. On this map the Fort site is shown surrounded by woodland to the north, east and west, however a small section of land to the south is clear of trees. It is likely that the Fort area was deliberately left blank for security reasons (a common convention for military structures on early maps). A13 does not appear on this map, but was built subsequently to serve the mobilisation centre as a detached tool store.
- 3.6 In March 1906 the London Defence Positions Scheme was officially abandoned.

Early Twentieth Century

- 3.7 Part of the London Defence Positions Scheme was resurrected during the First World War, when Fort Halstead was used as a defensible ammunition store forming part of the London anti-invasion stop line. In 1915 an ammunition laboratory (the extant F14) was built inside the Fort.
- 3.8 In 1921 the Fort was sold by auction to Lt. Colonel Bradshaw (a retired army colonel) and Dr Allpart (a Harley Street specialist). Figure 7 shows the 1921 auction map associated with the sale. Bradshaw lived in the laboratory (F14), the cottages (A14) were converted in a single residence and the site was used as a campsite for the Territorial Army, Boy Scouts, Girl Guides and provided accommodation for destitute refugees (Clive 1977).

The 1930s Projectile Development Establishment (PDE)

- 3.9 In terms of national military development during the twentieth century, aviation was of critical importance. British interest in rocketry strengthened and in 1936 the Committee for Imperial Defence gave Alywn Crow of the Armourments Research Department (ARD) the task of developing rockets for anti-aircraft defence, long range attack, air combat and assisted take off units (Crow, 1947 cited in Cocroft 2010). This part of the ARD's work initially began at the Royal Arsenal in Woolwich however a remoter site was soon sought due to safety concerns.

- 3.10 The 1936 Ordnance Survey (Figure 8) shows the Fort and the buildings contained within it, alongside buildings A13 and A14. The surrounding area remains undeveloped woodland traversed by a series of roads and footpaths.
- 3.11 In 1937 Fort Halstead was repurchased by the War Office to accommodate the rocketry work of the ARD. Several of the Fort's casemates and magazines were altered and further buildings were built within the Fort. Figure 9 shows the Fort in 1937 along with proposed alterations, including the conversion of casemates, repair of A13, A14 and F14 and the construction of A12.
- 3.12 Following the success of this initial work, in 1938 under the directorship of Alwyn Crow, Fort Halstead became the separate Projectile Development Establishment (PDE). One of the earliest buildings constructed for the PDE was an experimental firing shed (F11), erected in 1938 for filling cordite rocket motors. The pioneering work undertaken by Sir Alwyn Crow at the Fort led to the development of explosive and armament technologies, such as Unrotated Projectiles which were widely used in the D-Day operations.
- 3.13 Additional land around the Fort was purchased in 1939. The plan which accompanied the sale (Figure 10) shows the surrounding land in greater detail than previous maps. It indicates that a parcel of land immediately surrounding the Fort was sparsely planted with trees, when compared with the wider surroundings which are heavily wooded, and that there still remains a relatively small gap in the tree coverage to the south, affording long distance views across the landscape.
- 3.14 To avoid the Blitz, the Armaments Design Department and Research Department moved to Fort Halstead from Woolwich during the Second World War. The site also accommodated the Ministry of Supply which co-ordinated the supply of equipment to the British Armed Forces. Military and civilian staff at the Fort increased from 1000 to 3000 between 1939 and 1942 (Waterman 2009).
- 3.15 By the end of the war circa eighty buildings including explosives filling sheds, a large laboratory (now known as A10), workshops, administration buildings, and welfare facilities, such as a canteen had been built and the site had expanded beyond the immediate boundary of the Fort. The development also included air raid shelters, a war time fire-watcher's post, road and drain networks and a housing estate to the north for the War Department Police (Cocroft 2010) (Figures 11 and 12). A11 is understood to have been built between 1936 and 1944 by German prisoners of war. Figure 13 is a plan of the site in 1947 which shows the extent of development to the north, east and west of the Fort that had occurred by this time.

The Atomic Bomb, High Explosives Research (HER)

- 3.16 In January 1947, the British cabinet decided to proceed with the development of the atomic bomb under the direction of William Penney, Chief Superintendent Armaments Research (CSAR) at Fort Halstead. Penney was a physicist and had been a leading member of the wartime British Mission to the United States Manhattan Project responsible for creating the first atomic bombs in the world. To mask its true purpose the atomic work was codenamed High Explosives Research (HER).
- 3.17 The atomic bomb project involved developing the Mark 1 warhead which, when assembled in its casing for service, was known as 'Blue Danube'. Additional structures for this research were built inside the Fort including the bomb chamber (F16), detonation chamber (F17), a recording laboratory (F18) and casemates (F4 and F8). Existing buildings were also adapted for use as workshops and stores and significant new development occurred to the north-east of the Fort in the Q area. The link between the project and the Fort was top secret and although few records exist, it is understood that Fort Halstead personnel were responsible for developing both high explosive and electronic detonators for the atomic bomb (Historic England list entry 1412292). Penney's team worked within a secure fenced enclave within the Fort and the group of buildings to its immediate north and west.
- 3.18 The boundary of the enclave is shown on a 1952 plan of the Site (Figure 15). Other research sites around the country were responsible for the research, development, manufacture and testing of other components of the bomb, including the Royal Arsenal in Woolwich, AWRE in Foulness, Royal

Aircraft Establishment in Farnborough, Hudswell Clarke and Co Ltd in Leeds, Percival Aircraft in Luton, Woolwich Common factory, Orford Ness range and RAF Woodbridge (Cocroft and Fiorato, 2012).

- 3.19 There was close co-operation between HER and Royal Air Force (RAF) personnel. Squadron Leader John Rowlands was in charge of ten staff involved with the development and was responsible for guiding the RAF in the bombs' future storage, maintenance and operation, in addition to ensuring its overall quality. Most of the RAF team worked within the purpose built Q14 workshop, and included Squadron Leaders Rowlands, Brown, Mitchell and Skelley and Flight Lieutenant Blythe who were responsible for the weapon's assembly, Squadron Leaders Betts and Pulvermacher who worked on electronics, Flight Lieutenant Mercer on explosives and Wing Commander Hunty-Toddy on mathematics. Under William Penney, HER personnel included Leonard Tyte and his team who were in charge of electronics and high-speed measurements. Kluas Fuchs, an émigré German scientist also contributed to the work at Fort Halstead, but was subsequently discovered to be a Soviet spy (Cocroft and Fiorato, 2012).
- 3.20 Plans of the site between 1949 and 1952 show the additional development that occurred during this period (Figures 14 and 15).
- 3.21 In addition to the work of the HER, following the Second World War research was undertaken into captured German technology, an example being the high-speed wind tunnel that was brought to Fort Halstead but has since been removed.
- 3.22 On 3rd October 1952 Britain exploded her first atomic bomb on the Mont Bello Islands, Australia.
- 3.23 Atomic research and development continued at Fort Halstead until 1955 when staff transferred to the Atomic Weapons Research Establishment at Aldermaston in Berkshire.

Mid - late Twentieth century

- 3.24 Following the departure of the HER, armaments research continued at a reduced level whilst the site continued to expand in response to the threats of the Cold War (1946-89). Much of the research conducted during this period is still subject to the Official Secrets Act. The 1950s saw the growth of the site to the north into the 'N' 'H' and 'R' areas. Additional test ranges, including X44 and X45 and a predecessor to the extant X47 were constructed to the west of the site. (Figures 16-17).
- 3.25 In 1954 the Site became the first government research establishment to acquire a digital computer. This led to the invention of Mirfac computer language (Waterman 2009).
- 3.26 The ADD and ARD were amalgamated in 1955 to form the Armament Research and Development Establishment (ARDE). It later became the Royal Armament Research and Development Establishment (RARDE).
- 3.27 During the 1970s the RARDE was charged with the provision of help for the Home Office on the hazards of explosives, dangerous chemicals and forensics; this nationally significant work continues at the site today.
- 3.28 The site has continued to expand and become more densely populated with infill developments (Figures 18-20). The 1980s saw the expansion and development of the X area to become the largest component of the site and the addition of the M area magazines. In 1981-1982 a reception building (N7) was built and the main entrance gates moved. Between 1982 -1984 the western site entrance was moved to the Crow Road and Star Hill junction, in order to allow for the new magazine facility in the 'M' area.

Site Assessment

- 3.29 The Site is located within the "X Enclave" of Fort Halstead. The X Enclave was developed from the 1930s and originally provided stores, magazines and research buildings associated with the rocketry

research undertaken at Fort Halstead from 1936 as part of the PDE programme. The earliest buildings are generally located to the east of the X Enclave, proximate to the Fort. This includes X2, X3 and X38 which are located outside of the Site boundary. The earliest buildings are Buildings X2-X13, with X38 also constructed during this first phase of development. The majority of the other buildings within the X Enclave date from after the Second World War and many are late twentieth century in origin.

- 3.30 The Site is slightly smaller than the whole X Enclave and excludes Buildings X2, X3 and X38. It now comprises a mixture of hard and soft landscaping and numerous buildings dating from the 1930s-1990s. The majority of the buildings date from the second half of the twentieth century and are generally designed in a simple, utilitarian style and faced in red brick. They range from 1-2 storeys in height, with large chimneys to some of the laboratory buildings.
- 3.31 The buildings are linked by footpaths and set within green space, with some trees within the Site. Access is provided from Crow Drive, which runs parallel with the northern boundary of the Site.
- 3.32 The red line boundary also includes two additional areas outside of the X Enclave (one within the Fort and on to the east) where magazines are currently located. These twentieth century magazines will be relocated as part of the proposed works.

Assessment of Heritage Assets

- 3.33 Previous assessment work of Fort Halstead has been undertaken by RPS (previously CgMs), Waterman and Heritage Collective in relation to planning applications for the redevelopment of the wider site submitted in 2015 and 2019 (15/00628/OUT and 19/05000/HYB respectively).
- 3.34 This work included detailed assessments of the designated heritage assets that form part of Fort Halstead, but which are located outside of the Site. These are:
- Fort Halstead (scheduled monument; NHLE 1004214) located to the east of the Site
 - Buildings F16 and F17 (Grade II* listed building; NHLE 1412293) located to the east of the Site, within the scheduled monument
 - Building F11 (Grade II listed building; NHLE 1412292) located to the east of the Site within the scheduled monument
 - Building Q14 (Grade II; NHLE 1396578) located to the north-east of the Site
- 3.35 In addition, a number of non-designated built heritage assets were identified within Fort Halstead. Within the X Enclave this includes:
- X2: located to the north-east of the Site
 - X4-7: located within the south-east area of the Site
 - X8-10: located within the south-east area of the Site
 - X11-13: located within the south area of the Site
 - X38: located to the north-east area of the Site
 - X44 and 45: located within the north-west area of the Site
- 3.36 All of the non-designated heritage assets identified within the Site will be retained as part of the proposed development and no major alterations, renovations or upgrades are proposed to these buildings. They are not consequently discussed in detail below.
- 3.37 The following section provides an assessment of the heritage assets' significance, which includes an assessment of the contribution that their settings (including the Site) make to that significance. Reference to any suitable mitigation measures has also been provided below.

