Bembridge Fort, Isle of Wight

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Bembridge Fort, Isle of Wight

Report on Archaeological Investigations

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Summary

Bembridge Fort is a largely intact example of a brick built polygonal land fort, which was constructed between 1862 and 1867 as part of the recommendations of the 1860 Royal Commission on the defences of the United Kingdom. It is a Scheduled Monument and is owned by the National Trust, who have commissioned this building recording project.

The project is focused on understanding the Officers' Quarters at the east end of the Parade Ground, specifically the sash windows which are in poor condition and require repair work to the joinery. This repair work needs to be informed by a better understanding of the window joinery, it's construction and phasing. In addition to this a programme of building recording was also required of surviving Second World archaeology at the fort, including two Allan-Williams Turrets, a Spigot Mortar Emplacement and features relating to the use of radar on the site.

The investigation into the Officers' Quarters including producing a 3D photogrammetric model of the elevation, which was annotated to illustrate phasing and construction. This showed that the 1860s elevation has undergone a programme of repairs which is thought to date from the early-1930s. At this time the Officers' Quarters were modified which led to the infilling of former doors and also saw repairs to the sash window joinery. A further phase of repairs led to the partial infilling of windows to shorten them in length, and the insertion of double doors at the south end of the elevation. This date of this phase of work is uncertain, but may date from between the mid-1930s to the mid-1940s.

The investigation into the surviving window joinery was informed by a specialist in architectural detailing, Charles Brooking, who visited the site. All the main windows have been replaced in the 1960s but there is varying survival of 19th-century window joinery (ie shutter boxes etc fixed into the openings). One of the most important discoveries was the fact that the windows were originally fitted internally with vertical-sliding counter-balanced shutters, a detail widely used until the 1880s. The unexpected discovery was that the two types of sash window construction were employed at the Officers' Quarters, a more expensive construction in addition to a more economical arched window design.

It is possible that this second form of construction dates from the second, 1930s, phase of work as investigation into the sash pulleys suggest that work was undertaken to the windows at this time. Further investigation is needed to better understand the phasing of the joinery, which will necessitate the removal of the 1960s side panelling to the windows which is obscuring the earlier joinery.

The investigation into the Second World War archaeology recorded the known features from this phase, such as the radar buildings and related features, as well as the two Allan-Williams Turrets and Spigot Mortar Emplacement. During the investigations, two further Spigot Mortar Emplacements were identified, in addition to two Motely Stalk emplacements, a Rifle Trench and an Open Machine Gun Position. These features were also recorded so that an informed decision could be made of the conservation of the surviving Second World War archaeology.

Clearly, there is considerable potential for further work in order to better understand the Second World War remains, and the surviving 19th-century sash window joinery. The removal of some of the 1960s timber panelling internally and externally would greatly enhance understanding of the surviving 19th-century joinery, as well as closer examination of the pulleys. Initial investigations suggest that Bay B is the best preserved of the eight bays because it retains its 1860s construction with no later adaptations and modifications, and because the windows have been confirmed as retaining surviving 19th-century joinery which is of the superior form of construction.

The conservation of the Second World War archaeology would also benefit from further research particularly through aerial photograph analysis to better identify surviving features from this phase. Further on-site investigation would also help to confirm the functions of newly identified features from this phase, and how these operated in the Second World War, both in relation to the fort and the wider military landscape of the Isle of Wight and beyond.

1 INTRODUCTION

1.1.1 This report has been commissioned by the National Trust to provide information about the Officers' Quarters at Bembridge Fort in the Isle of Wight, which is a Scheduled Monument. These quarters form part of the original 1860s construction of the fort, located at the east end of the Parade Ground. It is formed of eight casemated bays constructed in red brick, which have undergone alterations.

1.1.2 The sash windows which are now in a poor condition and require repair work which needs to be informed by a better understanding of the window joinery, it's construction and phasing. The elevation was recorded using photogrammetery and the windows and elevation investigated and recorded to better understand the phase and construction of the elevation, particularly the window joinery.

1.1.3 In addition to this, a programme of building recording was also required of surviving Second World archaeology at the fort, including two Allan-Williams Turrets, a Spigot Mortar Emplacement and features relating to the use of radar on the site. During this work a number of additional Second World War features were identified, which were also recorded. The recording work and the investigation into the Officers' Quarters is required to gain Scheduled Monument for works, and to ensure the conservation works are fully informed.

1.2 Location

1.2.1 Bembridge Fort is a fort built on the highest point of Bembridge Down close to the village of Bembridge, on the east coast of the Isle of Wight (Fig.1). It is situated at national grid reference SZ 62405 86082, from where the fort commanded the space between Brading Haven and the sea.

1.3 Significance

1.3.1 Bembridge Fort is a Scheduled Monument (list entry number – 1012717). The significance of this Officers' Quarters elevation is enhanced by the fact that the corresponding elevation at the west end of the fort has been masked by the construction of a workshop in the 1960s. It is understood however, that the original fabric has been retained behind the 20th century brickwork.

1.4 Scope of work

1.4.1 An outline brief for the work was given by Gary Marshall, National Trust Archaeologist.This project is focused on the eight bay east elevation at Bembridge which contained the Officers' Quarters, as well as features and structures relating to the Second World War use of the fort. The remaining fort was not included in the scope of works. The key focus of the work is to understand the existing window joinery, its phasing and construction, as well as to produce elevation drawings illustrating construction and phasing.

1.4.2 The second element of the scope of work was to record a number of extant features on the fort's terraplein relating to the Second World War use of the fort. A number of additional Second World War features were identified during the investigation, which were not included in the scope of works, but were also recorded.

1.5 Aims and Objectives

1.5.1 The overall objectives of the project was to provide a record of the Officers' Quarters at Bembridge Fort, particularly the sash windows, and to better understand the construction and phasing of the elevation and joinery. A second overall objective is to record and investigate a number of Second World War features within the Scheduled Monument.

1.5.2 Individual aims are to -

- Review current understanding using desk-based information (paticularly Cantwell 2004)
- Create a 3D photogrammetric model of the Officers' Quarters elevation.
- Illustrate phasing and change in the elevations (blocking, insertion of lintels etc.)
- Provide detailed analysis of one typical bay with sectional details through joinery showing how the bay was constructed.
- Produce detailed illustrations (elevation, plan and cross section) of the most representative bays.
- Describe the design phasing and construction of each bay and the joinery within that bay and cross relate these to appropriate photographs.
- Produce an assessment of significance of the various phases and also provide a recommendation for the design of a reconstructed bay.
- Examine joinery internally and externally to understand how the architraves relate generally to joinery used in internal doorframes.
- Record Second World War features on the fort including iron fixtures associated with the chain home low radar installation, two fixtures relating to the Allan-Williams gun emplacements and a spignot mortar emplacement.

1.6 Methodology

1.6.1 The external elevation of the Officers' Quarters was recorded by photogrammetric survey, using a camera mounted on a pole. This information was processed in our offices to create a 3D model of the Officers' Quarters.

1.6.2 On site, historic drawings of the Officers' Quarters including elevations and plans (obtained from the National Archives), were annotated to describe the built form of the elevation and record archaeological features. Scale drawings of the sash windows including a sections through the windows joinery were made of representative windows that retained primary features. Analytical description was added to the drawings, and digital photographs were taken using an SLR camera.

1.6.3 Charles Brooking, a specialist in 19th Century window joinery, provided specialist advice on the sash windows, particularly their construction and phasing. A number of the sash window pulleys were carefully examined as were an internal set of pulley weights to provide information about the date of the window joinery, and the extent of survival of the primary frames. Charles Brooking's report has been referenced through this report, and is included in the Appendix of this report.

1.6.4 Historical research was undertaken to help widen the understanding of the Officers' Quarters and Second World War features. This research was based on the principal secondary sources and historic drawings identified at the National Archives, these are listed in the bibliography.

1.6.5 The Second World War features were also recorded using digital photography, and analytical notes were taken to describe the history and function of the buildings and features. Historical

research provided information about the role of the military features, and their functional relationship with other military installations on the island and further afield.

1.7 Acknowledgements

1.7.1 Oxford Archaeology would like to thank the National Trust for commissioning this project, in particular Paul Rayner and Gary Marshall.

2 GENERAL DESCRIPTION AND HISTORY OF BEMBRIDGE FORT

2.1.1 The following summary description is taken largely from the report on Bembridge Fort for the National Trust by Anthony and Rosemary Cantwell in 2004, along with information taken from Oxford Archaeology's report on 19th-century Fortifications (Phimester 2017). A more detailed description of the history and phasing of the Officers' Quarters and Second World War archaeology is given in Sections 3 and 4.

2.1.2 Bembridge Fort is a largely intact example of a brick built polygonal land fort, it was built as part of the 1860 Royal Commission defences of the Isle of Wight, and was intended to be a keep to the four coast batteries in Sandown Bay (Fig.2) (Plates 1-3). In 1861 the first plan of Bembridge Fort was devised by Major W.F.D Jervois, and following revisions construction began in 1862 by contractor George Tyrell. The fort was completed in July 1867 with Six 7-inch rifled breech-loading (RBL) guns were placed on the salients on the terreplein.

2.1.3 It occupies the heights on Bembridge Down, commanding the space between Brading Haven and the sea. It has a deep dry ditch surrounding it with a covered way and rifle parapet on the outer side, complete with crochets. The fort was to serve as a last stand if the Isle of Wight was invaded, and was to be armed initially with 20 guns. There were some alterations to the original design when single caponiers were substituted for double ones and the scarp and counterscarp were fully revetted.

2.1.4 The original armament was replaced in 1893 by six 64pr, 71cwt RMLs on 6ft parapet carriages and two 4-inch RBL guns on siege travelling carriages. The 64prs were removed in 1900 but the 4-inch RBLs remained until 1903. The fort then stored the moveable armament for the eastern end of the island until at least 1910. Between 1880 and 1900 the fort was used as an experimental test facility for anti-submarine and anti-torpedo devices. Two cables ran from the fort to the sea and a magnetic field between was to be used to detect any metal objects passing. The fort, for much of its existence was used as a barracks and a store by various army units stationed in the locality.

2.1.5 At the outbreak of the First World War Bembridge Fort was probably used as a store and a command post for No.7 Coastal Fire Command (Culver), from which all the Sandown Bay defences might be directed. At the end of the war the fort became a storage depot for Territorial troops attending summer camps at Yaverland Battery.

2.1.6 When Culver Down Battery was completed in 1906, the fort acted as a co-ordinating point for the 9.2-inch guns at Nodes Point Battery and Culver Down Battery. A plan dating from 1928 shows that the fort had been altered by this date, it shows only two passageways at this period meaning that the others must be after that date and the entrance lobbies have also been removed (Fig 3). In 1938 indicator loops were laid on the seabed of sea channel into Spithead to detect the passage of enemy submarine and small craft were controlled from Bembridge Fort by naval detachment.

2.1.7 Bembridge Fort saw a programme of improvements in the Second World War, largely related to the installation of radar, which are outlined briefly below and explained in more detail in Section 4. At the outbreak of the Second World War Bembridge Fort became the headquarters for the reactivated Culver Fire Command by 527 Coast Regiment RA (TA). Mobile search lights and 3-inch AA guns were stationed at Bembridge Fort.

2.1.8 In 1940 Bembridge Fort was used for experiments with Chain Home Low (CHL) radar and a set was subsequently installed at the old Commander Royal Artillery's (CRA) cell. Hardened defences were added including two Allan-Williams Turrets, Spigot Mortar emplacements, rifle

and machine gun trenches. These were for local ground and light AA defence. At the end of the war the CHL radar was closed down, and a caretaker was appointed.

2.1.9 The fort remained in the hands of a caretaker from 1945 to 1948 when it was relinquished. From then on until 1965 the property was derelict and vandalised until the Isle of Wight council purchased the property in 1965 and the National Trust bought it from them in 1967. A free-standing industrial unit was constructed at the west end of the parade ground and this was rented to a light engineering firm, Micronair, who are still based at the fort.

3 OFFICERS' QUARTERS (BAYS A – H)

3.1 Historic Plans and Elevations

The National Archives

3.1.1 Several drawings of the elevation were identified at the National Archives in Kew, which formed the basis for the survey. These are -

- WORK 78/4128 – includes an elevation drawing of the Officers' Quarters dated 18th March 1889 (Fig.6), and a drawing of a section of the elevation (probably Bay G).
- WORK 43/214 – plan of the Officers' Quarters dated 31st January 1862, showing the internal layout and function of the quarters (Fig.7).
- WORK 43/213 – short section of the Officers' Quarters (part of bays B and E, and Bays C and D) dated 31st January 1862 (Fig. 8).

3.1.2 General drawings of the fort were also identified (Fig.2).

Historic England Archives, Swindon

3.1.3 The Cantwell report on Bembridge Fort identifies a further drawing which is held in the Historic England Archives in Swindon, which dates from 1933 and shows the work that was carried out at this time (Reference – WD414). The investigations showed that the 1930s are a key period in the history of the Officers' Quarters and its sash windows, as initial investigations suggest that the windows received an overhaul at this time. Due to works taking place at the Historic England archives it was not possible to access this drawing within the time frame of this project, but it would be useful to review this drawing if further works are planned.

3.2 Summary Description and Phasing of the Officers' Quarters Elevation

3.2.1 The east facing elevation of the former Officers' Quarters consists of eight casemated bays constructed in red bricks which includes vitrified bricks (Plate 4) (Fig.4). As designed, these casemates were intended to house four officers and their servants, as well as the Officers' Mess, but by 1889 the two southernmost casemates had been redesignated as the Master Gunner's Quarters. At this time it is thought that very few soldiers were living at the fort (Cantwell, pg.27), as it was too remote to make a good barracks and the centre of military activity was at Sandown.

3.2.2 Each of the eight bays has three openings (doors or windows), with the exception of the two narrower central bays, which have a door and window within each opening only. For ease of description, each bay is referenced A-H from north to south, and each opening allocated a number, which run from A1 to H22 (Fig.4).

3.2.3 An elevation drawing identified in the National Archives dates from 1889 and shows the external arrangement of the Officers' Quarters as built (Fig.6) (TNA - WORK 78/4128). This shows the eight bays with access doors within each bay, either at the north or south end. Each bay has one large and one small window opening, which are of the same height and width in each bay. The two central bays (D and E) have only one window and one door, with a larger window opening than evident on the other bays. The floor plan dating from January 1862 shows that the openings follow the same arrangement as described in the 1889 elevation (Fig.7) (TNA - WORK 43/214).

3.2.4 A plan dating from 1928 (Fig. 3) shows that there were only two passageways at this time, so the others must be after this date. The plan also shows that some of the entrance lobbies had

been removed by this point, suggesting that the quarters may have been altered before the 1930s.

3.2.5 The bricks of the 19th-century phase of construction (Phase 1), measure 0.22 by 0.06m, and are laid in English bond with lime pointing. Each opening is framed by a brick arch formed of six rows of headers, below which the elevation is stepped in and contains two to three openings. Each bay, with the exception of the central narrow bays (D and E), have one tall and one shorter window opening and one door (Plate 5). The arch of its bay is mirrored above each opening, which is formed in rubbed brick voussoirs, which are horizontally scored. At the time of construction this technique would have been used on alternate stretchers, but weathering has resulted in the loss of the false lime pointing in places. Each window has a Portland stone sill. Air-bricks, typical of mid-Victorian designs, are evident within the elevation and elsewhere at Bembridge Fort.

3.2.6 The original arrangement of the sash windows is shown in drawings obtained from the National Archives dated 1862 (WORK 43/213), which show part of bays B and E, and bays C and D (Fig.8). These confirm the construction of the elevation with brick arches above the bays and openings, and also shows the glazing arrangement which is now lost. The windows have a vertical glazing-bar directly above the central arched pane, and there is a fanlight above the panelled door.

3.2.7 These drawings indicate fully operational sash windows, however the smaller windows would have had a small one-pane high lower sash window, and the joinery detailing may have been designed to mimic a meeting-rail profile on a fixed light (Brooking 2018). Alternatively, the top sash may have been originally fixed owing to its relatively small opening area. There may have been an issue with ventilation which might explain the possible replacement of the windows with an adjusted sash arrangement, allowing for greater ventilation. This would explain the difference in the box-frame construction, i.e – the square head behind the arched outside lining.

3.2.8 Today, the elevation retains much its 19th-century appearance, although there has been some infilling of brickwork to doors and windows (Plate 6) (Fig.5). This second phase of work at the Officers' Quarters is likely to date from the early-1930s, when the Officers' Quarters were modified, with the work being completed by 1934. At this time the three bays at either end of the elevation were formed into married quarters, with each set compromising a kitchen/bathroom, living room and bedroom (Cantwell 2004).

3.2.9 The three casemates were connected by driving new doorways through the side walls at the rear of the rooms, keeping the front door in the centre casemate and blocking up those of the other two. The internal access doors to the rear access passageway behind the casemates were retained. However, some command facility remained, in that the two central casemates (D and E) continued as the Commanding Officer's Office and Telephone Room respectively (Cantwell 2004). Today, these two bays retain their original arrangement, each bay with one door and one window, although these have been replaced probably in the mid-20th century.

3.2.10 In total four former doorways were infilled and small top hung casement windows inserted to allow for the changed use of the internal space (in openings A1, C7, F16 and H22) (see 3.4 for a detailed description) (see Plate 6). The red brickwork of the infilling is of a similar size to Phase 1 and also laid in English bond, but the pointing is light grey in colour and more cementitious with inclusions. At this time the sash windows are thought to have been updated; investigation into the joinery including the pulleys strongly suggest that modifications to the sash windows date from the early 1930s.

3.2.11 At this time the internal fixtures and fittings were also updated including imitation panelling, doors between the separate quarters and architraves surrounding the door frames. Other features from this period include the salt-glazed pottery air-brick, of a design produced in the *c*. 1925-35 period, which was probably fitted at the same time as the 1930s improvements. This pattern was also produced in terracotta with a matt red slip-finish and was widely used in the housing stock of the 1920-30s (Plate 7) (Brooking 2018).

3.2.12 The sash windows have been considerably compromised by several phases of alterations, and the coastal weather conditions has affected the joinery (particularly the sills), which are in a fragile state (Plate 8). Architectural details have, however, been preserved such as the rubbed brick voussoirs, and features such as the boot scrapes (Plate 9). Seven of the latter remain, one in each bay with the exception of bay H, which may have been lost with the insertion of the double doors. These indicate the position of former doors.

3.2.13 At the south end of the elevation, a third phase of brickwork was identified, which was used for the infilling of three windows to shorten them in length and allow for the insertion of smaller windows (see Fig. 4c and 4d and Plate 6). This brickwork is evident above the later concrete lintels within openings F14, F15, G18 and in H21, where there is an infilling for the insertion of double doors. The bricks are more orange in colour than the earlier phases and slightly larger (0.23 by 0.06m), and have harder more cementitious pointing. The date of this second phase of infilling is not clear, but appears to be later in date than the c.1925-35 phase. Phase 3 is therefore thought to date from between the mid-1930s and early to mid-1940s, after which the War Office abandoned the fort.

3.2.14 The original arched sash windows are thought to have been removed and replaced in the mid-1960s when the fort was first owned by the Isle of Wight County Council, and then the National Trust from 1967. The top-hung casement windows and the timber doors with large window, are typical of this period. They are all painted white although this is now peeling off, exposing the timber to the coastal conditions and furthering decline.

3.3 Summary Description of the window joinery (Charles Brooking)

3.3.1 This summary section is largely taken from the report produced by Charles Brooking for this project, the following section which describes each bay also incorporates some of the findings from this report (Brooking 2017, Appendix C).

3.3.2 Charles Brooking undertook a detailed examination of the surviving sash-boxes and associated joinery at Bembridge Fort, which threw up some interesting and unexpected findings. Drawings of the sash windows were completed as part of this project, which are illustrated in Fig. 9 of this report.

3.3.3 Although the original arched sashes were removed and replaced (circa 1968) with top-hung casement windows typical of the late-1960's, enough original fabric survives to reinstate one bay to its 1867 appearance.

3.3.4 One of the most important discoveries was the fact that the windows were originally fitted internally with vertically-sliding counter-balanced shutters, a detail widely used from the mid-Georgian period until the circa 1880's. This form of window shutter was often employed when the depth of the wall did not allow for traditional folding shutters. Although most of the sash-boxes have suffered from decay, particularly around the sill area, they are all capable of repair and restoration in the hands of an experienced joiner.

3.3.5 When the sashes and the internal sliding shutters, along with the parting beads and staff beads had been removed, the new timber frames with top-hung lights were fitted set back from the

face of the frame, sitting in the sliding shutter box-frame. In several cases the pulley-stiles were then covered with new boards (which has made clear identification of the windows virtually impossible without their removal).

3.3.6 The unexpected discovery was the fact that two types of arched sash window construction were employed in the Officers' Quarters, the first of these being the more expensive and superior form (Plate 10). Here the upper sash has a true arched head and sash-frame, the lower sash being provided with a square head to allow its full-height operation, appearing as an arch when the sash is lowered. This method of construction was quite complex and expensive, many architects and builders of surprisingly high-quality buildings frequently opting for the cheaper type. The advantage of the more expensive version was principally aesthetic - the sash being properly arched did not have the somewhat disturbing effect of a flat horizontal head when the window was opened.

3.3.7 The second form of construction was the most widely used and cheaper form of arched window design (Plate 11). The outer lining itself was arched behind the rubbed-brick arches whilst the sash-frame has a square head, the upper sash itself having a horizontal head with solid or glazed spandrels, which become visible when the sash is lowered. This form of arched sash window construction was extensively employed from the late-Georgian period until the present day, being widely used in railway stations, Victorian villas and hotels.

3.3.8 It appears that the original windows at Bembridge Fort were of the superior form. It is most unusual to encounter two forms of window joinery of this type used alongside each other in such a project, indicating later alterations and modifications. The findings of this report are based on previous examination of military sash window joinery both at Fort Widley and Fort Nelson, Portsmouth, and at the 1867 Southsea Barracks, as well as Maidstone Barracks, Kent, built in the 1850's, and military buildings built in the 1850's-90's at Aldershot, Hampshire.

3.3.9 At both Fort Widley and Fort Nelson the sash window ironmongery - e.g., the sash-pulleys - were supplied by Archibald Kenrick & Sons of West Bromwich, one of the leading ironmongery companies of the Victorian period. Kenricks were founded in 1791 and by the mid-Victorian period were producing a wide range of household and architectural ironmongery, including flat-irons, Holloware, coffee-mills, door-knockers and an extremely comprehensive range of sash-pulleys, catering for all tastes and pockets.

3.3.10 Several of the sash-pulleys were examined at Bembridge Fort. Interestingly, the original axle-pulleys specified were entirely cast-iron. These included good-quality cast-iron axle-pulleys made by Kenricks with brass bushes to the axles, and three other types produced by unidentified manufacturers, of designs widely used in the early and mid-Victorian periods (Plate 12). This choice was probably driven by the combination of cost and an awareness of the effects of a marine environment.

3.3.11 It is interesting to note that at Fort Widley the more expensive axle-pulleys with brass face-plates and wheels were specified. It is possible that, as in the case of The Grand Hotel at Brighton, designed by John Whichcord in 1864, cast-iron was specified owing to the fact that a combination of iron and brass face-plates can be severely affected by rust in marine situations. Perhaps this is the reason why cast-iron sash-pulleys were specified. The cast-iron sash-pulleys were originally supplied with a painted iron face-plate. It is extremely rare to encounter sash-frames with varying joinery details in such a relatively small contract. When this has been the case, invariably the work has been altered later or the window replaced in a later phase of works.

3.3.12 One of the cheaper forms of sash-frame was examined at Bembridge Fort, this had a square head for both sashes at the Officers' Quarters, Bembridge Fort. The pulleys to this frame

indicated a date of circa 1925-34 (Plate 13). These pulleys have thin stamped-brass face-plates with brass screws and are of designs which are typical of the 1925-34 period.

3.3.13 Other differences included the pocket-piece arrangement, there appeared to be no evidence of earlier screw-holes or fixings for earlier pulleys. These findings strongly indicate that the modifications and possible replacement sash-frames might belong to the circa early 1930's works undertaken to the Officers' Quarters, which included stylised imitation panelling internally, doors between the separate quarters, and other changes.

3.3.14 Great care was undertaken to match the joinery detailing externally as both forms of sash-boxes have beaded outside linings. Owing to the existence of cover-boards obscuring the pulley-stiles, it was only possible to examine a few of the windows in great detail.

3.3.15 The possibility that a number of the sash windows in the Officers' Quarters date from the circa 1930's raises the question as to why they were replaced in the first instance. It is possible that originally fixed lights were used for reasons of economy in each separate bay, which were later converted to fully-operational sashes. It appears that these fixed windows were originally fitted with two internal vertically-sliding shutters which were re-fitted when the new sash windows were inserted, if this was the case. It was not possible to examine ironmongery in the shutter weight-boxes as the pulley-stiles are completely obscured by the circa 1968 windows. A sash-weight was discovered in a partly-opened weight-box (Opening **C8**).

3.3.16 If indeed these sashes were replaced to provide more ventilation for the Officers' Quarters, it would have proved an expensive exercise. Apart from the stylised false panelling fitted in the circa 1930's upgrade and additional doors, an architrave profile was identified which appeared in the early 1920's and remained in production until the circa early 1950's. This might belong to the 1930's phase or possible Second World War modifications. The architrave around some door-frames appears both in the Officers' Quarters and in other upstairs areas altered in the Second World War. This area requires further investigation.

3.3.17 The original drawings clearly show the glazing-bar arrangements of the arched sashes (Fig. 9). There are several forms adopted for this design of window, the most sophisticated being the 'London pattern'. These differ from the 'London pattern', having a central vertical glazing-bar dividing the top two panes of the arched window.

3.3.18 Two forms of glazing-bar were used in military buildings of this type in the mid-Victorian period, the first being the elegant 'Grecian ovolo' profile, the second being a simple bevelled glazing-bar design, sometimes described as 'bevelled' or 'rustic'. At the 1867 Southsea Barracks building, which also had arched sashes, 'Grecian ovolo' mouldings were used. Interestingly, I noted that the casement windows fitted at Bembridge Fort in the 1890's-1900's period had 'rustic'/'bevelled' mouldings. These windows were seen in other parts of the building.

3.4 Detailed Description of Bays A to H

Bay A (Openings A1 – A3)

3.4.1 Bay A is situated at the north end of the elevation; the bay largely retains its primary construction, but a former access door at the north end of the bay (A1) has been infilled with brick. This probably dates from the mid-1930s when a small rectangular casement window was inserted below the arch (also evident in openings A1, C7, F16 and H22) (Plate 14). This window (0.53 by 0.80m) has a concrete sill (0.69 by 0.13), which is of the same style (although later in date), as those of the original openings which gives architectural cohesion to the

elevation (Plate 15). At the top of the opening is a strip of iron which is now badly corroding, but provided a level platform for the row of headers above.

3.4.2 The infilling of the doorway facilitated the creation of a small internal room which is currently used for storage. A plan of the Officers' Quarters (Fig. 7), dated January 1862, provides evidence of the former use of this bay as a kitchen. The plan indicates that the former door provided entry into a small internal foyer area.