- 3.38 This follows the '5-step' process provided by Historic England in *GPA3: The Setting of Heritage Assets* which is considered best heritage practice when assessing how a development may affect the setting and significance of a heritage asset (see paragraph 2.19 above).
- 3.39 Significance is defined in the NPPF as:
'The value of a heritage asset to this and future generations because of its heritage interest. The interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting. For World Heritage Sites, the cultural value described within each site's Statement of Outstanding Universal Value forms part of its significance'.
- 3.40 Further information is provided in the PPG which defines each of the interests as follows:
'Archaeological interest: As defined in the Glossary to the National Planning Policy Framework, there will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point.
'Architectural and artistic interest: These are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically, architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types. Artistic interest is an interest in other human creative skill, like sculpture.
'Historic interest: An interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history, but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity'.
- 3.41 These terms are used in the following assessment to provide a proportionate assessment of the potential effects to heritage assets arising from the proposed development.

Assessment of Significance

Fort Halstead (scheduled monument)

Description

- 3.42 The Fort is polygonal in plan, surrounded by an earth rampart and a deep external ditch with a sloping earth counterscarp and concrete revetment. The ditch is extant for much of the circuit except at the north-west and west of the Fort where it has been infilled. The rampart is a large earthwork, with a parapet, banquette (infantry fire-step) and terreplein (a platform or level surface on which heavy guns are mounted). Traces of brick-revetted emplacements for machine guns, some with expense magazines set into the rampart, survive. At the north-east corner of the Fort is an additional structure of Second World War date thought to be a fire watchers post. It is built of brick and concrete.
- 3.43 The interior parade is entered via the original entrance to the north-west, formed within two inward pointing angles of the polygonal Fort. It is entered via a north-south causeway over the ditch, lined by concrete walls topped with original metal fence posts and a modern wire mesh fence. A secondary entrance to the Fort is located to the south-west; this entrance was inserted between 1946 and 1952 in order to link the Fort interior with the area beyond the Fort to the south-west, where other additional buildings had been constructed.
- 3.44 The interior parade of the Fort is dissected by a large, central linear traverse which runs on a roughly north-south axis and contains a block of nine casemates and two wagon sheds with a covered access corridor to the west (collectively F2). A further block of casemates (F4) is located close to

the eastern rampart and another block (F8) containing seventeen is located close to the western rampart which was originally earth.

- 3.45 Three widely spaced magazines with shell and cartridge stores within them are cut into traverses to the north east, south east and south (F3, F5 and F6). These are concrete chambers providing storage of ammunition and were all provided with safety lamp recesses with glazed and metal grill covers. The magazines' earth-covered, reinforced, concrete roofs have an added layer of flint designed as a bursting layer intended to detonate incoming shells before reaching the interiors. Details and paraphernalia such as a nineteenth century fire hydrant and metal ventilation grilles survive.

Historic Development

- 3.46 Built circa 1895-1897 as a mobilisation centre, the Fort was modified from the late 1930s for rocketry research, and again in the late 1940s for the top-secret development of Britain's first atomic bomb.

Significance

- 3.47 As a Scheduled Monument, the Fort is a heritage asset of the highest, national significance.
- 3.48 The Fort has historic interest as one of thirteen purpose-built mobilisation centres devised as part of a scheme known as the London Defence Positions, which was designed to protect the southern and eastern approaches to London, which survives largely intact, though with some later alterations. Historic interest is also derived from its use during the mid-late twentieth century rocketry and atomic bomb research and development. The Fort's largely intact form and relative rarity increases the evidential potential of the asset to enhance our understanding of the development and operation of the late nineteenth century mobilisation centres constructed to defend London and the nationally significant armaments research and development undertaken here. Significance is derived from the asset's physical fabric and construction, its association with key phases and personnel in the nation's military history as well as notable world events.
- 3.49 Fort Halstead was the largest and most expensive of the mobilisation centres (Beanse and Gill, 2000) and is one of four designed for artillery deployment. The Fort's architectural interest is derived from how its form, construction and materials relate to its specific military functions.

Setting

- 3.50 The Fort is located on the crest of the North Downs where it intersects the Darent Valley. The London Defence Positions line turned northwards at this point and followed the western flank of the valley to join the mobilisation centre at Farningham. This strategic location and the Fort's relationship with the other mobilisation centres, which collectively formed a defensive line to the south and east of London, contributes to its wider setting and our understanding of its significance. It is reasonable to assume that strategic views of the surrounding landscape were integral to the Fort's design and the choice of location, however the precise extent and location of such long-distance views are currently unclear.
- 3.51 On maps from the nineteenth century the Fort and the immediately surrounding area are shown as blank, but surrounded by dense woodland to all sides, with the exception of a small gap to the south, which would have provided long distance views to the south and south-west. The 1939 plan (Figure 10) provides greater detail than previous maps and indicates that the parcel of land immediately surrounding the Fort on all sides was sparsely planted with trees, when compared to the wider surroundings which are again shown as heavily wooded with the exception of the small areas to the south. This immediate area was presumably kept sparsely planted to allow close range defence of the centre; several gun emplacements were set into the rampart suitable for small calibre, quick firing guns and machine guns. Gun emplacements were positioned to defend the entrance and the main defence positions to each side of the Fort (Beanse and Gill, 2000). Given the level of tree

planting found today both on the Fort itself and on the adjacent land to the south, any long-distance views once gained from the top of the Fort rampart have been lost.

- 3.52 Originally the whole Fort would have been enclosed within a high steel fence with gates hung on steel girders at the entrance (traces of which survive).
- 3.53 Today, the Fort is located to the east of the Site and is surrounded to the north, east and west by the other buildings and infrastructure relating to the later military research establishment. The surrounding buildings range from subterranean to three storeys in height. Overall this collection of buildings contributes to the Fort's functional context. The Fort shares particular group value with all of the buildings contained within it and the contemporaneous A13 and A14, which contribute to its significance. It is considered that due to their visually prominent positions close to the heart of the Site, their close proximity to the Fort and their related historic values A10, A11, Q1, Q13, Q14, X2, X3 and X38 form the asset's immediate visual and historical setting, and as such make a contribution to how we understand and experience the asset's significance when outside its confines.
- 3.54 The Fort was originally approached via the road/trackway now known as Crow Drive. This road survives in the original alignment, comprising the sequential experience of the historic approach to the Fort, and contributing to its significance.
- 3.55 Whilst many other buildings lie in close proximity, due to the designed, enclosed nature of the Fort, intervisibility with other structures and the surrounding landscape is limited when inside the Fort area. The overgrown nature of the Fort earthworks mean that it is visually discreet from within the Site. Originally the Fort's earthworks would have been devoid of such vegetation, which appears to have developed organically over time rather than as a result of a strategic planting scheme, but which may nevertheless have provided valued screening and privacy for the later secretive PDE and HER work. The overgrown nature of the earthworks is deemed detrimental to its legibility and our ability to appreciate its form and significance.

Summary

- 3.56 The asset derives significance from its built fabric which has architectural and historic interest, the group value it shares with the buildings contained within it as well as A13 and A14. It also shares group value with the immediately surrounding buildings with which it shares both a historic and visual association, while its wider strategic setting remains an important contributor to its significance.

Buildings F16 and F17

Description

- 3.57 F16 is a rectangular, flat roofed Bomb Chamber built of reinforced concrete. A corrugated iron clad entrance corridor leads to an E-shaped single armoured inner chamber where explosive devices would be detonated. There is an external metal staircase providing access to the roof which has metal railings to the north-east, south-east and north-west elevations. The rear elevation has electrical inlet and outlet points and there are three rows of square, centrally bolted metal plates to the rear and side elevations which are presumed to be fixings for explosion monitoring equipment. F17 is a detonation chamber constructed of concrete and red brickwork laid in English bond with metal framed casement windows with concrete heads. The single storey flat roofed section of the building has a 'T' shaped funnel protruding from the top. This section houses a bursting chamber with armoured glass observation windows, surrounded by high speed camera rooms from which the explosions were recorded. The two-storey section of the building at the northern end housed a photographic dark room on the ground floor and a control room above from which the trials were overseen (Historic England, List Description 2013).

Historic Development

- 3.58 F16 was designed in July 1947 with F17 designed in August that year, just two to three months after the creation of the High Explosive Research Establishment. The speed at which they were designed

reflects the importance of, and requirement for, these structures in relation to the body's research and development. The buildings have undergone little alteration since their construction.

Significance

- 3.59 F16 and F17 are Grade II* listed and particularly important buildings of more than special interest. Both designed in 1947, shortly after the High Explosives Research Establishment was set up at Fort Halstead, the buildings hold considerable historic value and make a vital contribution to our understanding of the nation's atomic bomb research and development which contributed to one of Britain's major scientific breakthroughs in the field of military armament. The lack of known associated records, rarity and relatively intact nature of the buildings increases the significance of the buildings.
- 3.60 Whilst lacking in architectural ornamentation, the buildings hold architectural interest in the way their original functions remain legible through their specialised form, design and materiality, which remain little altered from their original design.

Setting

- 3.61 Both buildings are situated within the Fort to the eastern side of the roughly central traverse. Along with F18, F16 and F17 sit within and form a key group of buildings relating to atomic bomb research and development. The confines of the Fort provide a strong visual and functional immediate setting to the buildings. The enclosed nature of the Fort and the restrained use of fenestration on the buildings coupled with intervening vegetation means that the buildings have no intervisibility with the wider surrounding landscape and buildings beyond the Fort's earthworks.

Building F11

Description

- 3.62 F11 is a two storey, L-shaped building with a sloping reinforced concrete roof. It has a concrete frame encased in brick laid in English bond. The principal east facing elevation has a metal staircase providing access to a first-floor covered walkway. Four, full height brick bays with pipework to the rear occupy the southern half of the building and were designed to accommodate filling of vertical rocket casings. The building has metal framed casement windows to all elevations except the blind north elevation. The principal elevation has two pairs of glazed double doors to the ground floor level and two single doors to the first-floor level. The western elevation had four external doors, two to the ground floor and two to the upper floor (since blocked) which likely provided emergency exits. Over-head cable gantries extend north from the building.

Historic Development

- 3.63 F11 was designed and built in 1938 as an experimental filling shed to allow the filling of cordite rocket motors. It was later called 'Poole's Folly' as there is a question as to whether or to what extent it was ever used for this function.

Significance

- 3.64 F11 is Grade II listed and is considered of special interest. This modest building represents the earliest surviving purpose-built rocket related building in England and Britain's first steps to manufacture modern missiles. It is directly associated with the pioneering work by Sir Alwyn Crow that led to Unrotated Projectiles which were widely used in the D-Day operations. F11 has historical value as the earliest surviving purpose-built building associated with rocketry research and development, nationally. Most buildings associated with this era of research date to post rather than pre-war, and therefore F11 has considerable historic interest and is a particularly rare survival.

- 3.65 The architectural interest of the building is derived from its innovative form and design which reflect the specialised function of the building. This is manifest within the building's internal layout, form, design, materiality, construction and associated plant and fittings.

Setting

- 3.66 F11 lies within the western half of the Fort, towards the northern entrance. The confines of the Fort provide a strong visual and functional immediate setting to the building. The enclosed nature of the Fort and the restrained use of fenestration on the building's northern elevation coupled with intervening vegetation means that the building has limited intervisibility with the wider surrounding landscape and buildings beyond the Fort's earthworks. Despite the limited visual connection, the surrounding buildings and particularly those which are contemporary with the PDE provide an historic and functional setting to the buildings.

Building Q14

Description

- 3.67 The building is a two-storey, flat concrete roofed building with a rectangular planform. It is built in red brick laid in stretcher bond encasing a steel frame structure. The main entrance to the building was originally to the south elevation through glazed double doors. A further pedestrian entrance is located on the east elevation, and there is evidence of a former doorway at the north east end of the building which has now been blocked (neither of these doorways are original). A former, large equipment entrance to the south-west has been blocked but retains its original exterior wall light. This door head is suggestive of a former roller shutter door, now partly obscured by a later plant room. The form of the original fenestration to west and north elevations remains legible as double-height windows to the ground floor to light the workshop inside. These large openings are now bricked up with smaller ground floor windows inserted. Ground floor windows on the east elevation are later insertions. All first-floor windows are PVCu replacements although re-use original window openings. There is a late twentieth-century fire escape staircase to the north elevation.

Historic Development

- 3.68 Q14 was designed in 1949 and had been built by 1952. It was originally known as Building 27 and was used to assemble the atomic bomb prototype. It has undergone a series of alterations during the late twentieth century, including additional entrances, an external fire escape staircase, additional ground floor windows to the east elevation, alteration of internal partitions and insertion of a suspended ceiling.

Significance

- 3.69 Q14 is Grade II listed and is considered of special interest. It is of national historic interest through its association with William Penney, Chief Superintendent of Armaments Research, who led Britain's atomic bomb development programme. The association is celebrated by a memorial plaque and the building is colloquially referred to as the 'Penney Building'. It also holds historic interest as the only building nationally where the prototype atomic bomb was put together and was thus instrumental in the detonation of Britain's first atomic bomb in 1952.
- 3.70 The building's unique architectural interest is derived from how its form and design reflect its function as a purpose-built workshop for Britain's atomic bomb development programme. This is principally manifest in the double height ground floor workshop with gantry for travelling crane, as well as evidence of former strong rooms on the first floor. The building's form and design also express the secrecy surrounding the HER programme and the work that was being carried out inside. The HER secure boundary was drawn to the east of Q14 and therefore the building's east elevation at ground floor level was originally blind on the public-facing side. Double height windows were placed on the north and west sides probably to maximise daylight for the work being carried out inside, though

these were glazed with obscured glass to the lower half and had internal metal grilles. The building's functional architecture reflects both the urgency with which the HER needed the new purpose-built buildings, and the rise of modernism, which championed the idea that form should follow function. The building's rectangular shape, lack of ornamentation, use of metal frame and concrete flat roof are illustrative of this period of military architecture.

Setting

- 3.71 The building is located within the Fort Halstead complex, surrounded by hundreds of other buildings and structures related to its function as a military research site; these structures have a predominantly utilitarian character and range from subterranean to three storeys in height, with the tallest building reaching 22 metres above ground level (Pegasus).
- 3.72 The building's immediate setting is formed by the Q Area, which incorporates closely packed buildings ranging from the 1930s to the late twentieth century in date, and was surrounded by a security fence during the HER phase. Crow Drive runs to the south of this area and separates it from the Fort. Areas of hard standing surround the building on all sides but are interspersed with grassed areas planted with mature trees. Intervisibility with the wider surroundings is restricted by the density of surrounding built form including the adjacent Q8, Q11 and Q12 which as a result of their relatively recent dates, high levels of alterations and/or standardised design range from making a neutral to detrimental contribution to the asset's setting. Other buildings in the Q area which share a visual and historical association such as Q01, Q03, Q04, Q04-1 and Q13, along with the adjacent Fort make a positive contribution to the setting of the asset.

4 PROPOSALS AND ASSESSMENT OF IMPACTS

Development Proposals

- 4.1 The proposed development includes the consolidation of QinetiQ's existing functions within the secure enclave. Full details, including plans and drawings of the proposed alterations, are included elsewhere within this submission.
- 4.2 The description of development is:
- Works to the proposed QinetiQ enclave comprising the erection of perimeter security fence, erection of a new reception building, creation of a new main site entrance along Crow Road, refurbishment of existing buildings including plant installation, creation of a new surface level car park and access, installation of two new explosive magazine stores and surrounding pendine block walls, demolition of existing buildings, installation of 6no. storage containers, installation of new site utilities, landscaping and ecological works*
- 4.3 Primary access into the Site will be from a new point on Crow Drive, with a secondary vehicle access point on the east boundary (immediately west of the Fort) and two emergency personnel gates also provided on this boundary.
- 4.4 The buildings to be demolished are shown on the submitted drawings and include Building X51. These buildings are of no architectural or historic interest and their demolition will not affect the significance of the identified non-designated heritage assets within the Site. Following the demolition of X51, the remaining floor plate will be used to support 6no. storage containers
- 4.5 Three new buildings will be constructed, including a new reception building and two small magazines, which will be moved from elsewhere within the Fort Halstead site, one of which (X51.2) is located within the scheduled area. There is extant planning permission for the relocation of these magazines (19/02447/FUL) and Historic England have previously confirmed that scheduled monument consent is not required for the relocation of the magazine within the Fort. There will also be new electricity sub-stations and other utilities provided. Four existing buildings will be refurbished.
- 4.6 The non-designated heritage assets within the QinetiQ Enclave identified at paragraph 3.31 of this report will not be affected by the proposed works, although there will be some limited changes to their settings.
- 4.7 The construction of the new fence will mean that the majority of the works undertaken within the Site will not be visible from outside of the QinetiQ Enclave. Therefore, the key change will be the construction of the fence (and some minor alterations to access) which will alter the setting of the designated heritage assets identified at paragraph 3.30 of this report and assessed in Section 3. The proposals also include the construction of the new Reception building, which will be seen from Crow Road but will not be visible from the surrounding heritage assets.
- 4.8 The potential impacts to their significance arising from the proposed development are assessed below.

Heritage Impacts

Fort Halstead

- 4.9 The proposed development will result in some alterations to the approach to Fort Halstead and to some views to and from the scheduled monument. The existing approach along Crow Drive will be altered by the access approved in association with application 19/05000/HYB, with the new fence also being constructed to follow the boundary of the X Enclave adjacent to the cycle lane which will follow the line of Crow Drive.

- 4.10 The new fence will be visible from the Fort and is likely to be visible in filtered views from the ramparts, beyond the tree cover. It will be seen as a simple, defensive boundary and will obscure the majority of buildings beyond, providing a taller and less permeable barrier than the existing chain link fence. However, this will have a limited impact on the visual relationship between the Fort and the Site, with the existing buildings (notably X2 and X3) and the planting already obscuring the majority of views from the Fort into the Site. Return views are similarly limited and therefore there will be no impact on the ability to appreciate or experience the significance of Fort Halstead. The fence will therefore reinforce the enclosed setting of the scheduled monument here.
- 4.11 The limited demolition within the Site will only affect buildings constructed in the latter part of the twentieth century that do not relate to the important early phases of Fort Halstead's use for rocketry research and the development of the atomic bomb. The loss of these buildings will therefore have no impact on the historic interest of the Fort. The removal of the magazine from within the Fort and its relocation to the QinetiQ enclave will also have no impact on the significance of the scheduled monument and permission has previously been granted for this relocation under a separate planning application.
- 4.12 The proposed works will have a limited impact on the setting of the scheduled monument. This will reinforce the now separate uses of the Fort and the majority of the X Enclave and slightly alter some views to and from the Fort. However, this will not diminish the ability to appreciate the historic use of the Fort as a mobilisation centre, located in a deliberately and highly prominent location overlooking the Darent Valley. It will also have no impact on the historic interest the Fort derives from its later uses associated with rocketry research. Those buildings that form the immediate setting to the scheduled monument will be retained and their contribution to its significance also maintained.
- 4.13 The proposed redevelopment of the Site will therefore have no impact on the significance of Fort Halstead, or to the ability to appreciate and experience that significance. It will represent some generally minor changes within the setting of the scheduled monument, with its significance being conserved.

Buildings F16 and F17

- 4.14 Buildings F16 and F17 have a strongly enclosed setting, with no visual relationship with the surrounding landscape. The proposed works will therefore have no impact on any views to or from the listed buildings. In addition, the demolition proposed relates only to later buildings that share no direct association with the listed buildings. The proposals will therefore have no impact on the architectural or historic interest of the listed buildings and no impact on their overall significance.
- 4.15 The proposed works will preserve the special architectural and historic interest of Buildings F16 and F17.

Building F11

- 4.16 Building F11 has a similarly enclosed setting and shares no visual relationship with the Site. Its role as an important early construction as part of the PDE use for Fort Halstead means that it shares some historic interest with the earlier buildings within the X Enclave, all of which will be retained.
- 4.17 The proposed development will not therefore alter the significance of the listed buildings, or the ability to appreciate this significance and the proposed works will preserve the special architectural and historic interest of Building F11.

Building Q14

- 4.18 Building Q14 does not presently share any intervisibility with the Site. However, the proposed security fence will alter the approach to the listed building along Crow Drive and therefore will present some change to the setting of the listed building. However, the alteration to this approach will not

affect the ability to experience and appreciate the architectural interest of the listed building. In addition, its historic interest, which is largely derived from its use and association with the Fort, will be unchanged.

- 4.19 The proposed development will therefore have no impact on the significance of the listed building, with its special architectural and historic interest preserved.

5 CONCLUSION

- 5.1 This Built Heritage Statement has been prepared to accompany a planning application for land and buildings within the X Enclave, Fort Halstead. The proposed development comprises the demolition of some existing buildings, the construction of new buildings, the erection of a security fence, and associated access and landscaping works.
- 5.2 The proposed works will have no impact on the non-designated heritage assets identified within the Site. It will represent some minor changes to the setting of Fort Halstead, a scheduled monument, and four listed buildings. However, the nature of the works mean that these changes will have no impact on the significance of these heritage assets, or on the ability to experience and appreciate this significance.
- 5.3 The proposed development will therefore conserve their significance and will preserve the special architectural and historic interest of the listed buildings. The proposals therefore accord with section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 and national and local planning policy related to heritage assets. This report complies with the requirements of paragraph 189 of the NPPF and provides sufficient information regarding the heritage impacts of the works to determine this application.