3.4.3 A boot scrape built into the brickwork to the right of the infilled doorway also provides evidence of the earlier entrance (Plate 16). There are a total of seven identical boot scrapes in the elevation, one in each bay with the exception of the south bay (Bay H), which was probably removed during the insertion of the double doors. The boot scrapes (0.23 by 0.41m) are recessed into the brickwork to a depth of 0.28m, and have been afforded architectural embellishment with a rounded segmental brick arch (of the same form as those over the window and door openings). The iron boot scrape remains extant at the bottom of the recess, and the internal brickwork of the recess has been painted white. The wall mounted design is typical of military buildings.

3.4.4 Centrally, there is a tall window opening (A2) which has been boarded up in the arched area at the top of the window (0.64 (h) by 0.89m (w)), below which the 1960s window has been inserted (see Plate 10 and Plate 17). The main section of this later window is fixed (1.11 by 0.8 m), with the top hinged section opening, although now this too has been boarded up (0.32 by 0.89m). This arrangement is also evident in bays B and C, with window openings of the same size evident centrally in bays F, G and H although these have been infilled with brick above the later window, or lost to the insertion of double doors (bay H).

3.4.5 In opening A2, the frame of the original sash window survives and two pulleys are visible, one to each side of the window positioned at the bottom of the arch opening. These are two original cast-iron axle-pulleys, produced by to an unidentified manufacturer. One axle-pulley was examined and this was found to date from 1862-67, this pattern of cast iron axle-pulley was widely used in the early to mid-Victorian period. It is of relatively cheap design, manufacturer unknown. It is similar to designs produced by Wood and W. Bullock of Birmingham, who clearly marked their products.

3.4.6 This window (A2) is of superior construction detail of the arched head and centrally-placed pocket piece which was originally bisected by the parting-slip. This window has suffered from extensive decay and has largely lost its original oak sill and the metal water bar between the base of the oak frame and Portland stone sill also survives.

3.4.7 The window to the east of the bay (A3) is less tall and of the same size as openings in bays B, C, G and H (Plate 18). This window is possibly part of the *c.* 1925-30s works and clearly illustrates the differences in joinery, A3 being of an inferior type of construction. The window retains an arched outside lining with a square head for both the upper and lower sashes. There are four pulleys *in situ*, two to each side of the window frame, one of which was examined as part of the investigation works.

3.4.8 This axle-pulley has a thin stamped-brass face-plate fitted to the cast-iron pulley-face by folding brass around the screw-holes, which was introduced in *c*. 1880. The brass screws and casting details of the pulley case clearly indicate a date of *c*. 1920-35. There is no evidence of earlier pulleys, indicating this sash-pulley is contemporary with this window, with its cheaper form of arch head. Internally, the frames survive for both window openings in bay A, although they are boarded up in the bottom half, removal of this would aid understanding (Plate 20).

3.4.9 Internally, the 19th-century architrave survive in places, such as the door frame leading to Bay B, but elsewhere it is no longer extant. There is also a 20th century (possibly Second World

War) architrave surviving, showing the continued use of the space. At the former entrance (A1) the 1889 plan shows a small foyer area, around the 19th-century architrave remains extant, although the inserted door is 20th century. The entrance leading to the connecting corridor is 20th century and the architrave has been removed, which is in contrast to the other bays where the 19th-century joinery remains largely *in situ.*

Bay B (Openings B3 – B6)

3.4.10 Bay B is significant as it retains the original arrangement of the bay with two windows and a door to the south (Plate 20). Both windows retain their original 1862-67 box-frames, although the sill area suffers from decay, the frames are quite repairable (Plate 21). Internally, the vertical sliding shutter-boxes are visible. Both windows B4 and B5 are of the superior construction previously described for opening A2 in Bay A. This bay was formerly used as a Mess Room (see Fig. **7**).

3.4.11 Window B4 has two pulleys extant, one to each side of the window. The sides of the window frame have been boarded up, but further evidence of the frame's construction (including pulleys) may well survive behind this (as found in opening H20 when the boarding was removed). The addition of the boarding has resulted in the loss of some of the original joinery fabric, the extent of which requires further investigation.

3.4.12 Internally, the frame of window B4 survives in the upper section but has been sawn off below the base of the present 1960s window (Plate 22). Evidence of the sash window may survive below the boarding, including the sash weight (as seen in Bay C), and requires further investigation. The main central section of the lower half of the window has been infilled with a cementitious render.

3.4.13 The surviving sash frame of opening B5 is of the same type as surviving in opening A2, which is also a tall opening where the sash is of superior construction with an arched head. There are no pulleys visible. As described above in relation to opening B4, the sides of the window frame have been boarded up, which appears to have resulted in the loss of some of the original fabric, but there may be surviving evidence of the frame beneath the boarding.

3.4.14 Internally, the frame survives in the upper half of B5 but it has been sawn off at the base of the window. There is boarding above the extant 1960s window, which if removed may reveal evidence of the primary sash window. As discussed above in relation to window B4, evidence of the sash window may also survive beneath the boarding of the lower half of the window.

3.4.15 Between openings B4 and B5 is a metal covering, presumably a vent, and there are electrical wires hanging down over the elevation. Towards the top of the elevation are four metal hooks for cables and an iron pipe. On the pillar between bays B and C is a salt glazed pottery air brick of a design dating from *c.* 1925-35, which was probably fitted at the same time as the 1930s improvements to the elevation (see Plate 7).

3.4.16 A metal drainage pipe extends the height of the brickwork between the bays, and near the base of the bay there is also a plastic drainage pipe extending towards Bay C meeting the metal drainage pipe running the height of the elevation between openings C7 and C8. There are several short metal pipes extending from the brickwork, roughly situated at the point the arches meet between the two bays.

3.4.17 The door in opening B6 is a replacement of the *c.*1960's-70's, although it sits within its original opening. Below the rubbed brick arch there is boarding but it is possible that the fan light of the original arrangement (see Fig. 8) survives beneath this. Internally, however the area of the

early fan light has been rendered over, which may have resulted in the loss of surviving primary fabric. The timber frame to the door may well be part of the primary construction, although this requires further investigation.

3.4.18 Internally, there is 19th-century architraving *in situ*, for example around the door leading to the rear connecting corridor (Plate 23). This is boarded up, presumably covering the 19th-century joinery, it is possible that features such as a fan light may be revealed above the door if this is removed. The architrave dates from the 20th century, some of it appears to be 1960s in date, including the door to the connecting corridor. Elsewhere, such as the door leading to Bay C, the architrave appears to date from the Second World War period. The skirting boards are all modern, although some 19th-century skirting survives in places.

Bay C (Opening C7 – C9)

3.4.19 Opening C7 is an infilled door which has a top-hung casement as described for opening A1 (Plate 24) (see 3.4.1). The entrance door would have previously provided access to the bay which was designated for use by an officer, but the door has been infilled to allow the space to be used for a WC (see Fig.7)

3.4.20 The sash-frames of windows C8 & C9 appear to be part of the primary construction (Plate 25, and see Plate 11) (Fig.9). Both sash-frames retain their original 1862-67 box-frames and internal sliding shutter-boxes. More investigation is required to understand if they are of the superior type of construction previously described. Interestingly, the pocket-pieces are situated behind what was the lower sash in the pulley-stile, as opposed to window A2, where they are situated in the centre of the pulley-stile, bisected by the parting-bead. The tall opening of C8 is boarded up at the top, which if removed may reveal further evidence of the sash windows.

3.4.21 A pulley survives to the side of each window frame, a pulley from window C8 was further investigated and this showed that it dates from *c*. 1925-39 period, and probably replaced the original cast-iron axle-pulleys. This secret axle pulley[1] has a stamped-brass face-plate, although the make of the pulley is unknown. Internally, the frames survive for the two openings which are boarded up in the bottom half although it is likely that the original sash window joinery survives beneath this (Plate 26). Removal of one of the boards revealed the sash window weight (see Fig.9)

3.4.22 There is a large metal drainage pipe between openings C7 and C8 which is painted brown, and situated in front of the 19th-century boot scrape. In the brushed arch of the former door entrance of opening C7, a piece of metal pipe protrudes from the brickwork. On the pillar between Bays C and D are four air-bricks which are typical of ornamental mid-Victorian designs and part of the primary 1960s construction of the elevation. A short metal pipe extends at the point where the two brick arches meet, below which is a metal hook.

3.4.23 Internally, the doors in the north and east walls may date from the Second World War period. The architrave surrounding the door leading to the connecting corridor dates from the 19th century, removal of the boarding above the door may reveal further contemporary joinery including a fanlight. The skirting boards are all modern.

[1] Secret axle-pulleys were first patented by Archibald Kentick & Sons in *c.* 1877. This complex casting-method, which involved casting the cast-iron pulley case around an existing pulley, was later copied by other manufacturers. By the 1900s this form of axle-pulley was one of the most copied types used.

Bay D (Opening D10 – D11)

3.4.24 There is one window opening (D10) and one door opening (D11) within the bay which in the 19th century was used by servants (Plate 27)(Fig. **7**). The date of the single sash (D10) is hard to ascertain as the pulley-stile and arched head has been obscured by later boarding fitted when the top-hung timber window was installed (Plate 28). No pulleys are visible. It appears to be of the cheaper variety in terms of construction, however it is possible the arched frame for the upper sash may have been removed when the top-hung light was fitted. Further investigation will be required to establish the date of this window. Internally, the primary frame appears to survive with later boarding in the bottom half. Again, further investigation including the removal of the boarding may reveal further 19th century survival.

3.4.25 The adjoining door appears to be c.1960's-70's in date, although the primary frame with fanlight above appears to survive (Plate 29). Internally, the moulded 19th-century door frame survives as well as the primary skirting boards.

3.4.26 There is a large metal vent between the two openings, just below the bays stepped brick arch, and there are two metal hooks above the arch, which would have held cables. A 19th-century boot scrape remains extant to the west of the door. Between bays D and E are four mid-Victorian air bricks and a large metal pipe extends from the elevation immediately to the west of this.

3.4.27 Internally, the skirting boards are mostly relatively recent replacements (probably 1960s), with the exception of the south-east vestibule which is tall and beaded (Plate 30). The architrave is thought to be part of the primary construction around the inner edge, although the outer has been replaced. The door leading to the connecting corridor has 19th-century architraving, although the inserted door is 20th century. As with the other bays described, it is possible that 19th joinery including a fan light survives beneath the boarding.

Bay E (Opening E12 – E13)

3.4.28 The 1862 plan (Fig. 7) shows that the bay was previously used as Officers' Quarters. Both the door (E12) and the sash window joinery (E13) have been entirely replaced in the 1960's both internally and externally (Plate 31 and 32). There may be some survival of 19th-century joinery, but this requires further investigation.

3.4.29 To the south edge of the bay are four metal drainage pipes (painted brown) extending from above the height of the brick arch into the ground. Also above the brick arch but situated centrally are metal hooks for holding cables (no longer extant), and above this is some black cabling which extends from Bay D. Between Bays E and F at ground floor level are four mid-Victorian air-bricks, which are part of the primary construction.

3.4.30 Internally, the bay has no 19th-century fixtures and fittings surviving, those in situ are thought to date from the 20th century.

Bay F (Opening F14 – F16)

3.4.31 The 1862 plan (Fig. 7) shows that the bay was previously used as Officers' Quarters (Plate 33). The door and window joinery has been entirely lost internally and externally, and the openings to door (F14) and window (F15) have seen the introduction of concrete lintels inserted from

where the gauged brick arches spring, the arched spaces above having been infilled with brick (Phase 34).

3.4.32 The 1889 drawing shows that opening F14 was formerly a window, and that while the width of the opening was retained, brickwork was removed below the window to allow for the insertion of the door. Below the lintel of the central window is an area of later brickwork, it is likely that this relates to the replacement of the concrete lintel which appears to be more recent. The exact date of the brickwork and replacement is not known but it may be co-current with the works to the windows in Phase 3 (1930s-40s).

3.4.33 The former door in opening F16 has been infilled, as is the case with the original door openings of A1, C7 and H22, and has been fitted with a casement window, almost certainly of the same date. The infilling allowed for a WC to be inserted in the space internally. There is a boot scrape to the west of the door which is part of the primary 1860s construction, and a pipe runs from just to the east of this into the drain between bays F and G. A metal drainpipe runs from here to the just below the height of the arches where it is built into the brickwork.

3.4.34 Immediately above this drainpipe is a row of headers between the two bays. This feature is not seen elsewhere on the elevation but appears to be contemporary with the primary construction, and requires further investigation. Immediately to the south of the drain pipe, situated roughly mid-height is a 1925-1935 salt-glazed pottery air-brick.

3.4.35 Internally, there is good survival of 19th-century skirting board in bay F which is contemporary with the surviving architraves of the doorways. The room has timber panelling which is built around the original architraves in the north-east and south-east walls and not contemporary with the 19th-century architraves (Plate 35). It is thought to date from the Second World War period. The area above the doorway to the connecting corridor is boarded up, removal of this boarding may reveal 19th-century joinery. A later door has been inserted into this earlier entrance, probably in the 1960s.

Bay G (Opening E17 – E19)

3.4.36 The 1862 plan (Fig. 7) shows that the bay was previously used as Officers' Quarters (Plate 36). There remains a door in opening G17, but this has been replaced entirely, circa 1968 (Plate 37). Internally, the frame has been lost but externally the fan light has boarding nailed on to the frame, and there may be some survival of 19th-century fabric.

3.4.37 The 1889 elevation drawing (Fig. 6) shows that window G18 has had a similar treatment to window F15, however it appears to retain the lower section of the box-frame which has been panelled over entirely on both sides, with only the sill being visible. This is probably an original frame. Further investigation may reveal the type of frame and the extent of survival of 19th-century joinery. Internally, the primary frame remains *in situ* to its full height, although the upper and lower sections are boarded up.