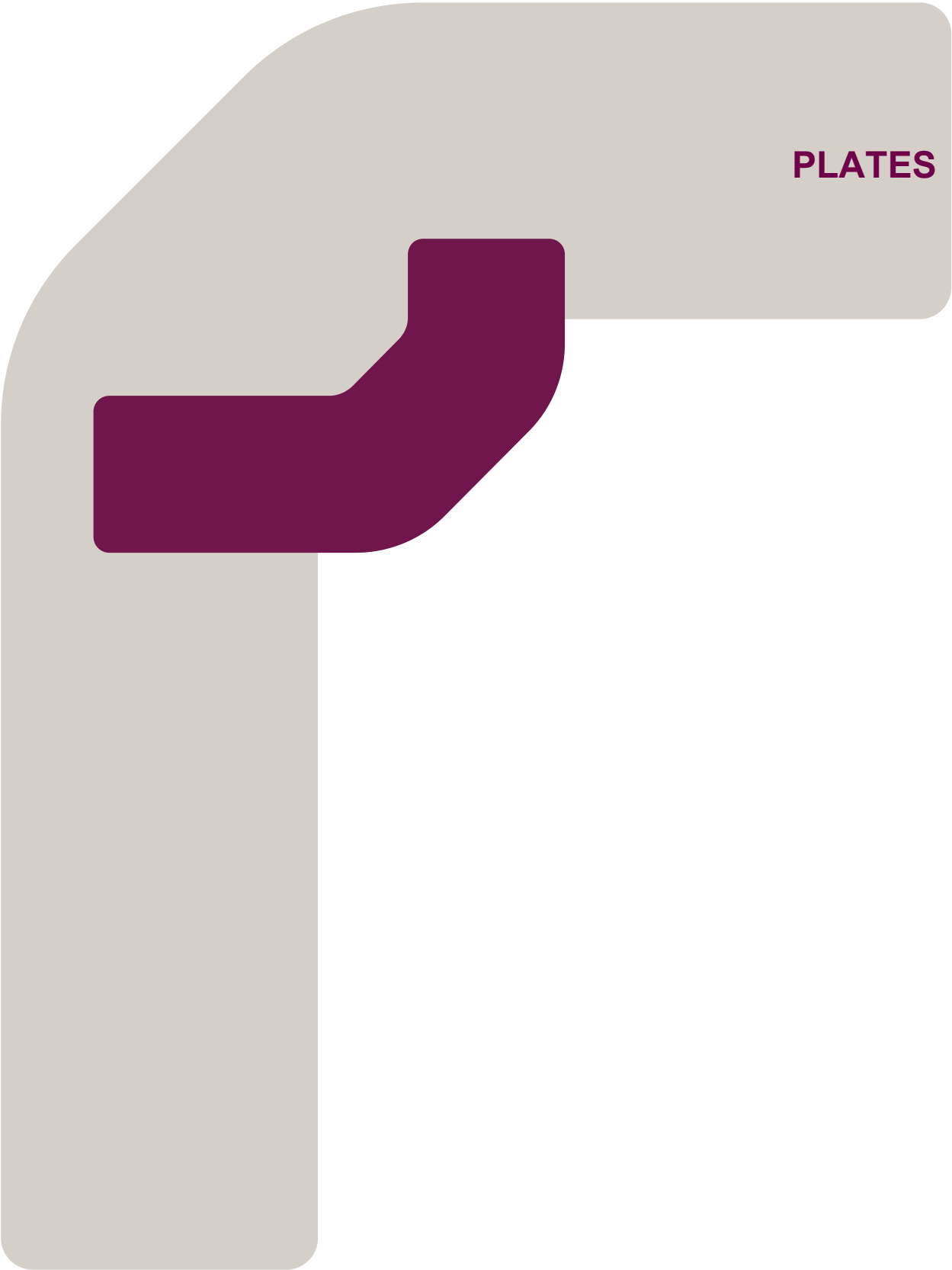




Plate 1: View looking southwards from land adjacent to the Fort (next to X54).



Plate 2: View looking southwards from on top of the Fort Rampart



Plate 3: View looking south from the south-west corner of the Fort's rampart



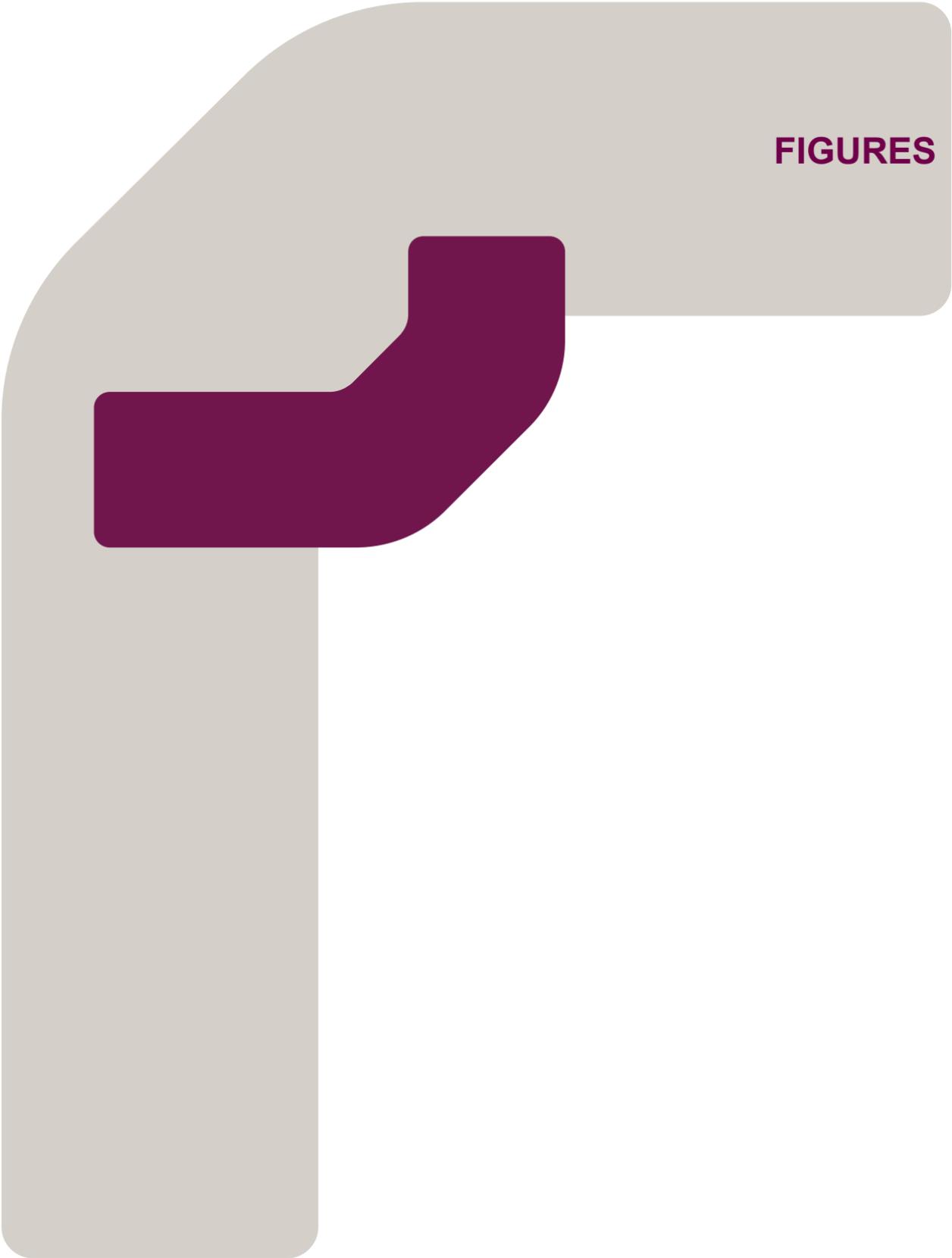
Plate 4: View looking south-east from the south east corner of the Fort's rampart



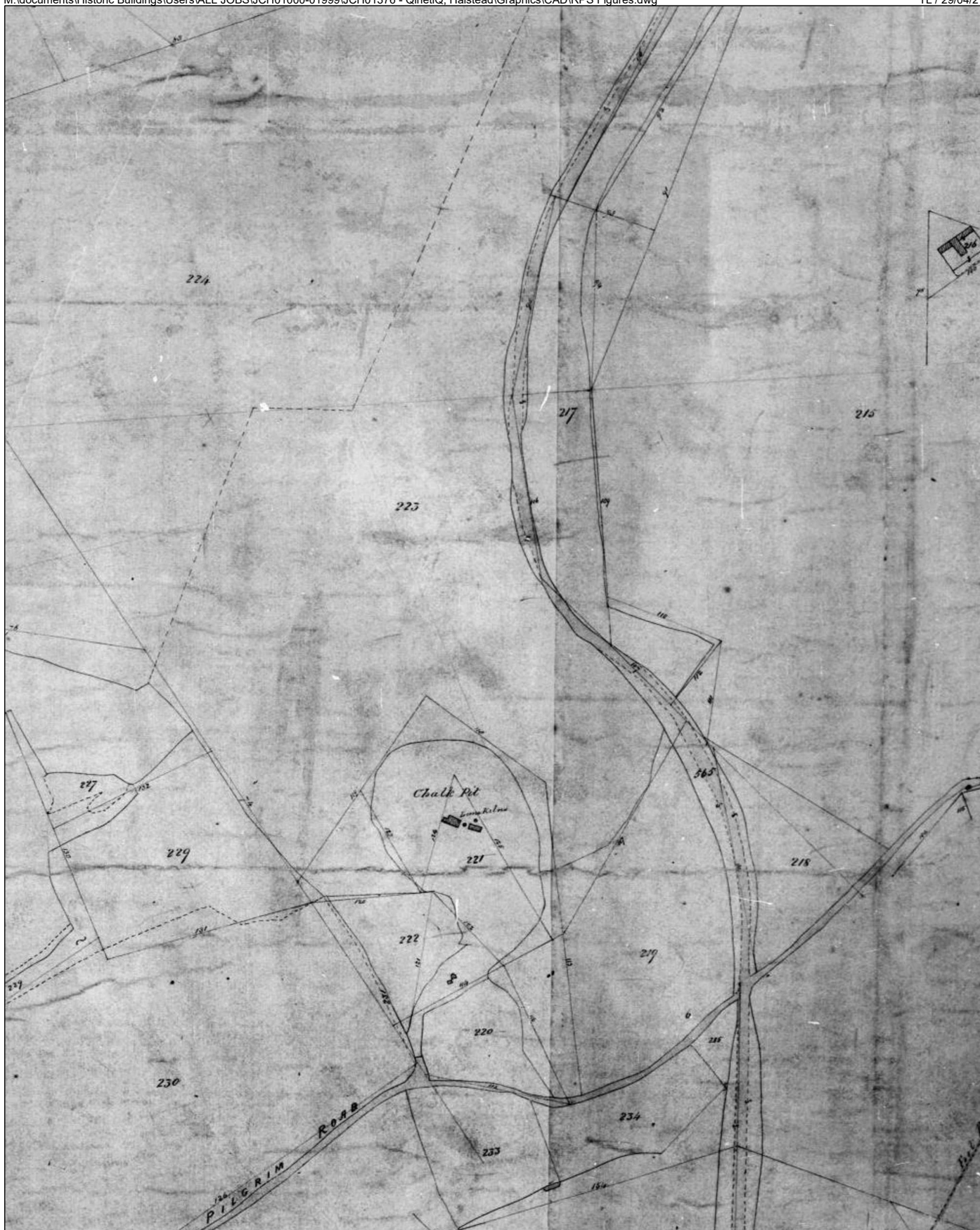
Plate 5: View looking towards the Fort's entrance



Plate 6: View looking eastwards along Crow Road with the Fort on the right-hand side and Q1 on the left.