3.4.38 Window G19 retains its original box-frame, both pulley-stiles having been panelled-in, but further 19th-century joinery may survive below the panelling (Plate 38). This sash frame is of the superior construction quality as evident in openings A2, B4, B5 and H20. One pulley is extant to each side of the frame. Internally, the frame survives well to its full extent, the bottom half is boarded up but 19th-century joinery may survive beneath this (Plate 39).

3.4.39 There are various electric wires hanging over the bay's brick arch, and a primary boot scrape to the south of the door. Between bays G and H are four mid-Victorian air-bricks, and above this at the point where the brick arches meet is a metal pipe. Also on the pillar between the two bays is the National Trust sign for Bembridge Fort.

3.4.40 Internally, there is good survival of 19th-century skirting boards along the south-west and partially along the north-east walls, and along the south-east wall and outer south-east wall of the vestibule. The skirting is later along the south-east and north-west walls and it is taller in profile. The inner doorway of the small chamber at opening G17 has a 19th-century architrave with an interior (possibly Second World War) architrave. The primary doorframe survives of the door providing access to the connecting corridor, the fanlight may survive above this but is currently boarded up (Plate 40).

Bay H (Opening H20 – H22)

3.4.41 The 1862 plan (Fig. 7) shows that the bay was previously used by servants (see Plate 6). Window H20 retains its original sash-frame which is of the superior type of construction described for windows A2, B4, B5, G19 and G20 (Plate 41) (Fig.9). The pulley-stiles have been panelled-in on both sides, but this later panelling was removed from window G20 to reveal the 19th-century window joinery (Plate 42). This showed a pulley-stile with centrally-placed pocket-piece, superior arched head design and cast-iron Kenrick axle-pulley. The pocket piece was provided each side of the box-frame to access the weights for sash-cord replacement. The paint scheme here is of note; the unpainted area previously covered with the internal staff-bead and stop-head of the internal sliding shutters. Also, the beaded outside lining has been cut back to allow the fitting of the cover board. The original primer of the *c*. 1968 top-hung window is clearly visible.

3.4.42 Opening H21, which was originally a window, has now been entirely altered with the introduction of double-glazed doors. The upper portion of the arched opening has been infilled with brick (Phase 3) above the concrete lintel (Plate 43). These doors probably date from the 1960/70s period, and are of simple timber construction with three glass lights to each door.

3.4.43 Opening H22 was formerly a door as shown in the 1889 drawing, that has been infilled probably in the 1930s. This infilling is as described for openings A1, C7 and F16. Between openings H20 and H21, just below the height of the arch, is a metal vent and there are various electric wires running above the arch of bay H. These connect to two black boxes between openings H21 and H22. Below the small window in opening H22 is a rectangle painted in white, possibly indicating the position of a former sign.

3.4.44 Internally, this infilled area contains a sink, which is accessed via an entrance which no longer has an extant door although the architrave around it survives and appears to date from the 19th century (Plate 44). The 1889 plan shows a small foyer here which would have been accessed by the (now infilled) entrance. The skirting board in bay H is all 20th century, although there is some 19th-century architrave surviving around the door leading to the corridor. There is boarding around the door, which if removed may reveal earlier joinery including a fanlight.

4 THE SECOND WORLD WAR

4.1 Historical Context

4.1.1 To understand the role of Bembridge Fort during the Second World War (and other periods), it is important to place the fort in its military landscape and understand its operation alongside other military installations. This includes other 19th-century forts of the period that, like Bembridge, were updated for 20th-century conflict. There were also newly constructed installations such as radar and gun emplacements which worked in conjunction with those at Bembridge Fort. On Culver Down and directly below Bembridge Fort, for example, Culver Down Battery was constructed in 1906, with concrete emplacements for two 9.2" guns. This remained operational throughout the Second World War until it was disarmed in 1956 when conventional coastal defence was rendered obsolete by nuclear weapons.

4.1.2 During the Second World War Bembridge Fort acted as a co-ordinating point for the heavy coastal gun sites at Culver Down Battery, and at Nodes Point Battery in the north-east of the Isle of Wight. As well as its role in battery observation, the fort also provided barracks for the army gunners and housed a Royal Navy contingent engaged in submarine detection. In 1938 the Royal Navy's anti-submarine division laid indicator loops across the channel into Spitbank Fort, and during the war three further harbour defence loops were laid and monitored from the fort.

4.1.3 As the Second World War broke out a searchlight unit moved in at Bembridge Fort, with anti-aircraft (AA) and two 3-inch guns, all on mobile mountings. The fort also became the HQ for local AA defences, in the event of the failure of the land line communications from the Gun Operations Room at Fort Fareham, near Portsmouth, which controlled the Portsmouth and Isle of Wight AA batteries and searchlights. In 1939-40 the First World War Redcliff Battery was converted to AA searchlight use and it is likely that the use of mobile guns then ended at Bembridge Fort.

4.1.4 Documents held in the National Archives (WO 166/2262) show that between September 1939 and December 1940 there is no evidence for the emplacement of AA guns at Bembridge Fort, although a searchlight was listed as being there in 1940 (Cantwell 2004).

4.1.5 A key role of Bembridge Fort during the Second World War was as a Chain Home Low (CHL) radar station. The Chain Home system was the backbone of the radar provision surrounding the country in the Second World War. This developed from 1935 onwards and as the technology progressed, with the provision of CHL it was also possible to plot low-flying aircraft (as well as high-flying aircraft). CHL was set up to provide radar plotting of both shipping and aircraft movements, and was originally manned solely by the Army, or jointly by all three services, until the RAF assumed responsibility for them (Lowry 1995).

4.1.6 Bembridge Fort was assigned the station number 10A in the CHL series (Searle 2016). In July 1940 the Army CHL radar set and aerials were moved to Bembridge Fort from Culver Battery, which were able to identify low-flying enemy aircraft. Cantwell reports (2004) that the transmitter was installed in the old CRA's cell (the Position Finding Cell) and the receiver in the old expense magazine immediately next to it. The aerials were mounted seven feet above the two emplacements, and between the end of July 1940 until February 1942 the two aerials were hand-turned from within the CRA cell.

4.1.7 The results from the radar were unreliable due to the uneven surrounding terrain and it was recommended in August 1941 that a new station be installed at the fort. This upgrade occurred at the same time as a national upgrade in anticipation of the Battle of the Atlantic (Dobinson 2000, vol. VII 1). This included a common aerial instead of the previous two and the

installation of plan position indicator (PPI) apparatus to bring the rig up to improved technical standards. This was followed 6-months later with power-turning apparatus for the aerial array (Searle 2016). The single or common aerial array allowed the transmitter and receiver to be concentrated in one building. This common aerial working offered improved efficiency, since transmitter and receiver were directly aligned.

4.1.8 By 1942 Bembridge Fort was fulfilling dual roles in regular service in reporting both aircraft and ship movements, assisted by a Type 41 set for surface watching. After army parachutists captured the essential parts of a German radar set at Bruneval (France) in 1942, there were concerns the Germans might retaliate at Bembridge and the Needles. The threat of attack of the radar installations explains the additional emplacements for AA and close-in defence. Hardened defences survive on the terreplein at Bembridge Fort including Allan-Williams Turrets, Spigot Mortar and Motley Stalk Emplacements, a rifle trench and possible open machine gun position also survive.

4.1.9 Following the end of the Second World War, the CHL set was closed down in June 1945, and in 1948 Bembridge Fort was relinquished by the war department, and in 1967 the National Trust acquired the site.

4.2 Site Investigations

4.2.1 The aim of this programme of work was to record those features relating to the use of radar at Bembridge Fort, one Spigot Mortar Emplacement and two Allan-Williams Turrets. During the course of the investigation however several other features dating from the Second World War were identified which were also recorded. This include two additional spigot mortar emplacements, three Motley Stalk emplacements (including one rare survival of the gun mount), a Rifle Trench and an Open Machine Gun Position.

4.2.2 There is clearly significant potential for further research of Bembridge Fort's role in the Second World War. Aerial photography from the period would greatly enhance interpretation of the surviving features, as well as identifying those that may be lost or buried. The installation of radar at Bembridge Fort is of particular significance, as it was this which necessitated the construction of hardened structures. Further investigation is required into radar to better understanding the surviving platforms and metal work, as well as the radar structures identified.

4.2.3 This report has identified as far as possible the functions of buildings and features, but further research is required to confirm the accuracy of this information. Initial investigations suggest that some of the surviving Second World War archaeology are rare examples, particularly the Allan-Williams Turret and the Motley Stalk emplacement with surviving gun mount. Further investigation is required to understand the rarity of the Spigot Mortar Emplacements. The overall extent of survival and the variety of hardened defences at Bembridge, in addition to the survival of the site's radar structures and features is of considerable historical and archaeological merit.

4.3 Radar

Radar Building

4.3.1 Dobinson's research on 'Acoustics and radar' for the Defence of Britain project (2000, Vol. VII 1), provides some information about the typology of radar structures in the Second World War which is useful in understanding those at Bembridge Fort.

4.3.2 The first group of radar sites that developed in Spring 1941 differed from later sites commissioned in 1942 although original drawings for the earliest sites have not been traced. Textual sources specify two buildings, consisting of the operating hut in brick or concrete, bearing the aerial gantry with a separate engine room. The operations building in this form was covered by drawing 55196A and the standby set house ('or engine room' by 55190A).

4.3.3 At Bembridge Fort, the radar room is situated at the east end of Bembridge Fort above the Officers' Quarters (Plate 45). The single storey structure is rectangular in footprint and has been constructed within the 19th-century gun emplacement. It is constructed in red brick laid in stretcher bond, and is a simple built structure which echoes the economic restrictions of the era with reused timbers and window frames. Interestingly the window frames appear to have been reused from earlier sash windows, possibly taken from elsewhere on the fort (Plate 46). The other interesting feature of the building is the reinforcement given to the roof with metal girders, which is thought to have been to accommodate the weight of the radar on top of the roof.

4.3.4 There is a wide opening (3.44m, and 2.21m in height) providing access to the front (north-west facing) elevation which has a concrete lintel above and concrete steps leading down. Along the south-west edge of the entrance is a timber frame which has been reused from elsewhere, as evidenced by the mortices and extant hinges. The door to the entrance is no longer extant. To the north of the door is a window (2.15m (w) by 2.21m (h)) with a timber lintel and concrete sill. There are further five windows along the rear elevation which are in poor condition, although some timber frames are extant. At the south end of the rear elevation, the three frames are painted cream but are evidently re-used sash windows (1.46m (h) by 1m (w)). The two larger windows in the north section of the building also have reused frames (1.62m by 1.21m).

4.3.5 At the north end of the building is a separate room which is not part of the same phase of construction as the main radar building, and extends a further 1.90m from the main building (Plate 47). Further investigation is required to establish the phasing of the building. This is also constructed in red brick laid in English bond, and is thought to have been earlier in date than the main building, possibly dating from the 19th-century phase of construction. It appears to have been used as plant as evidenced by the chimney flue and blast wall to the front of this area. It is now in poor condition with the asbestos corrugated roof partly collapsed, preventing close inspection. It is possible that this room contained the plant associated with the radar.

4.3.6 Internally, the main radar room has few fixtures and fittings surviving (Plate 48). The space has a concrete floor and is divided by a breeze block partition, the paint scheme is white at the south end and bright red and yellow at the north end. At the north end a hole in the wall leads through to the plant room, and adjacent to this, extant metal brackets along the internal front elevation suggest that heavy equipment was supported here. A striking feature of the internal space are the large girders used to support the roof, which are 0.36m thick.

4.3.7 The flat asphalt roof has a slight platform at the south-east corner which is raised *c*. 0.15m from the roof level and measures 2.45m (south-west to north-east) and 2.23m (north-east to south-west) (Plate 49). It has three extant pieces of metal girders projecting from it by *c* 0.25m. Along the south-east edge of the roof are small concrete rectangular projections at regular intervals, and again at regular intervals situated centrally along the roof are projecting girders. These features are thought to be related to the support of the radar, further evidence of this is not extant on the roof, but the metal work is situated on the ground to the south-west of the building and is described below.

Remains of radar platform

4.3.8 There are two areas of metal work to the south-west of the radar building and next to the Position Finding Cell, which are thought to be the remains of the radar platforms at Bembridge (Plate 50). The one which is a more complete survival is situated closest to the Position Finding Cell, and has a square platform but with rounded corners (1.60m square) (Plate 51). This has a large hole centrally, and two smaller holes to the north-east half of the platform. There has various bolt holes and bolts extant.

4.3.9 On top of this is a square constructed from four girders, two of these extend 3.63m in length. In the corner of the square platform, girders have been used to form a rectangular box shape (without sides) measuring 0.90 by 0.50m, which may have been used to hold machinery for turning the radar. Beneath the platform is a circular projection, which in turn contains a smaller circular projection which has diagonal metal strips radiating from it. There are various bits of iron attached to it at ground level which are difficult to inspect and heavily corroded.

4.3.10 The remains of the metal work for the second radar gantry is of similar construction to the more complete example, although this has been left on the ground facing the opposing way up. The long girders are no longer extant, although these may (in part) be buried in the over-growth (Plate 52). The square platform is of the same size as above (1.60m square), and the diameter of the circular projection is 1.08m with the inner circle measuring 0.49m.

4.3.11 There are again various holes around the edge for bolts to hold the platform to the metal girders on the roof. There are long girders extending 0.95m from the north-east end of the platform, but these are not evident to the opposing side (although as discussed above these may not be immediately apparent due to the vegetation in the area). The box type construction of girders is not extant, although this would have been evident on the side facing the ground and it is therefore not visible.

Position Finding Cell

4.3.12 The position finding cell at Bembridge Fort is thought to date from the Second World War period, and is situated directly to the south-west of the radar building and has a rectangular footprint orientated roughly north-west to south-east (Plate 53). It is very similar to the surviving and restored example at the Needles Battery, which is open to the public.