FIGURES

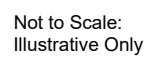
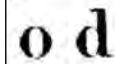


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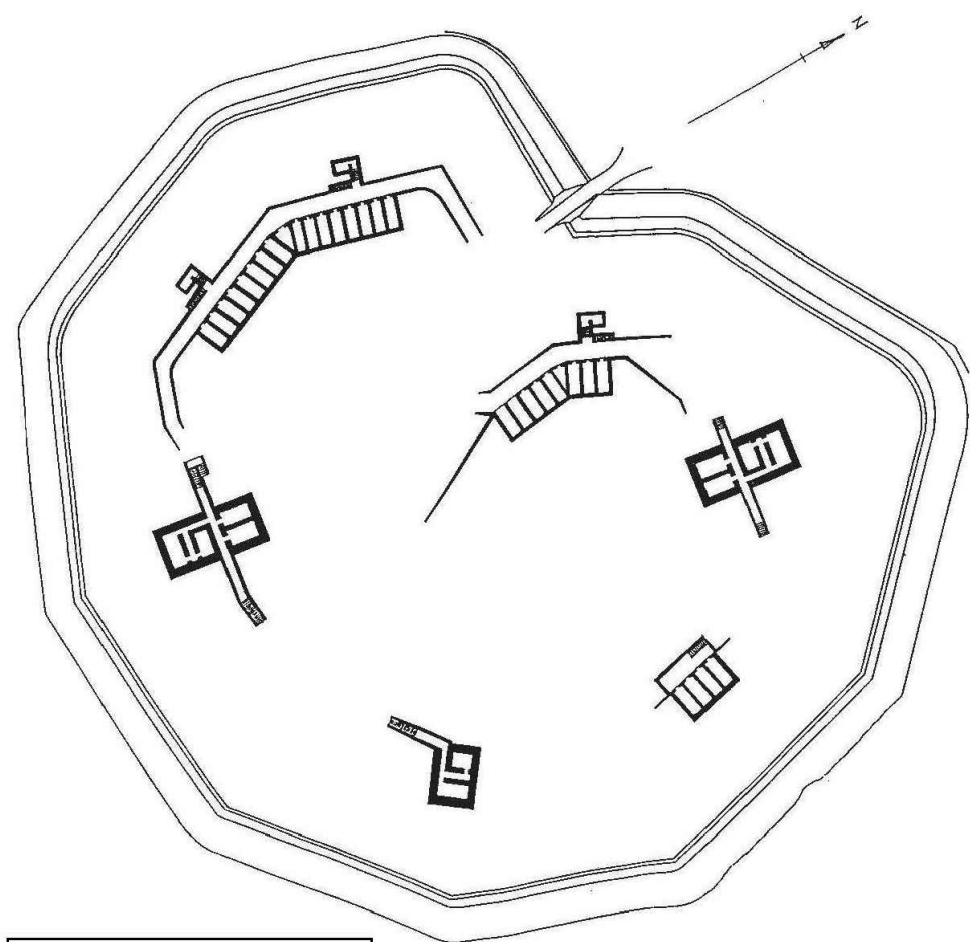


Figure 1

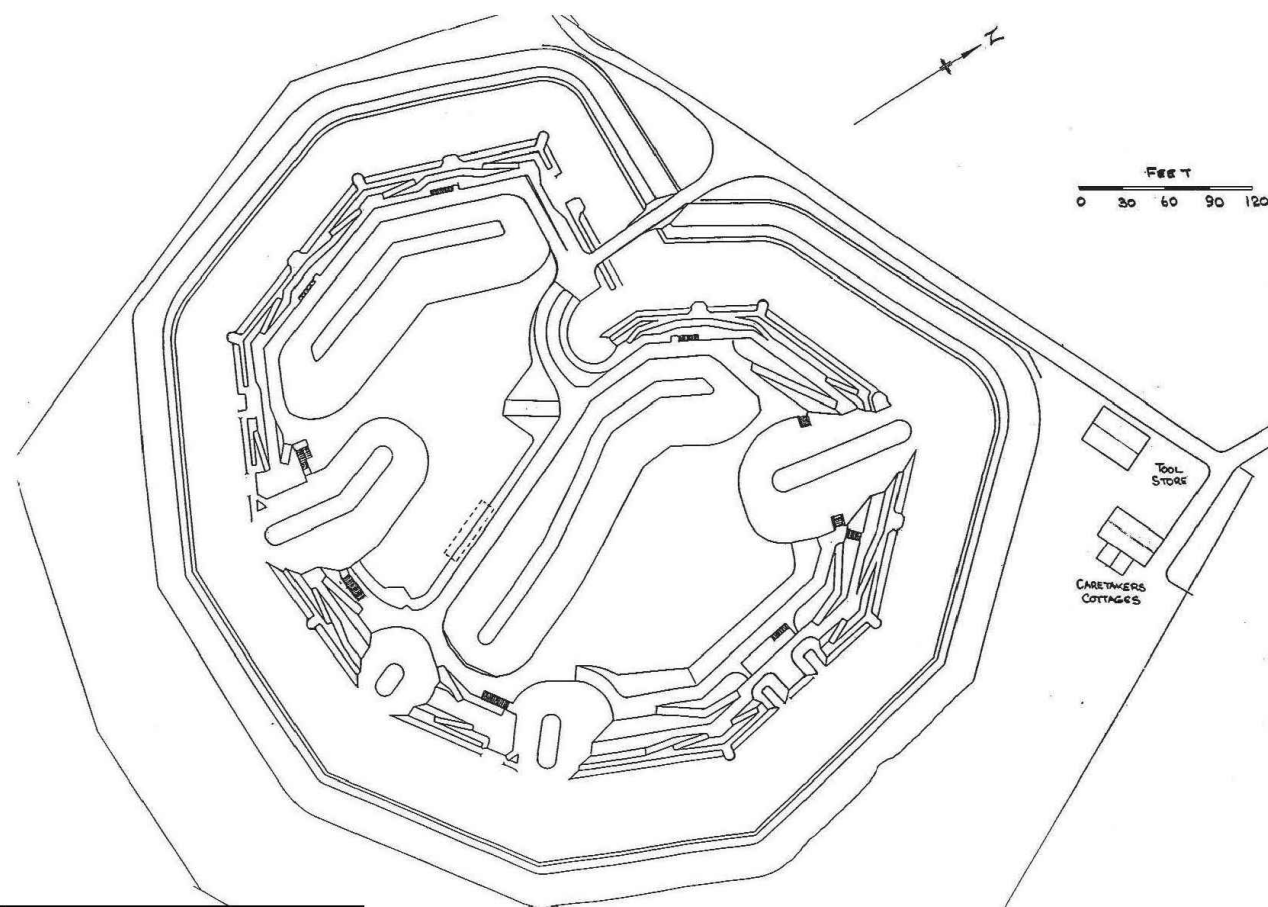
1844 Otford Tithe Map



Second Edition Ordnance Survey
Map, 1896



Fort Halstead
Plan of Buried Structures
(Alec Beanse)



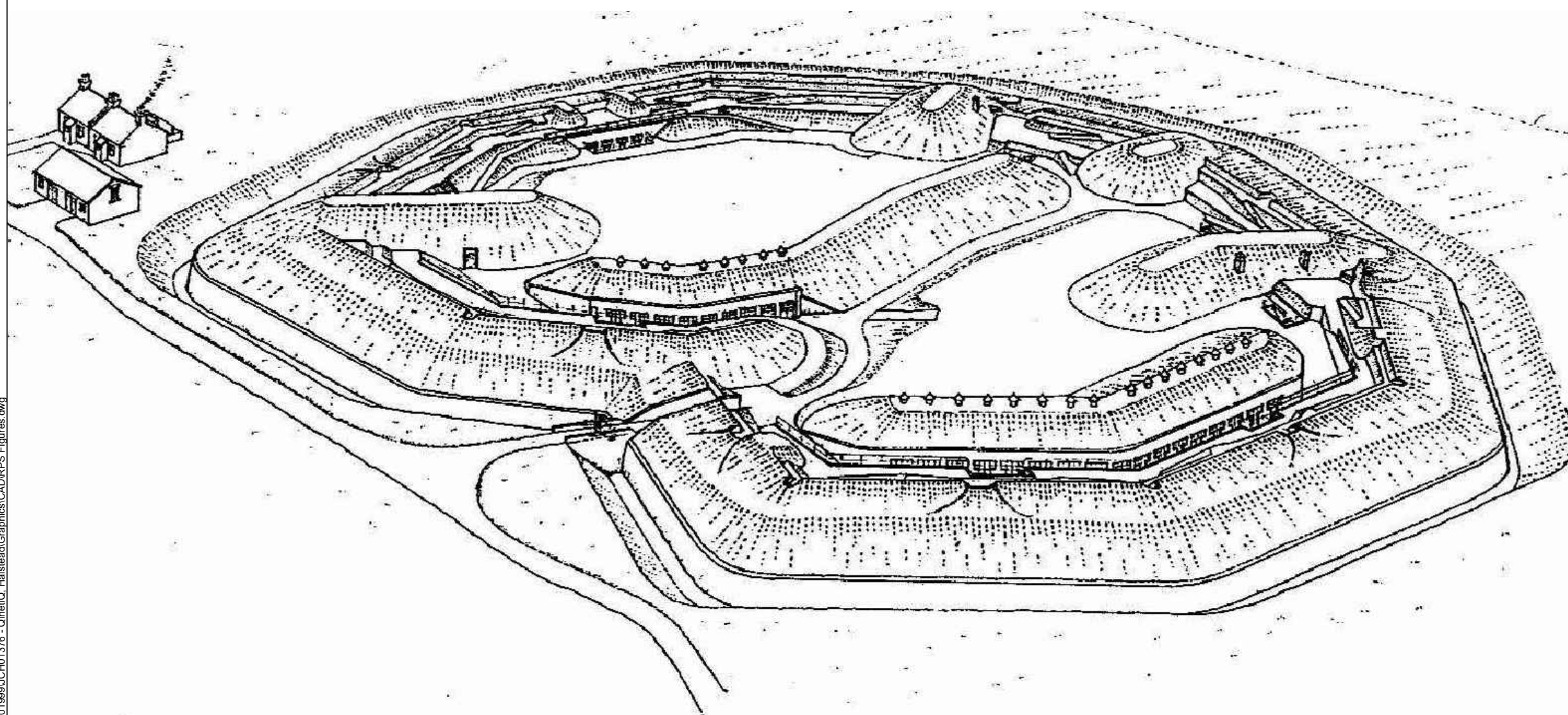
Fort Halstead
Top Plan
(Based on PRO WO78/3646 and
WO78/4372) (Alec Beanse)

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Figure 3

Plans of Fort Halstead
Mobilisation Centre (Source:
Roger Gill (illustrator & David
Moore (publisher, *The London
Mobilisation Centres*



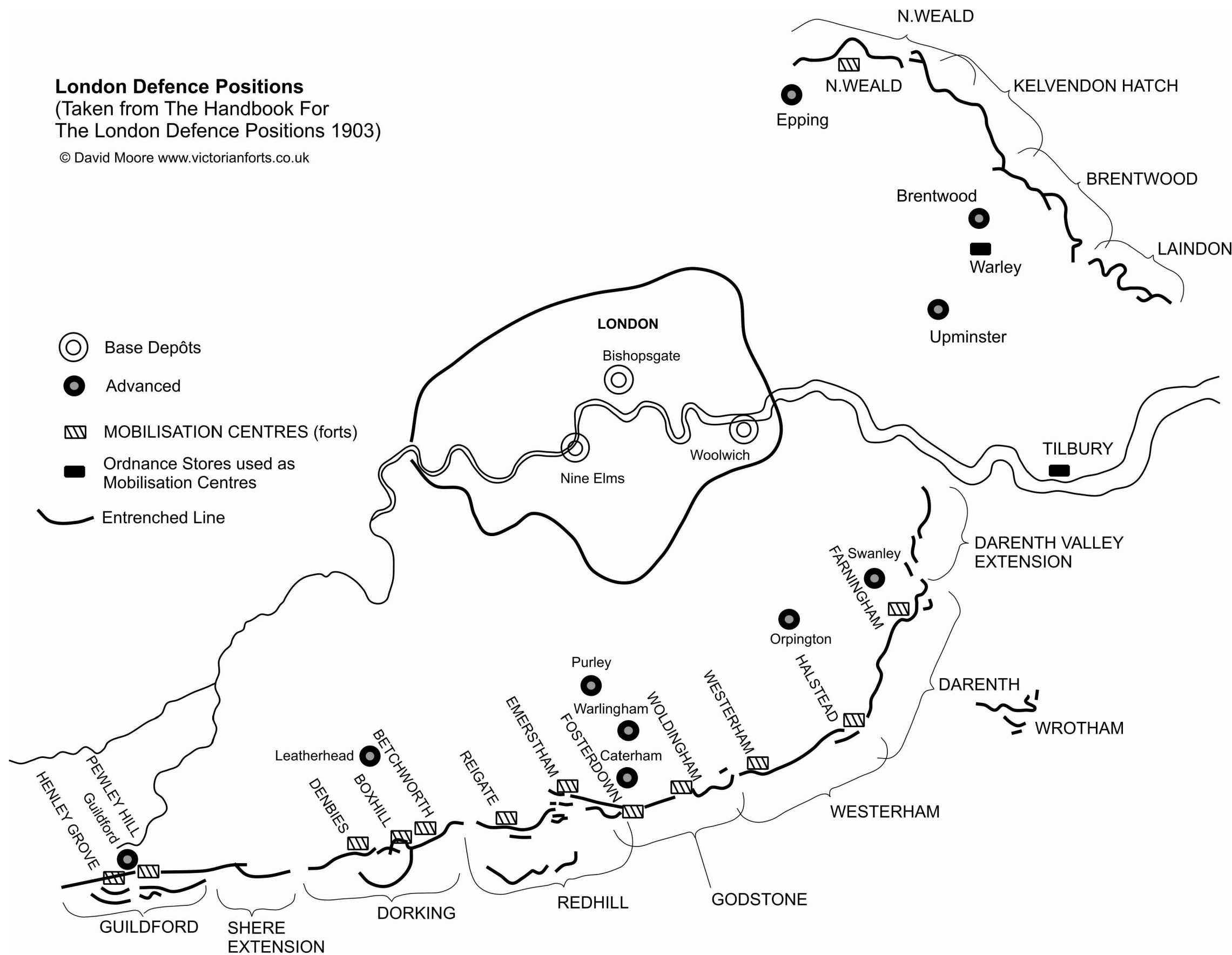
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Figure 4
Illustration showing For Halstead Mobilisation Centre as it may have appeared on completion c1896-7
(Source: Roger Gill (illustrator & David Moore (publisher, *The London Mobilisation Centres*

London Defence Positions (Taken from The Handbook For The London Defence Positions 1903)

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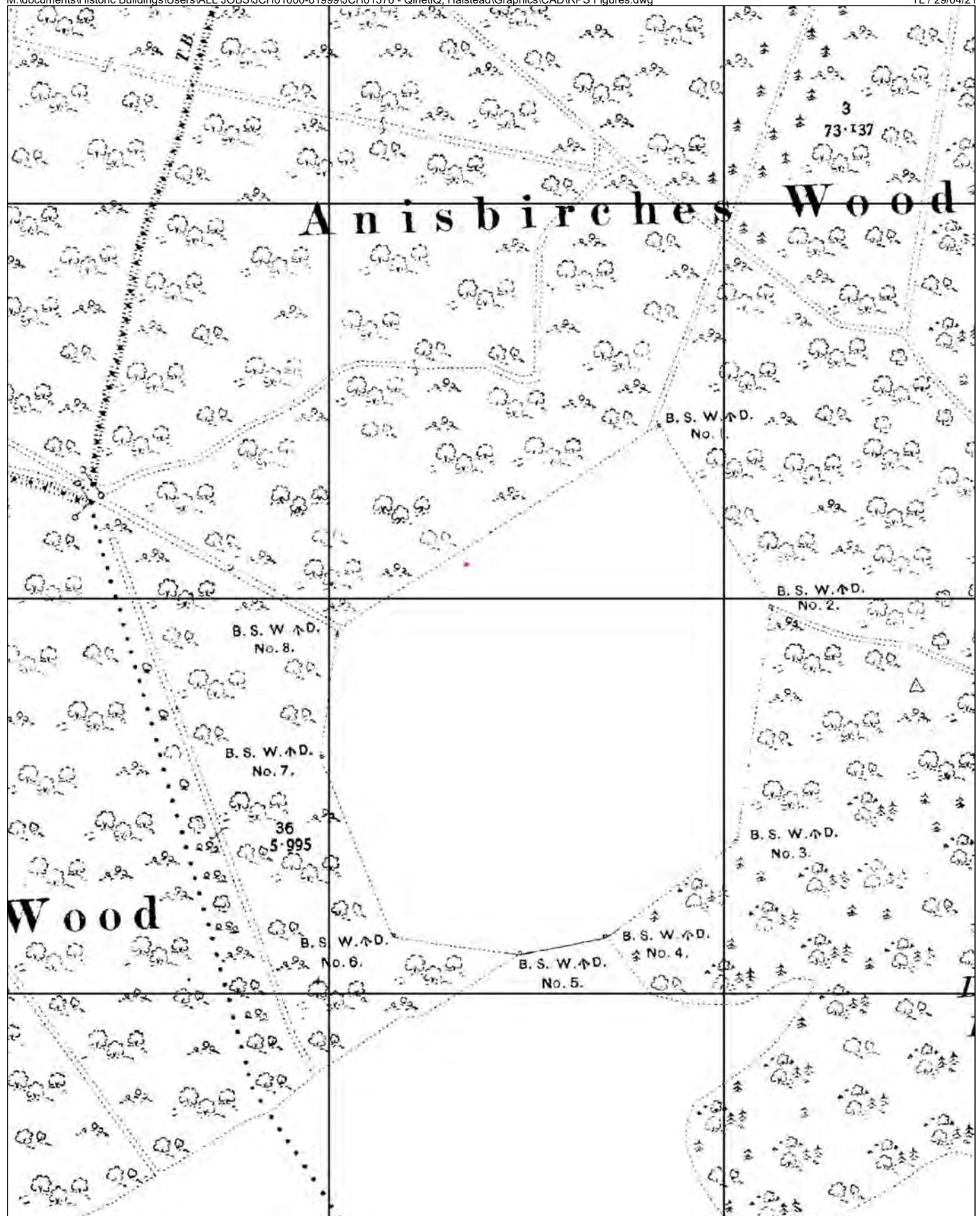


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Figure 5

The London Mobilisation Centres
(Source: David Moore, *The
London Mobilisation Centres*)

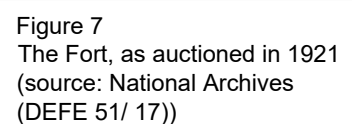
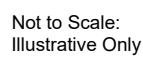


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Figure 6

1909 Ordnance Survey Map





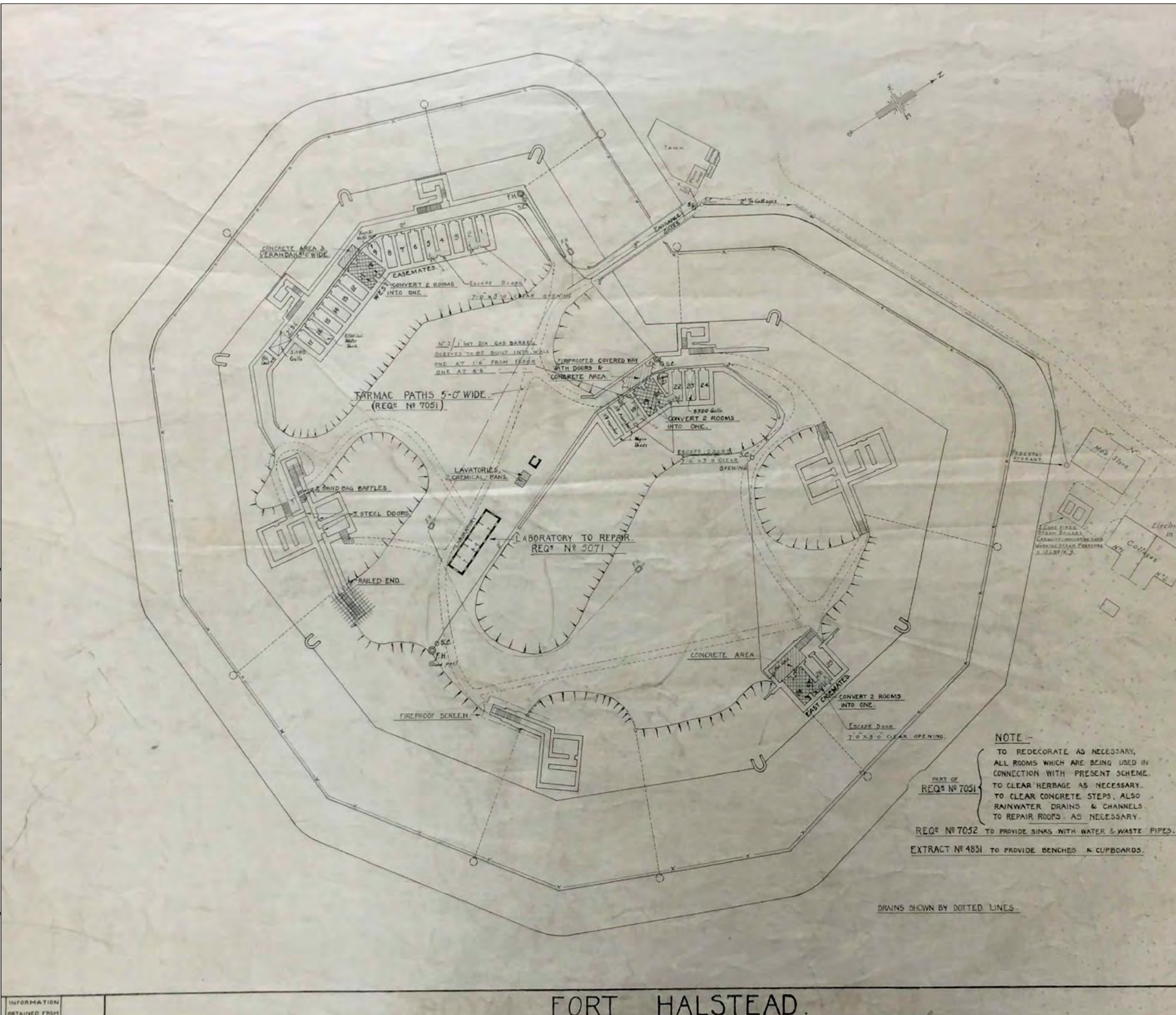
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Figure 8