4.3.13 It is a small red brick structure (English bond), accessed by concrete steps. As with the radar building, the cell is constructed economically with the re-use of joinery from elsewhere in the building. It is accessed by a timber door, which has a large window to the north-east of the door (2.22 by 1.35m) and a smaller one (2.21 by 0.70m) to the south-west of the door. Evidence of previous hinges and pegs on the windows and door provide evidence of their reuse.

4.3.14 The building is sunken to offer protection, which is most evident to the rear of the building where the distance from the ground to the base of the roof is 0.45m (Plate 54). This has clear views out to the sea allowing for the plotting of positions. There is a small rectangular timber framed window (0.84 by 0.48m) extant. There are two courses of later brickwork below the level of the roof suggesting that the window was previously larger, which is substantiated by internal investigation.

4.3.15 The side of the roof has been reinforced with girders which, as with the radar building, is thought to have allowed for the installation of the radar on the roof. The roof slopes up from the front elevation to a level platform on the rear half of the roof. There are two areas of breeze blocks (1.63 by 0.62) which hold horizontally two steel girders, where the gantry for the radar would have been positioned. The area of the platform measures 3.90 by 1.61m.

4.3.16 Internally, the space has a large raised platform to the rear accessed by steps which would have accommodated a desk and position finding equipment (Plate 55). There is breeze blocking to the rear wall (to 0.59m in height) which extends round to the side walls (to between 1.20 and 1.40m). This infilling indicates the area of a previously larger window allowing wide ranging views to the sea for position finding. There is some timber panelling surviving, which is no longer extant in places, but strips of wood in the breeze blocking provide evidence of its former position along the side walls internally.

4.3.17 To the south-west and adjoined to the position-finding cell is a sunken structure which is rendered in concrete and has a flat roof. This is now used as a telephone exchange which can be accessed internally by a door in the position finding cell. This can also be accessed by a timber door in the sunken passage leading to the front elevation, there is timber panelling to each side of this. This structure is currently used as a telephone exchange and it is not therefore accessible. Further investigation into its Second World War use would benefit understanding of the fort during this period.

Identification of Friend or Foe (IFF) Structure (possible)

4.3.18 A structure at the north of the terreplein is understood to have been used for IFF, although this requires further investigation (Plate 56). The identification, friend or foe (IFF) is an identification system designed for command and control. It enables military and civilian air traffic control interrogation systems to identify aircraft, vehicles or forces as friendly and to determine their bearing and range from the interrogator. It was first developed during the Second World War, with the arrival of radar, and several infamous friendly fire incidents.

4.3.19 The building is a small brick structure with a flat concrete roof and no windows. The internal space is 1.80m square, and is constructed to a height of 2.45m. Access is via an open passage to the front (south-west), and externally it is surrounded by a concrete stepped platform.

4.4 Hardened Defences

Allan-Williams Turret

4.4.1 There are two surviving examples of Allan-Williams Turrets at Bembridge Fort, one is situated at the north edge of the terreplein, and the other at the west end. The better example is to the west as the rotating dome remains in situ and the metal work is less corroded and affected by the weather conditions (Plate 57).

4.4.2 A total of 199 turrets were ordered and built during the Second World War, but the post-war salvaging of metal means that few now survive. Their rarity is shown by the Listing at Grade II in 2015 of a surviving example situated south of the A414 in St.Albans (List Entry number – 1425803). *Wikipedia* states that only 33 remain nationally, some of this number are now in museums. The survival of two examples within the military context of a 19th-century Palmerston Fort further increases their significance.

4.4.3 Allan-Williams Turrets had a pre-fabricated steel rotating dome, mounted over a pit, and entered by a short tunnel, manned by two men. It was designed to allow the top part of the turret to rotate through 360 degrees for all round field of fire. Opening or sliding shutters in front and in the roof enabled a light machine-gun to be mounted as either a LAA weapon, or against an attack at ground-level (Osbourne 2004). One man could rotate the cupola which is on roller bearings and requires 15lb of force to move it.

4.4.4 The turret to the west of the fort retains the dome in situ (painted green), although it is supported on timber props. It is accessed by a rough narrow gulley to the east which is not

lined, although the actual pit of the turret is metal lined (depth 0.77m), however this is now badly corroded. The dome is painted green internally (the base is 1.80m in diameter), and the various elements survive well, including the roller bearings and the revolving bracket for supporting the gun. It was designed for a machine gun to be fired either through the front loophole which was further protected by shutters, or through the circular opening in the roof in a light anti-aircraft role. Both the circular opening in the top and the front loophole survive.

4.4.5 The example to the east survives less well as the dome has been removed and placed next to the pit (Plate 58). The circular metal base on which the dome sits remains *in situ*. The metal is badly corroding in places although the key elements of the turret survive including the roller bearings and revolving bracket for supporting the gun.

Spigot Mortar Gun Emplacement

4.4.6 There are two Spigot Mortar gun emplacements on the terreplein at Bembridge Fort, one is situated at the north-west end of the site and is accessed via a cut in the 19th-century gun emplacement (Plate 59). The second is situated at the east end of the fort to the rear of the radar building. Both conform to the description of a typical spigot mortar pit. This type of gun allowed for short range local defence only, and would have been used to protect the fort, particularly the radar installation. A third possible emplacement was also identified to the south-west of the Position Finding Cell, this emplacement has largely been destroyed but surviving evidence suggests it conforms to the same typology.

4.4.7 Spigot Mortar Emplacements were produced from 1941 onwards in very large numbers. The normal deployment of a spigot mortar was in a brick-lined pit with ready-use bomb lockers built into the sides. In the centre stood the concrete cylinder, about 1.2m in height and 0.6 in diameter. This held a characteristic stainless steel pintle on its framework of steel bars, the spider, embedded in the doomed top of the pedestal. The spigot mortar pit was for the protection of the crew (Osbourne 2004).

4.4.8 The east emplacement is brick built and has been covered with a cementitious render, the height of the emplacement walls slope down in the direction of the outer fort (Plate 60). The walls are supported by two tall buttresses to the west and shorted ones to the east. The depth of the emplacement is between 1 - 1.23 m and the diameter is 2.65m, and the concrete cylinder extends to a height of 0.95m.

4.4.9 The emplacement to the north-west of the fort is slightly larger, measuring 2.82 in diameter and between 0.80 and 1.41m in height. It survives in less good condition with weathering to the bricks, which are crumbling and have fallen in places. This emplacement is accessed via a cut in the brickwork of the 19th-century gun emplacement, and a narrow tunnel extends from providing access to the emplacement.

4.4.10 The remains of a possible third spigot mortar emplacement was identified immediately to the west of the roof level of the Position Finding Cell (Plate 61). There are little standing remains of this former emplacement, but the feature is brick lined with truncated concrete and rubble in the centre. There is a concentration of concrete in the centre, which may be the remains of a concrete cylinder from a spigot mortar emplacement as described above.

Motley Stalk AA Machine Gun Mount Emplacement

4.4.11 There are two further emplacements situated at the east end of the site which are each thought to have been a position for a Motley Stalk AA Machine Gun, one of which still holds the gun mount. Both emplacements are of the same brick built construction, the example

containing the mount is the better surviving example and is on the terreplein to the west of the access point (Plate 62). The other is situated immediately to the north of the radar building. Further investigation is required to confirm the accuracy of the typology of the emplacement and the rarity of its survival. Initial research suggests the survival of the mount in such complete condition is rare.

4.4.12 The emplacement containing the Motley Stalk mount on the southern edge of the terreplein is brick lined and rendered at the top, it has an external diameter of 2.20m and is built to a depth of 1.10m (Plate 63). It also has two protective recesses built into the brick wall which would have allowed for the storage of ammunition. There are seven springs attached to the gun hold, which acted as a counter balance for the guns which would have clamped on to the fitting. The latter extends to a height of 1.20m. Handles to the side of the emplacement facilitated access into the pit by those operating the gun.

4.4.13 The emplacement to the east of the radar building is circular and brick built, mostly in headers with a diameter of 2.27m. It is built to a depth of 1.07m and has a concrete floor with protective recesses built into the circular brick walls. There is a raised circular area in the middle of the emplacement's floor from which bolts extended to hold the mount in place. The construction of this emplacement is of the same type as described above, and it is likely that this emplacement previously held a motley stalk mounting, which is no longer extant.

4.4.14 A further concrete platform is situated at the south-east, to the west of the radar area (Plate 64) at the very edge of the earthworks. It is a concrete platform with a circular recess (1.64 in diameter) in the middle and eight meta bolts extending from the concrete 0.04m. In the centre of this is a further circular area which is 0.25 in diameter. It is thought that this is the remains of a Motley Stalk emplacement has it follows the same typology as those described above. The surrounding brick protection has been demolished, but the footprint of this is evident in the concrete.

Rifle Trench

4.4.15 A probable rifle trench was identified at the north-east of the terreplein, which is 4.87m in length and 1.85m deep (Plate 65). This is brick built with loop holes of various sizes, some of which retain the mounts for guns. The loop holes are boxed which would have allowed some swing for the guns. The trench is accessed via steep steps orientated east to west, so that the trench has an L shaped footprint. The trench roof is no longer extant, but it is probable that it contained a corrugated sheeting roof to allow some protection from the elements. Regular areas of truncation in the render on the brickwork at the top of the brickwork suggest areas of support for a possible former roof.

Open Machine Gun Position

4.4.16 Situated on the edge of the north terreplein is a probable open machine gun position (Plate 66). This is a small brick brick built structure (2.10m by 2.50m), which is sunken to a depth of 1.26m and has a concrete floor. It is rendered internally and has two buttresses along its north face, but no roof. It is possible that this feature would have had a corrugated iron or similar temporary roof, to protect operators from the elements. This feature requires further investigation but initial research to confirm its function.

4.5 Additional Features

Metal crane post

4.5.1 A metal post extends to a height of 1.20m, which was probably used for hauling up equipment etc. from below (Plate 67). This date of this post is not known.

Footprints of Accommodation Huts

4.5.2 In August 1941, seven huts were erected in the western end of the ditch to accommodate extra personnel (the plan for which is available at English Heritage's archives (PLAN WD416). The bases for these structures are visible from the drawbridge of the fort, but were not investigated further as part of this programme of work.

5 SUMMARY AND FUTURE WORK

5.1.1 The investigations into the Officers' Quarters and the surviving sash window joinery has considerably enhanced understanding of this element of Bembridge Fort although it has also shown that the phasing of the windows is complex and further investigation would allow a fuller determination of the survival of 19th-century joinery. This would require removal of the 1960s panelling and further analysis of the axle pulleys to more accurately date and understand the joinery.

5.1.2 There may be evidence of re-sited joinery, such as the internal shutter-box, which would bear lever marks, previous nail-holes etc. Other joinery differences might include the construction of arched outside lining. To help confirm the date of possible later window joinery/alterations, paint analysis by a specialist, such as Patrick Baty, would be advisable. Further research of similar military structures would also be helpful, for example comparisons with the windows at both Forts Widley and Nelson

5.1.3 Based on the initial investigations of the sash window joinery undertaken for this project, if one of the bays is to be restored to its original appearance, Bay B is considered to be the best surviving example of the eight bays. This is because it retains its 1860s construction with no later adaptations and modifications, and because the windows have been confirmed as retaining surviving 19th-century joinery which is of the superior form of construction.

5.1.4 Research at the National Archives has provided evidence for the primary construction of the windows, which would form the basis for establishing the correct glazing-bar profile for the reinstated arched sashes at Bembridge Fort. Charles Brooking also has examples of sash windows of this date which would inform the reinstatement of a bay.

5.1.5 Further research is also required to better understand the function of the surviving Second World War archaeology. Clearly Bembridge Fort played a significant role at this time, particularly its use of radar, and some of the hardened defences built in response to this are of significance. The Allan-Williams Turret, Spigot Mortar and Motley Stalk emplacements in particular are thought to be rare survivals of their type, that remain in good condition. The military context of these features also enhances their significance.

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APPENDIX B SITE SUMMARY DETAILS

Site name:	Bembridge Fort, The Isle of Wight
Site code:	BEMBFT 18
Grid Reference	SZ 62405 86082
Type:	Building recording
Date and duration:	Site work (1st – 5th October 2018) and report writing in October 2018 with final edits in June 2019.
Summary of Results:	
Area of Site	0.5 ha
Location of archive:	The archive is currently held at OA, Janus House, Osney Mead, Oxford, OX2 0ES, and will be deposited with the National Trust in due course, under the following accession number: ENA9156

APPENDIX C CHARLES BROOKING REPORT

Charles Brooking

Historic Buildings Consultant

Report on the surviving window joinery at Bembridge Fort, Culver Down Road, Bembridge, Isle of Wight, PO36 8QY undertaken by Charles Brooking on the 3rd of October, 2018

I undertook a detailed examination of the surviving sash-boxes and associated joinery at Bembridge Fort, which threw up some interesting and unexpected findings. Although the original arched sashes were removed and replaced (circa 1968) with top-hung casement windows typical of the late-1960's, enough original fabric survives to reinstate one bay to its 1867 appearance.

One of the most important discoveries was the fact that the windows were originally fitted internally with vertically-sliding counter-balanced shutters, a detail widely used from the mid-Georgian period until the circa 1880's. This form of window shutter was often employed when the depth of the wall did not allow for traditional folding shutters. Although most of the sash-boxes have suffered from decay, particularly around the cill area, they are all capable of repair and restoration in the hands of an experienced joiner.

When the sashes and the internal sliding shutters, along with the parting beads and staff beads had been removed, the new timber frames with top-hung lights were fitted set back from the face of the frame, sitting in the sliding shutter box-frame. In several cases the pulley-stiles were then covered with new boards (which has made clear identification of the windows virtually impossible without their removal).

This report majors on the window joinery itself. There were several major interventions to the openings with the introduction of concrete lintels with brick infills above, the blocking of doors and the fitting of casement windows, which require further investigation.