1936 Ordnance Survey Map

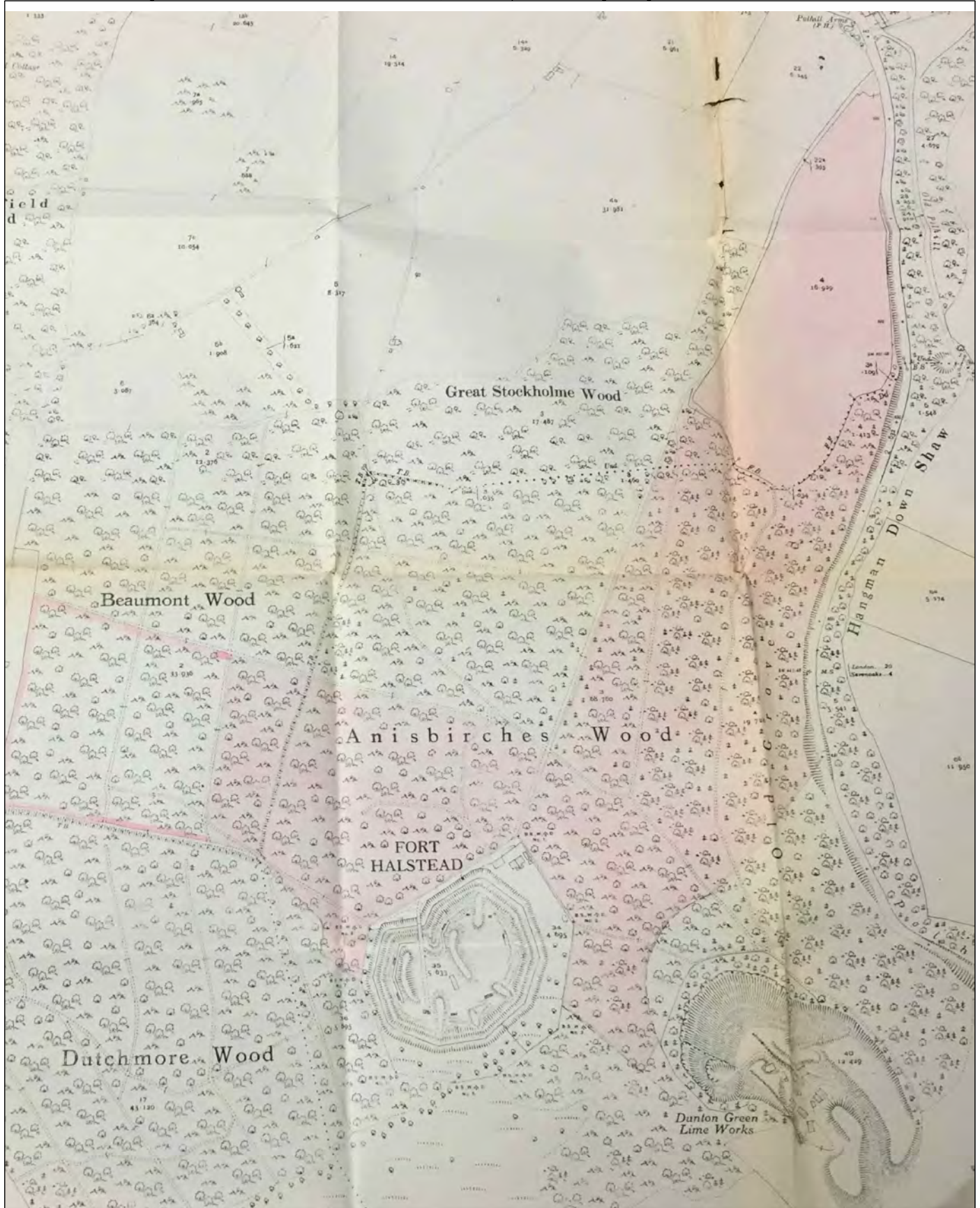
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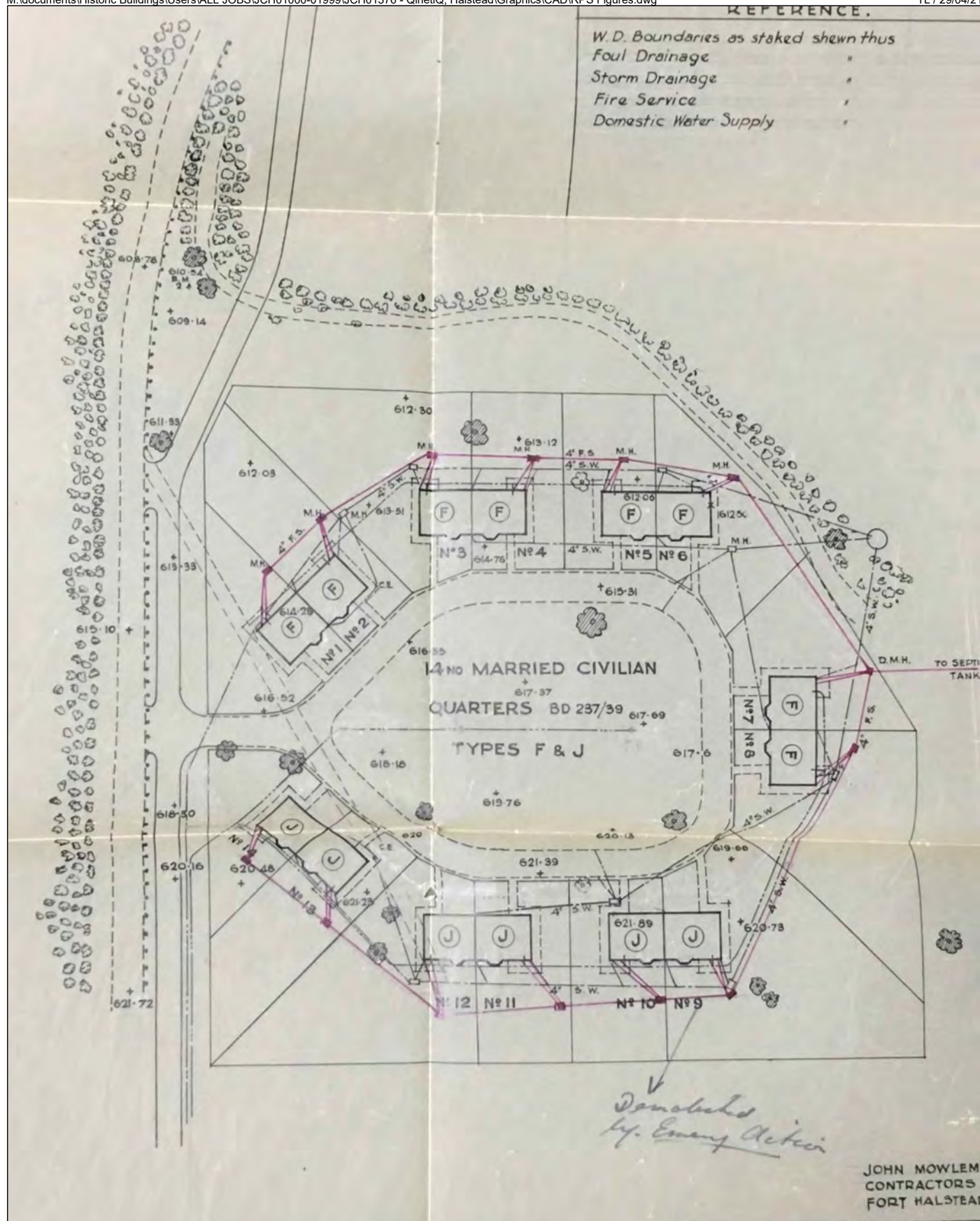
Figure 9
1937 Plan showing proposed alterations to the Fort
(source: National Archives (WORK 43/ 578))



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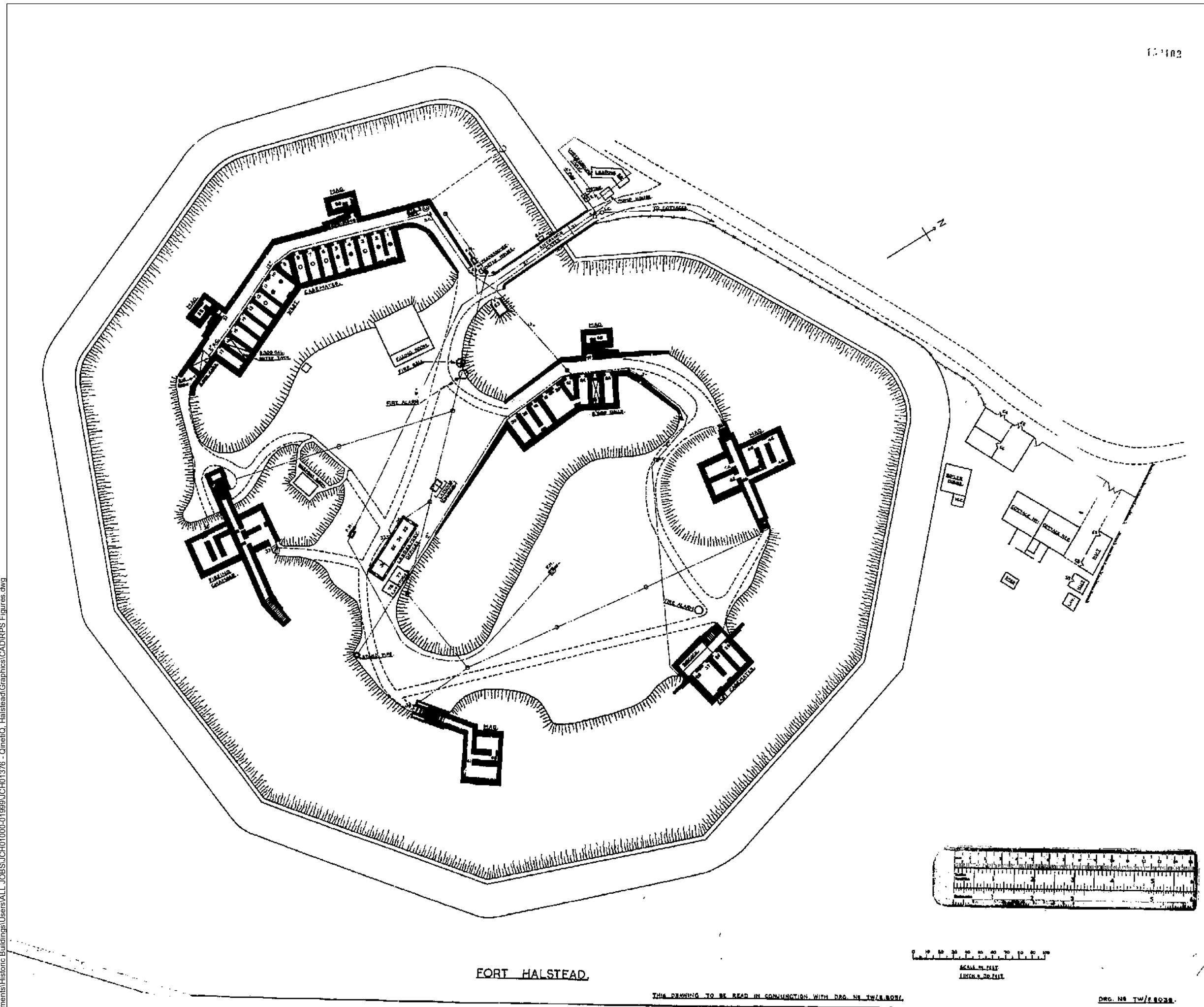
Figure 10
Additional Land Purchased in
1939 (Source: National Archives
DEFE51/ 17))



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Figure 11
Plans c.1940-1941 showing nos
1-14 Fort Road (source: National
Archives (AVIA 22/ 2304))



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Figure 12
Wartime plan of the immediate area
of the Fort