The unexpected discovery was the fact that two types of arched sash window construction were employed in the Officers' Quarters, the first of these being the more expensive and superior form. Here the upper sash has a true arched head and sash-frame, the lower sash being provided with a square head to allow its full-height operation, appearing as an arch when the sash is lowered. This method of construction was quite complex and expensive, many architects and builders of surprisingly high-quality buildings frequently opting for the cheaper type. The advantage of the more expensive version was principally aesthetic - the sash being properly arched did not have the somewhat disturbing effect of a flat horizontal head when the window was opened.

The second form of construction was the most widely used and cheaper form of arched window design. The outer lining itself was arched behind the rubbed-brick arches whilst the sash-frame has a square head, the upper sash itself having a horizontal head with solid or glazed spandrels, which become visible when the sash is lowered. Each window will be described individually at the foot of this report.

This form of arched sash window construction was extensively employed from the late-Georgian period until the present day, being widely used in railway stations, Victorian villas and hotels.

It appears that the original windows at Bembridge Fort were of the superior form. In my experience it is most unusual to encounter two forms of window joinery of this type used alongside each other in such a project, indicating later alterations and modifications.

Having examined windows both at Fort Widley and Fort Nelson, Portsmouth, and at the 1867 Southsea Barracks, I am familiar with military sash window joinery. I have also examined windows at Maidstone Barracks, Kent, built in the 1850's, and military buildings built in the 1850's-90's at Aldershot, Hampshire.

At both Fort Widley and Fort Nelson the sash window ironmongery - e.g., the sash-pulleys - were supplied by Archibald Kenrick & Sons of West Bromwich, one of the leading ironmongery companies of the Victorian period. Kenricks were founded in 1791

and by the mid-Victorian period were producing a wide range of household and architectural ironmongery, including flat-irons, Holloware, coffee-mills, door-knockers and an extremely comprehensive range of sash-pulleys, catering for all tastes and pockets.

I examined sash-pulleys in several of the windows at Bembridge Fort. Interestingly, the original axle-pulleys specified were entirely cast-iron. These included good-quality cast-iron axle-pulleys made by Kenricks with brass bushes to the axles, and three other types produced by unidentified manufacturers, of designs widely used in the early and mid-Victorian periods. This choice was probably driven by the combination of cost and an awareness of the effects of a marine environment.

It is interesting to note that at Fort Widley the more expensive axle-pulleys with brass face-plates and wheels were specified. It is possible that, as in the case of The Grand Hotel at Brighton, designed by John Whichcord in 1864, cast-iron was specified owing to the fact that a combination of iron and brass face-plates can be severely affected by rust in marine situations. Perhaps this is the reason why cast-iron sash-pulleys were specified. The cast-iron sash-pulleys were originally supplied with a painted iron face-plate. In my experience it is extremely rare to encounter sash-frames with varying joinery details in such a relatively small contract. When this has been the case, invariably the work has been altered later or the window replaced in a later phase of works.

I examined one of the cheaper forms of sash-frame with a square head for both sashes at the Officers' Quarters, Bembridge Fort. The pulleys to this frame indicated a date of circa 1925-34. These pulleys have thin stamped-brass face-plates with brass screws and are of designs which are typical of the 1925-34 period - see image at the foot of this report.

Other differences included the pocket-piece arrangement - see also images at the foot of this report. There appeared to be no evidence of earlier screw-holes or fixings for earlier pulleys. These findings strongly indicate that the modifications and possible replacement sash-frames might belong to the circa early 1930's works undertaken to the Officers' Quarters, which included stylised imitation panelling internally, doors between the separate quarters, and other changes.

Great care was undertaken to match the joinery detailing externally as both forms of sash-boxes have beaded outside linings. Owing to the existence of cover-boards

obscuring the pulley-stiles, it was only possible to examine a few of the windows in great detail.

The possibility that a number of the sash windows in the Officers' Quarters date from the circa 1930's raises the question as to why they were replaced in the first instance. It is possible that originally fixed lights were used for reasons of economy in each separate bay, which were later converted to fully-operational sashes. It appears that these fixed windows were originally fitted with two internal vertically-sliding shutters which were re-fitted when the new sash windows were inserted, if this was the case. It was not possible to examine ironmongery in the shutter weight-boxes as the pulley-stiles are completely obscured by the circa 1968 windows. A sash-weight was discovered in a partly-opened weight-box - see image at the foot of this report.

If indeed these sashes were replaced to provide more ventilation for the Officers' Quarters, it would have proved an expensive exercise.

Apart from the stylised false panelling fitted in the circa 1930's upgrade and additional doors, I noted an architrave profile which appeared in the early 1920's and remained in production until the circa early 1950's. This might belong to the 1930's phase or possible WWII modifications. The architrave around some door-frames appears both in the Officers' Quarters and in other upstairs areas altered in WWII.

This area requires further investigation as the main thrust of the last visit was to identify surviving window joinery in the Officers' Quarters and time did not allow for further detailed analysis of the wider joinery aspects in different areas of the fort.

To help confirm the date of possible later window joinery/alterations, paint analysis by an specialist, such as Patrick Baty, would be advisable. His work has been incredibly informative and helpful in similar situations where complex alterations have been made.

The original drawings clearly show the glazing-bar arrangements of the arched sashes. There are several forms adopted for this design of window, the most sophisticated being the 'London pattern'. These differ from the 'London pattern', having a central vertical glazing-bar dividing the top two panes of the arched window.

Two forms of glazing-bar were used in military buildings of this type in the mid-Victorian period, the first being the elegant 'Grecian ovolo' profile, the second being a

simple bevelled glazing-bar design, sometimes described as ‘bevelled’ or ‘rustic’. At the 1867 Southsea Barracks building, which also had arched sashes, ‘Grecian ovolo’ mouldings were used. Interestingly, I noted that the casement windows fitted at Bembridge Fort in the 1890’s-1900’s period had ‘rustic’/’bevelled’ mouldings. These windows were seen in other parts of the building.

To establish the correct glazing-bar profile for the reinstated arched sashes at Bembridge Fort, further research would be necessary - e.g., comparisons with the windows at both Forts Widley and Nelson, together with original surviving drawings of these forts and others of a similar date, would be desirable.

The design of the sliding shutters is relatively straightforward. The collection contains several examples of the 1850’s and 1860’s, of various qualities, which could provide much information. More important detail relating to the windows will become apparent when a suitable bay for reinstatement has been selected and the later 1960’s window infills have been removed.

Please now refer to the images with captions on the following pages.

General view of the Officers' Quarters from the ramparts. Note how the appearance of the windows has been seriously compromised by the 1960's modifications.

Cast-iron axle-pulley removed from window (A2) dating from the 1862-67 period. This pattern of cast-iron axle-pulley was widely used in the early-to-mid-Victorian period. It is of a relatively cheap design, manufacturer unknown. It is similar to designs produced by Woods and W. Bullock of Birmingham, who clearly marked their products.

Note the effects of the marine environment, the cast-iron case being seriously corroded.


A.K. & SONS

Detail of good-quality cast-iron axle-pulley with brass bushes and painted face-plate - from original window of 1862-67.

Several of the original sash windows were fitted with this pattern of Kenrick pulley - a design in use from the circa 1840's until it was superseded with an improved design in circa 1866.

Kenricks constantly improved their sash-pulley ranges throughout the 19th century. Details, such as the shape of the case, axle sizes, and the typeface used for the Kenrick legend all clearly indicate the date of the pulley. Both 'serif' and 'sans-serif' fonts were used in the 1860's, 'sans-serif' appearing on the improved version introduced in circa 1866.

Detail of secret axle-pulley from window (C8). This pulley of a secret axle design dates from the circa 1925-39 period and is almost certainly a replacement.

Note the stamped-brass face-plate. The make of this pulley is unknown.

Secret axle-pulleys were first patented by Archibald Kenrick & Sons in circa 1877. This complex casting-method, which involved casting the cast-iron pulley-case around an existing pulley, was later copied by other manufacturers. By the 1900's this form of axle-pulley was one of the most common types used.

Detail of the cast-iron axle-pulley with stamped-brass face-plate and brass rim to wheel. This pattern of axle-pulley dates from the circa 1925-35 period.

It was fitted by brass screws into window (A3). There was no evidence of earlier pulleys, indicating this sash-pulley is contemporary with this window, which has the cheaper form of arched head.

Note extensive wear to the axle, indicating extensive use.

View of window (H20(?)) in Bay H showing pulley-stile revealed following removal of circa 1968 cover-board. Note centrally-placed pocket-piece, superior arched head design and cast-iron Kenrick axle-pulley, shown in position. The pocket piece was provided each side of the box-frame to access the weights for sash-cord replacement. There were two schools of thought as to where these were positioned - one school believing in a centrally-placed pocket-piece to access both weights - the more common arrangement being a pocket-piece set behind the lower sash.

There is an important area of original paint archaeology preserved in this situation. Note the unpainted areas previously covered with the internal staff-bead and stop-bead of the internal sliding shutters. Also note the fact that the beaded outside lining has been cut back to allow the fitting of the cover-board. The original primer of the circa 1968 top-hung window is clearly visible.

Apologies for the position of the photo - we have yet to master the ‘turn around’ technique! Having lost images undertaking this, we are playing safe!

View of window (A3) with cheaper (more common) arched head construction.

This window was fitted with the brass-faced axle-pulleys shown in the previous image and requires further investigation in terms of paint analysis and construction - for instance, evidence of re-sited joinery, such as the internal shutter-box, would bear lever-marks, previous nail-holes, etc.

Other joinery differences might include the construction of the arched outside lining.

There were several methods of building an arched window-head in terms of the way the timber was cut, from a wood-grain point of view.

Several schools of thought existed regarding the integrity of the strength of the sections in relation to the direction of the grain in terms of the separate elements of the outside lining and how they were attached with cut-nails to the headpiece and pulley-stile.

These methods were used on both the superior arched-type and cheaper form described earlier.

Detail from the original drawings showing the original glazing arrangements and vertical glazing-bar directly above the central arched pane.

Interestingly, these drawings indicate fully-operational sash windows, however the smaller windows would have had a small one-pane high lower sash and the joinery detailing may have been designed to mimic a meeting-rail profile on a fixed light.

Alternatively, the top sash may have been originally fixed owing to its relatively small opening area. This may have been an issue regarding ventilation and might explain the possible replacement of the windows with an adjusted sash arrangement, allowing for greater ventilation. This would explain the difference in the box-frame construction - e.g., the square head behind the arched outside lining.

Detail of salt-glazed pottery air-brick, of a design produced in the circa 1925-35 period.

This pattern was also produced in terracotta with a matt red slip-finish and was widely used in the housing stock of the 1920's-30's.

The ovolo-moulded horizontal border top and bottom is a hangover from the earlier late-Victorian and Edwardian decorative air-bricks which were largely phased out by the manufacturers during the mid-1920's.

It is probable that this air-brick was fitted at the time of the 1930's improvements to the Officers' Quarters.

Detail of original air-bricks, typical of ornamental mid-Victorian designs.

Air-bricks of this pattern have been seen as early as 1838 in a rectory in Guildford, Surrey.

Possible manufacturers include Carters of Poole, Dorset, George Jennings, and Doultons of Lambeth, London.

This design is used extensively throughout Bembridge Fort.

Detail of typical basic restrained military-type boot-scraper of the wall-mounted design, almost certainly contemporary with the original build.

Charles Brooking
Historic Buildings Consultant

30th October, 2018

Bay A

My investigation work as far as was possible, bearing in mind the later modifications and boarding-over of the sash-boxes, indicates that the central sash in the photo chart provided - window (A2) - is original. Note this retains its original cast-iron axle-pulleys produced by to date an unidentified manufacturer. Note also the superior construction detail of the arched head and centrally-placed pocket-piece which was originally bisected by the parting-slip. This window has suffered from extensive decay and has largely lost its original cill. (See images at the foot of this report).

The adjoining doorway (A1) has been blocked and fitted with a top-hung casement window. This modification was probably undertaken in the 1930's works.

The right-hand sash window (A3) is possibly part of the circa 1925-30's works. This window clearly illustrates the joinery differences. Note the arched outside lining with a square head for both the upper and lower sashes. The sash-pulley in this window - see image at the foot of this report - was fitted with an axle-pulley with a thin stamped-brass face-plate fitted to the cast-iron pulley-face front by folding brass around the screw-holes - a feature introduced in this fashion in the circa 1880's. The brass screws and casting details of the pulley-case clearly indicate a date of circa 1920-35.

Bay B - Both windows (B4) and (B5) retain their original 1862-67 box-frames, although the cill area suffers from decay. These box-frames are quite repairable. Internally the vertical sliding shutter-boxes are visible.

The door is a replacement of the circa 1960's-70's.

Bay C - The original door (C7) was bricked-up and fitted with a top-hung casement at the same time as (A1), circa 1890's-1930 period.

The sash-frames (C8 & C9 on the chart provided) appear to be original. Interestingly, the pocket-pieces here are set behind the lower sash in the pulley-stile.

Both sash-frames (C8) and (C9) retain their original 1862-67 box-frames and internal sliding shutter-boxes. Interestingly, the pocket-pieces are situated behind what was the lower sash in the pulley-stile, as opposed to window (A2), where they are situated in the centre of the pulley-stile, bisected by the parting-bead. However, (C8) has pulleys dating from the circa 1925-35 period - see image at the foot of this report. In this case it is probable that these are replacements of the original cast-iron axle-pulleys.

Bay D - The date of the single sash in **Bay D** was hard to ascertain as the pulley-stile and arched head has been obscured by later boarding fitted when the top-hung timber window was installed. It appears to be of the cheaper variety in terms of construction, however it is possible the arched frame for the upper sash may have been removed when the top-hung light was fitted. Further investigation will be required to establish the date of this window.

The adjoining door appears to be of the circa 1960's-70's in date.

Bay E - Both the door and the sash window joinery have been entirely replaced in the 1960's.

Bay F - The door and window joinery has been entirely lost and the openings to door (F14) and window (F15) have seen the introduction of concrete lintels inserted from where the gauged brick arches spring, the arched spaces above having been infilled with brick. Door (F16) has been infilled, as is the case with the original door openings (A1) and (C7), and has been fitted with a casement window, almost certainly at the same date.

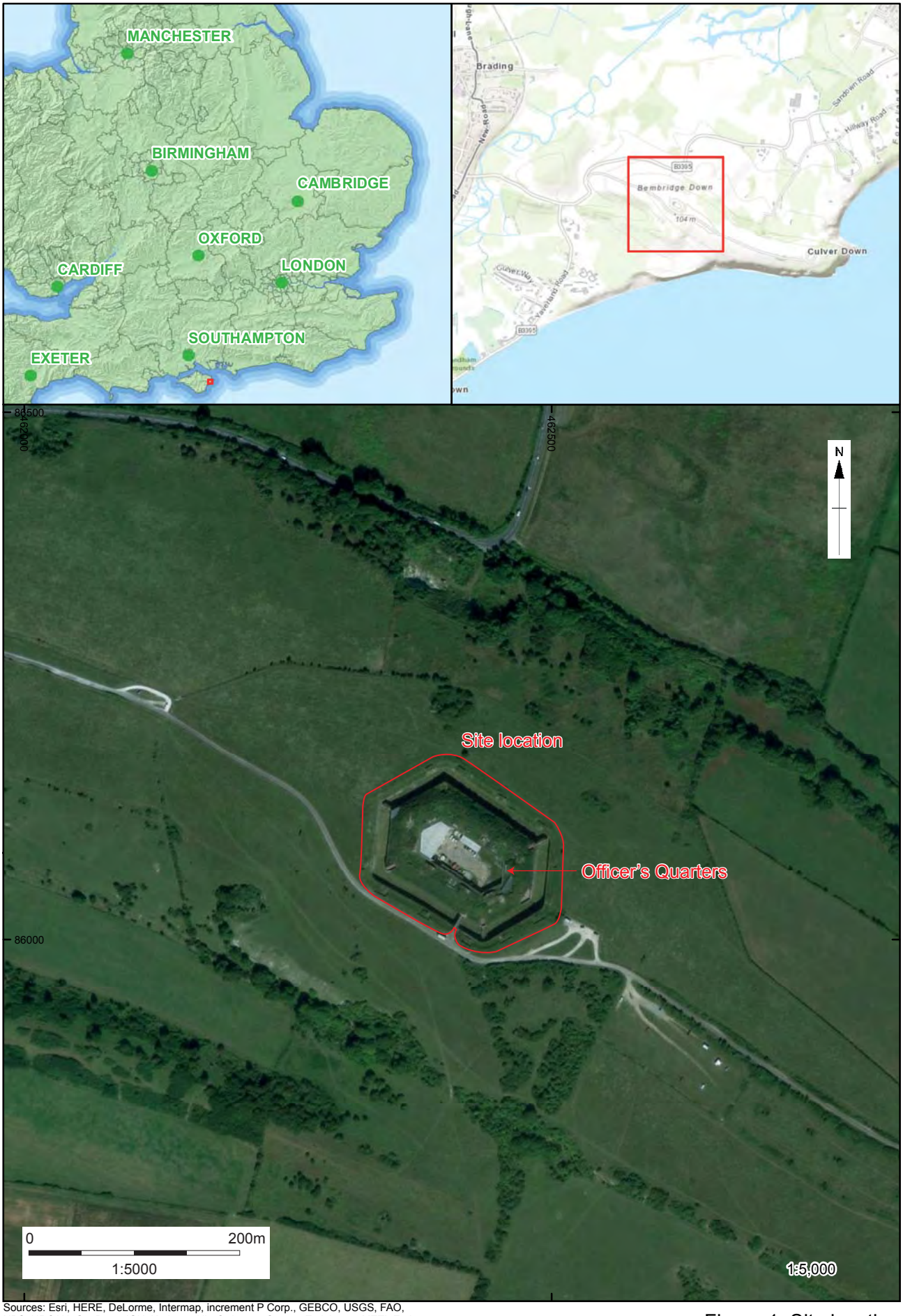
Bay G - Door (G17) has been replaced entirely, circa 1968. Window (G18) has a similar treatment to window (F15), however it appears to retain the lower section of the box-frame which has been panelled over enitrely on both sides, with only the cill being visible. This is probably an original frame.

Window (G19) retains its original box-frame, both pulley-stiles having been panelled-in.

Bay H - Window (H20) retains its original sash-frame - again the pulley-stiles have been panelled-in on both sides.

Window (H21) - This opening has now been entirely altered with the introduction of double-glazed doors, the upper portion of the arched opening having been infilled with brick above the concrete lintel.

Door (H22) is as per the original door openings (A1), (C7) and (F16).



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri

Figure 1: Site location

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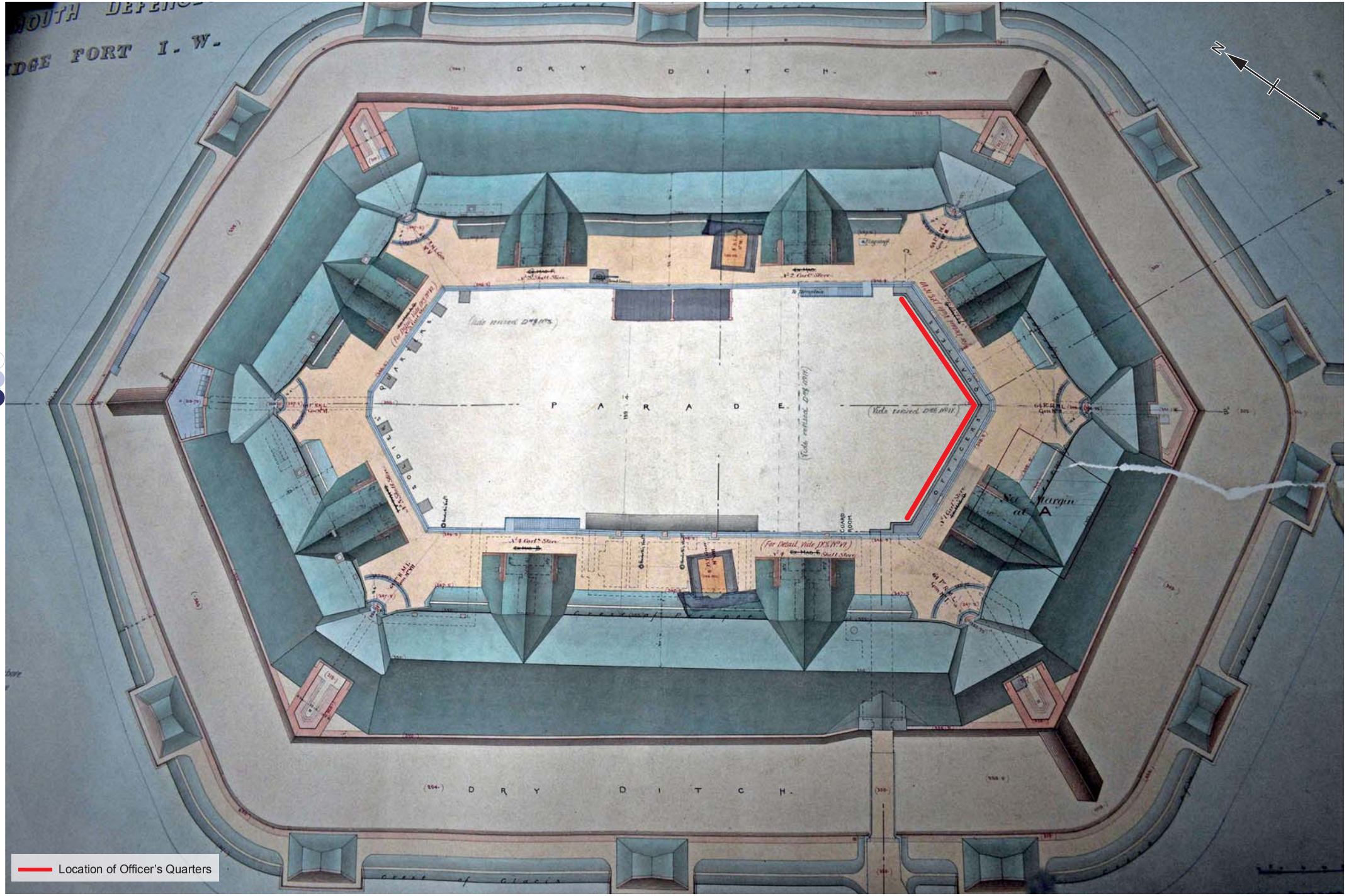

NOT TO SCALE

Figure 2: Historic plan of Bembridge Fort (23rd July 1895) (TNA – WORK78.4128)

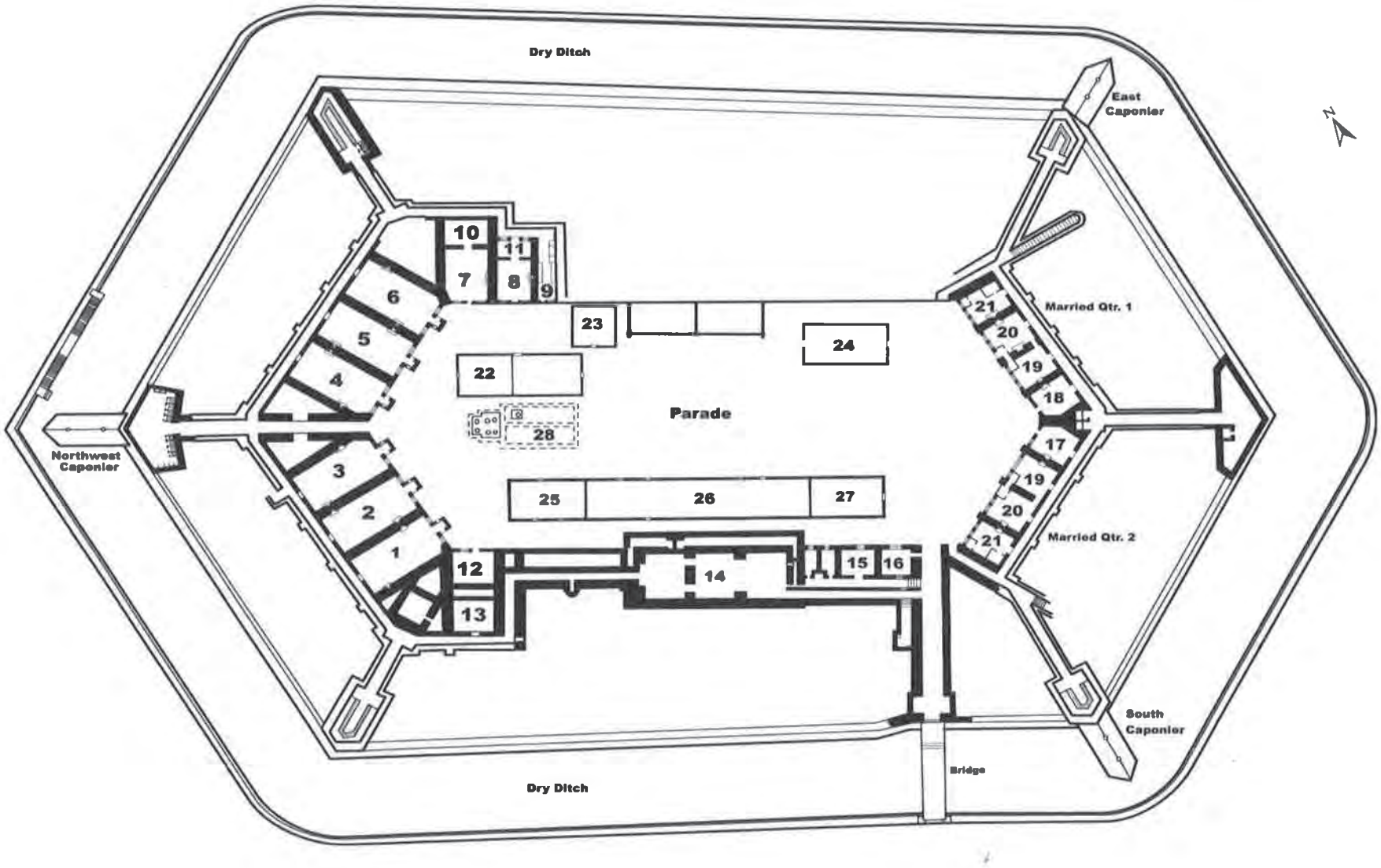

Fig 20: Bembridge Fort 1928

1 to 6 Barrack Room
7. NCOs' Qtrs.
8. Cookhouse
9. Ablution & Bath Room
10. Barrack Store
11. Bread & Meat Store
12. Group Store
13. Main Shell Store
14. Main Magazine
15. Prisoners' Room & Cells
16. Guard Room
17. Telephone Room
18. C.O.'s Office
19. Bed Room
20. Living Room
21. Scullery & Bath Room
22. Store
23. Drying Hut
24. Officers' Lecture Hut
25. Range Finder Store
26. Miniature Range
27. Lecture Room
28. Water Tank and Pump

Figure 3: Plan of Bembridge Fort (1928) (Moore 2010)

Bay A | Bay B | Bay C | Bay D | Bay E | Bay F | Bay G | Bay H

A1 A2 A3 B4 B5 B6 C7 C8 C9 D10 D11 E12 E13 F14 F15 F16 G17 G18 G19 H20 H21 H22

CHECKED BY: GJ 13/11/2018

0 5m

Scale at A3 1:125

Figure 4: Bembridge Fort, Officers' Quarters Elevation

M:\Projects_Ongoing\Bembridge Fort_Isle of Wight\010Geomatics\02 CAD\BEMBFTBS_2018-10-11_Fort_wall_elevation.dwg(Figure 4a A3 landscape)*code*code*BEMBFTBS*benjamin.brown* 28 Jun 2019