**MAKING
COMPLEX
EASY**

Figure 13

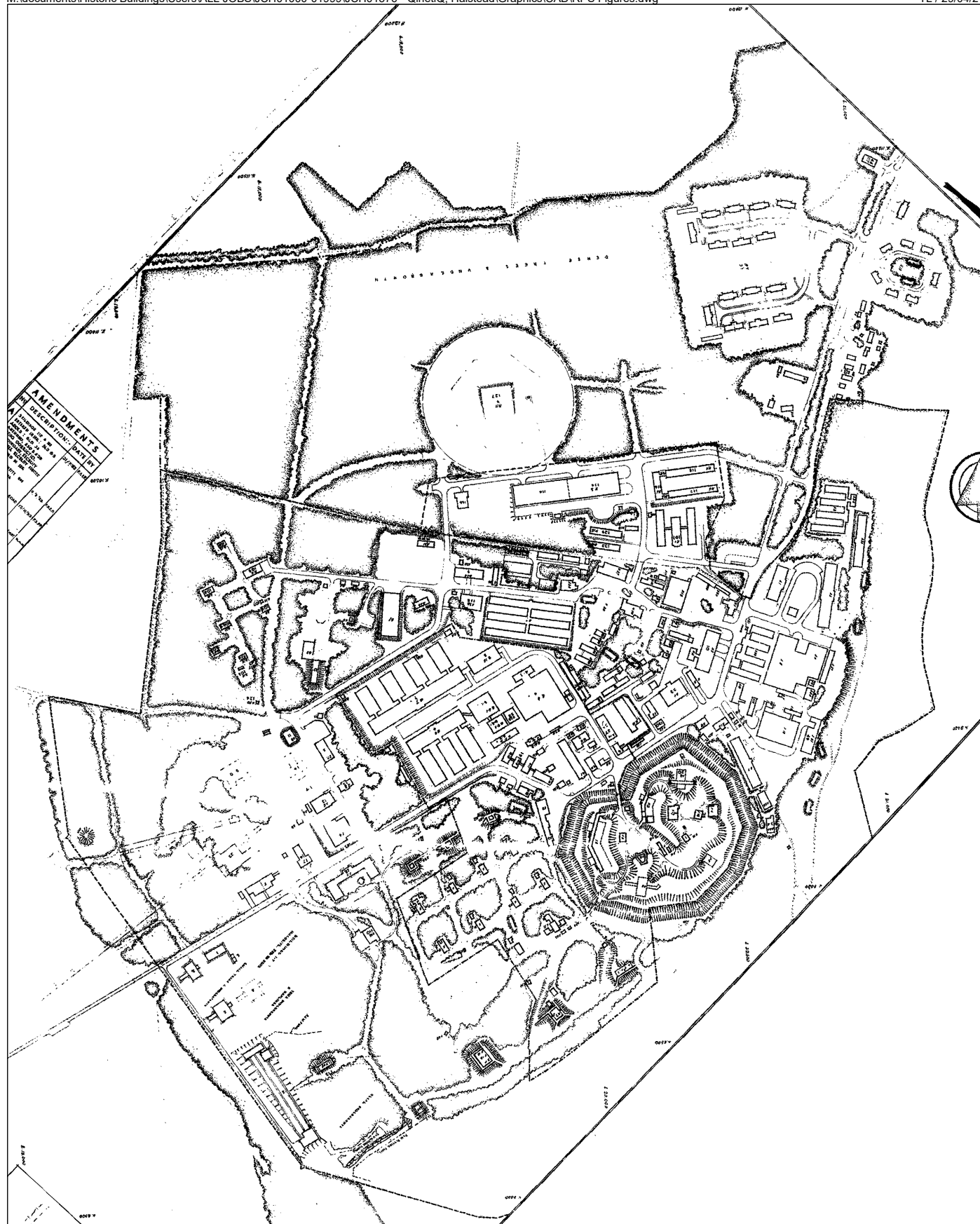
Plan of Site in 1947



**MAKING
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Figure 14

Plan of Site in 1949

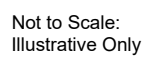


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Figure 15

Plan of Site in 1952





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**MAKING
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Figure 17

Plan of the Site in 1973

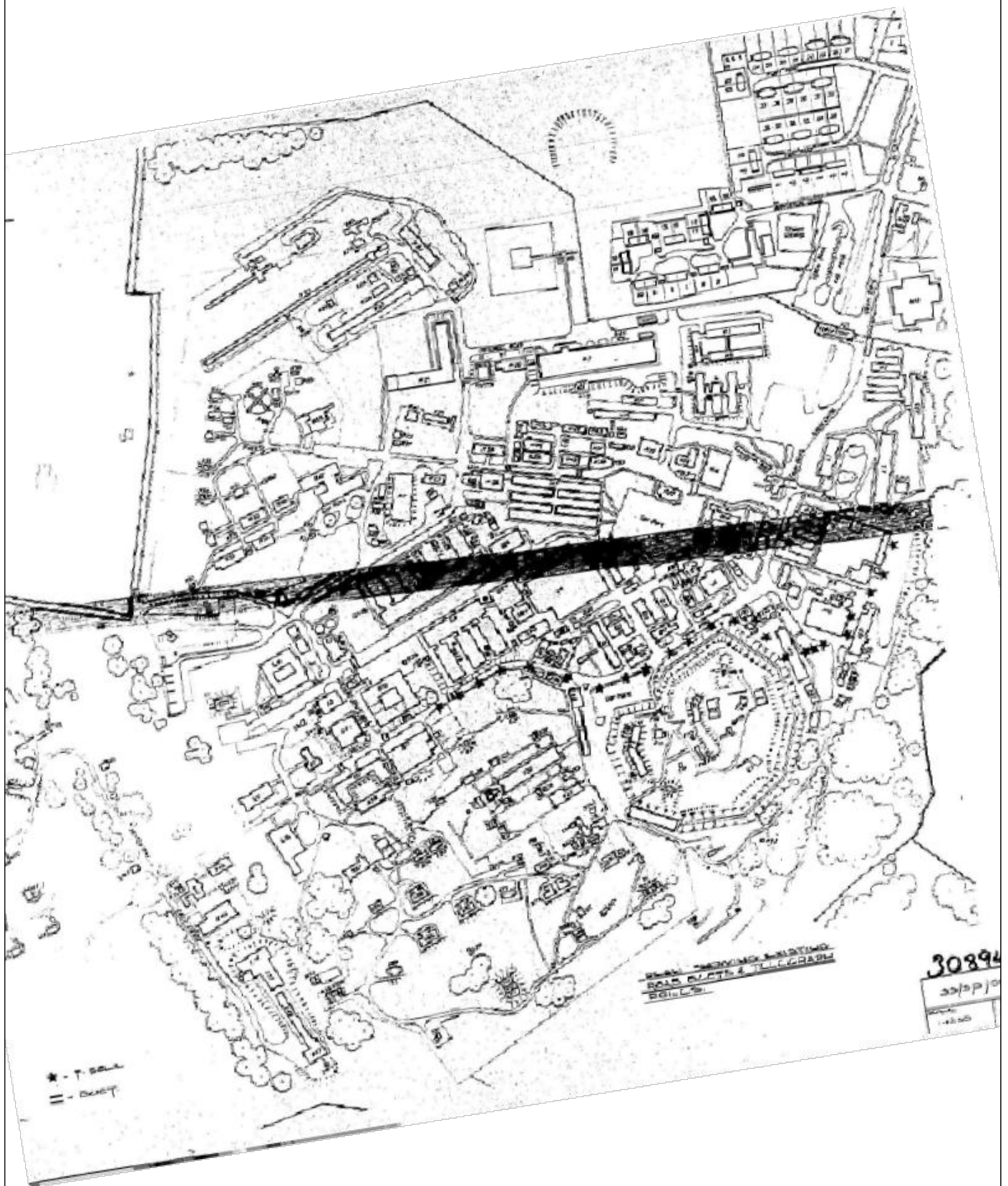


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Figure 18

Plan of the Site in 1973

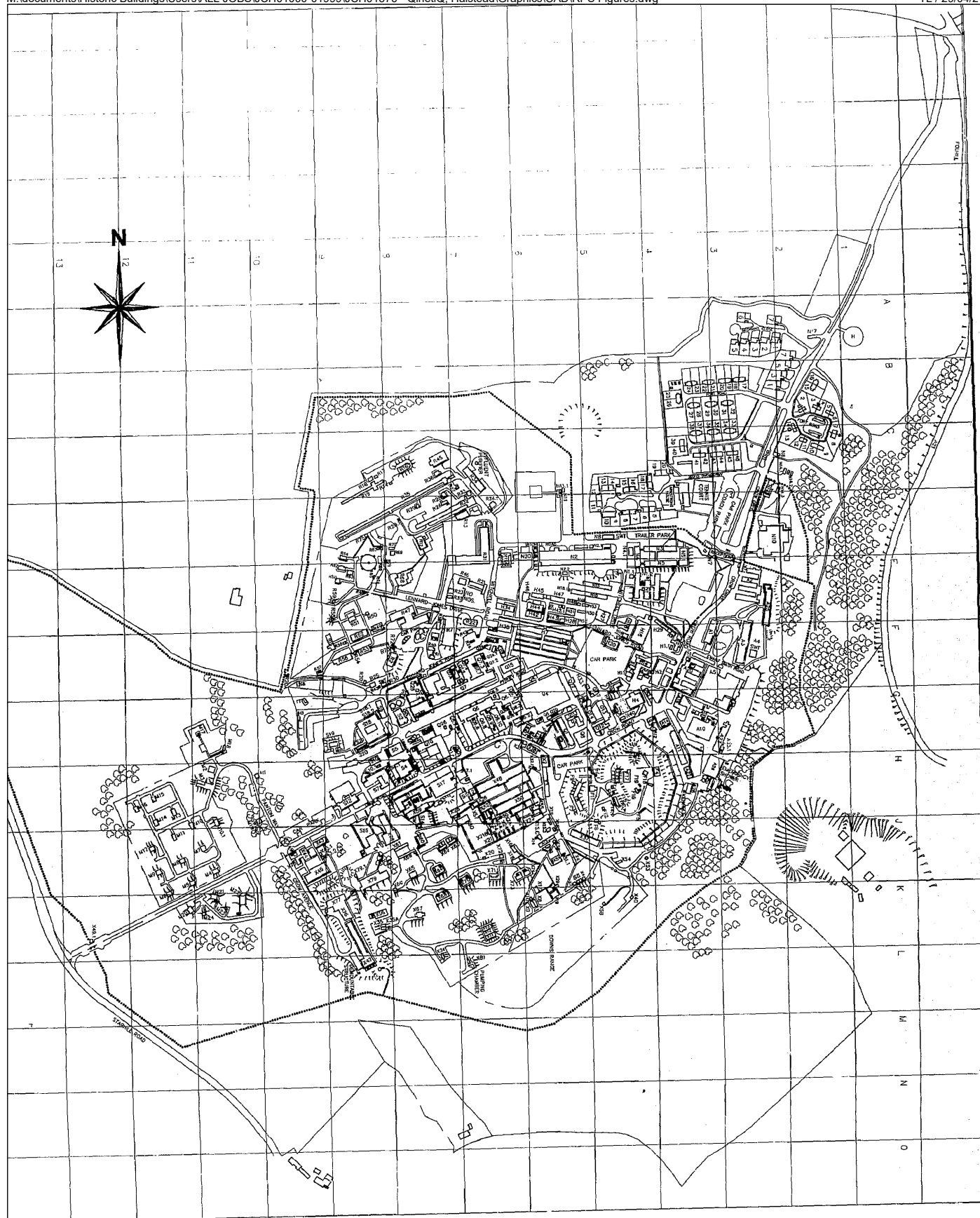


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Figure 19

Plan of Site in 1986, showing the Site at its maximum extent



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Figure 20

Plan of Site in 1993

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