Bay A

Bay B

A1 A2 A3 B4 B5 B6

A2 Evidence of phase 1 sash window of superior construction type

C9 Evidence of primary sash window of unknown construction type

D10 Possible phase 1 sash frame of inferior construction

A3 Evidence of sash window possibly part of phase 2

B6 Phase 1 door opening with 1960s door

F15 No apparent (E13 & F15) or limited (G18 + G19) evidence of phase 1 sash window

F14 Former window with later door inserted

A1 Infilled doorway

Phase 1: 1862 - 1867

Phase 2: 1930-1934

Phase 3: mid-1930s to mid-1940s

0 2m

Scale at A3 1:40

CHECKED BY: GL 13/11/2018

Figure 5a: Bembridge Fort, Officers' Quarters Elevation. Phasing and preliminary findings of investigation into surviving sash window joinery

Bay B

Bay C

Bay D

B4 B5 B6 C7 C8 C9 D10

A2 Evidence of phase 1 sash window of superior construction type

C9 Evidence of primary sash window of unknown construction type

D10 Possible phase 1 sash frame of inferior construction

A3 Evidence of sash window possibly part of phase 2

B6 Phase 1 door opening with 1960s door

F15 No apparent (E13 & F15) or limited (G18 + G19) evidence of phase 1 sash window

F14 Former window with later door inserted

A1 Infilled doorway

Phase 1: 1862 - 1867

Phase 2: 1930-1934

Phase 3: mid-1930s to mid-1940s

0 2m

Scale at A3 1:40

Figure 5b: Bembridge Fort, Officers' Quarters Elevation. Phasing and preliminary findings of investigation into surviving sash window joinery

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CHECKED BY: GJ 13/11/2018

Figure 5c: Bembridge Fort, Officers' Quarters Elevation. Phasing and preliminary findings of investigation into surviving sash window joinery

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Bay G

Bay H

G17 G18 G19 H20 H21 H22

A2 Evidence of phase 1 sash window of superior construction type

C9 Evidence of primary sash window of unknown construction type

D10 Possible phase 1 sash frame of inferior construction

A3 Evidence of sash window possibly part of phase 2

B6 Phase 1 door opening with 1960s door

F15 No apparent (E13 & F15) or limited (G18 + G19) evidence of phase 1 sash window

F14 Former window with later door inserted

A1 Infilled doorway

Phase 1: 1862 - 1867

Phase 2: 1930-1934

Phase 3: mid-1930s to mid-1940s

0 2m

Scale at A3 1:40

CHECKED BY: GJ 13/11/2018

Figure 5d: Bembridge Fort, Officers' Quarters Elevation. Phasing and preliminary findings of investigation into surviving sash window joinery

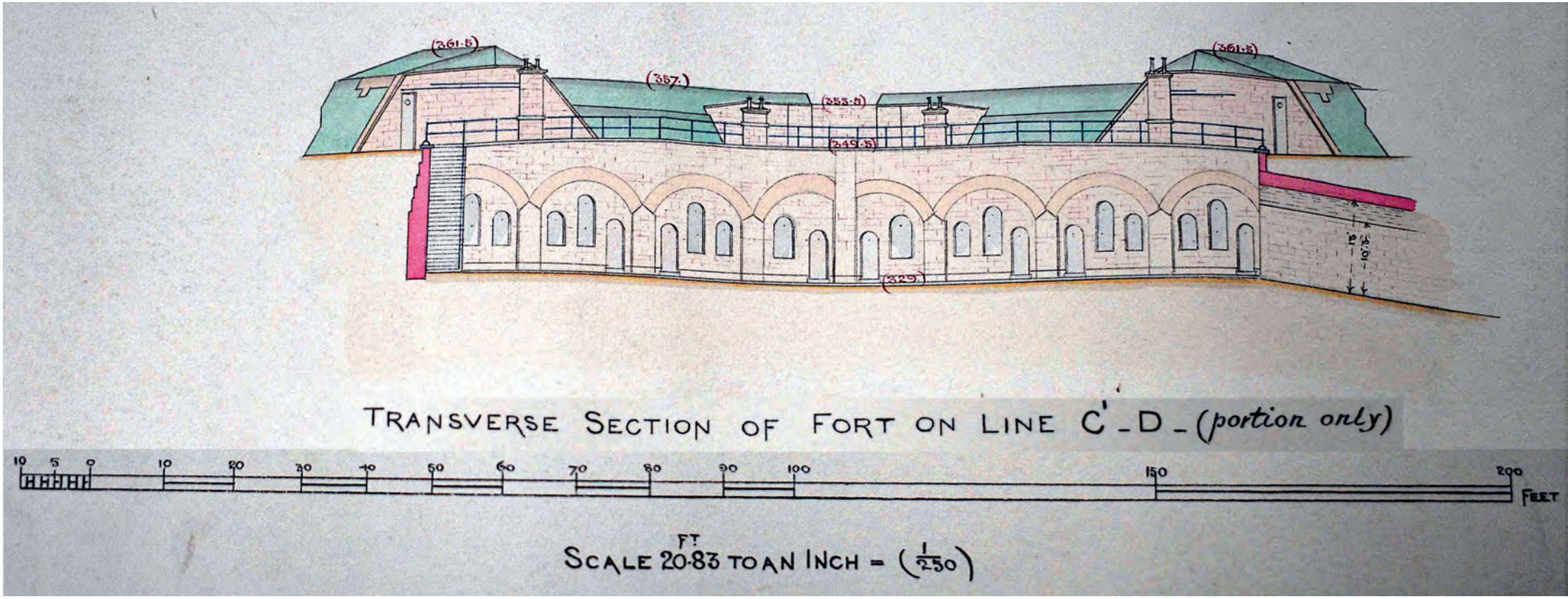


Figure 6: Elevation of the Officer's Quarters (18th March 1889) (TNA – WORK 78.4128)

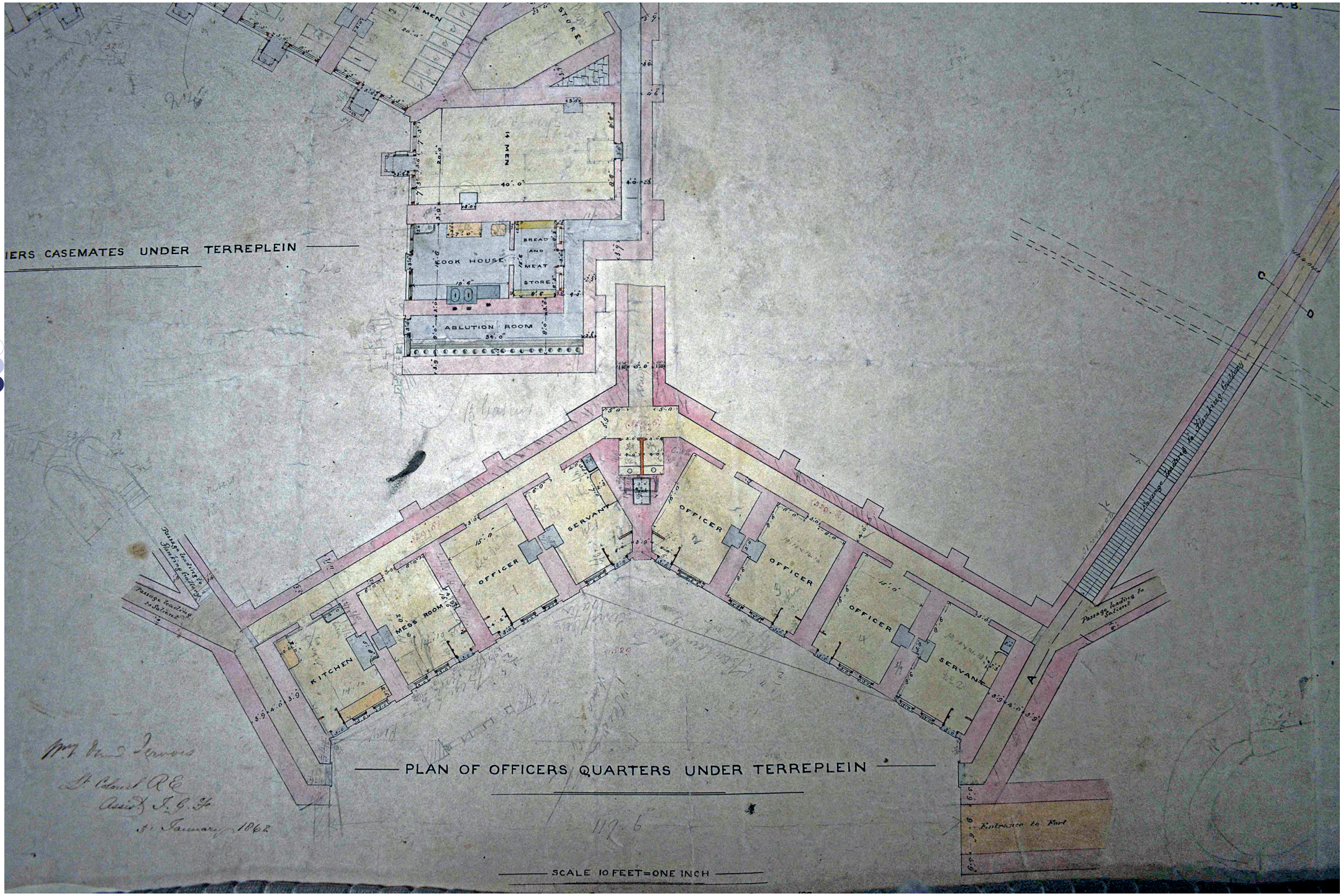


Figure 7: Plan of the Officer's Quarters (31st January 1862) (TNA – WORK 43/214)

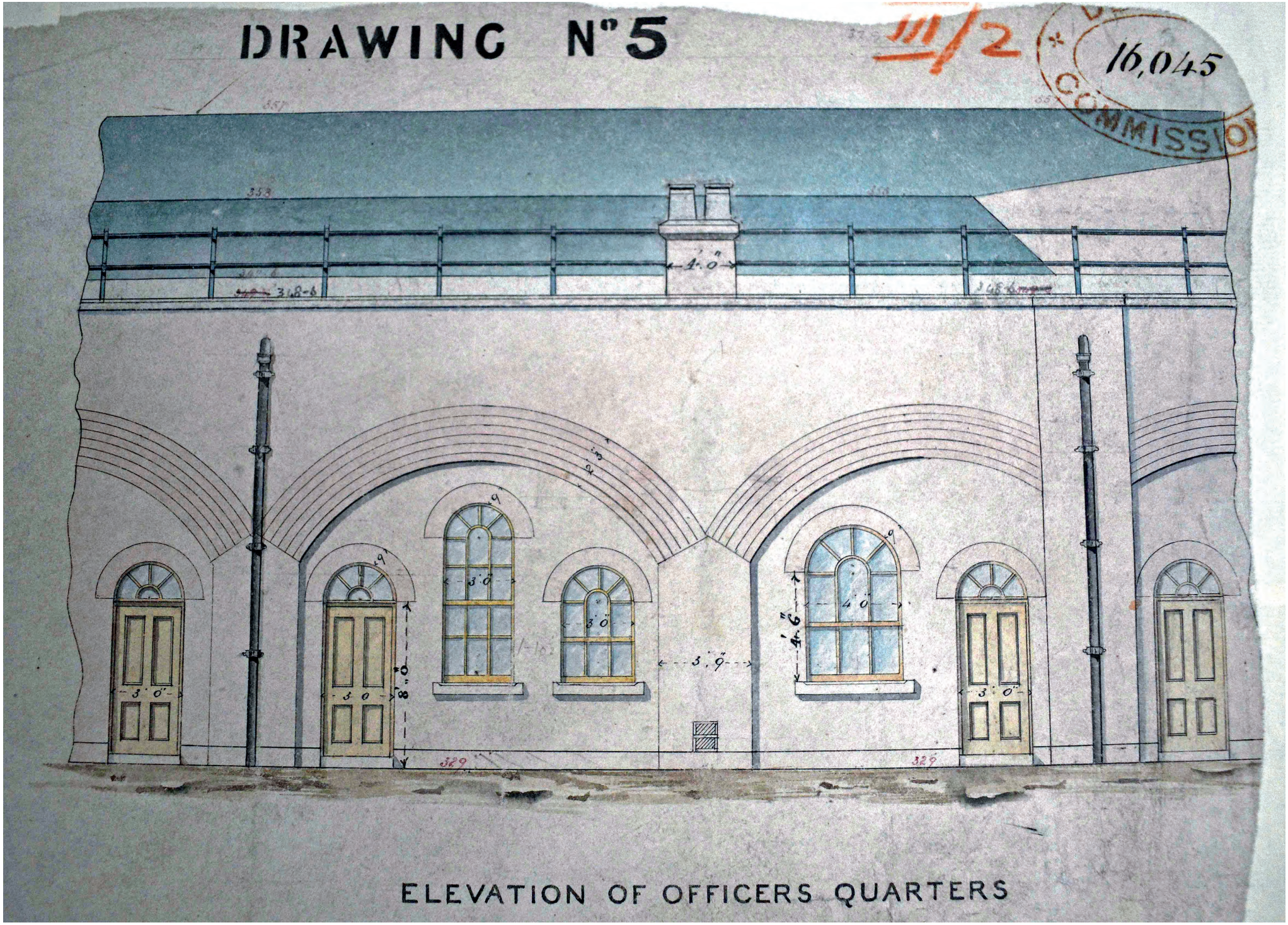
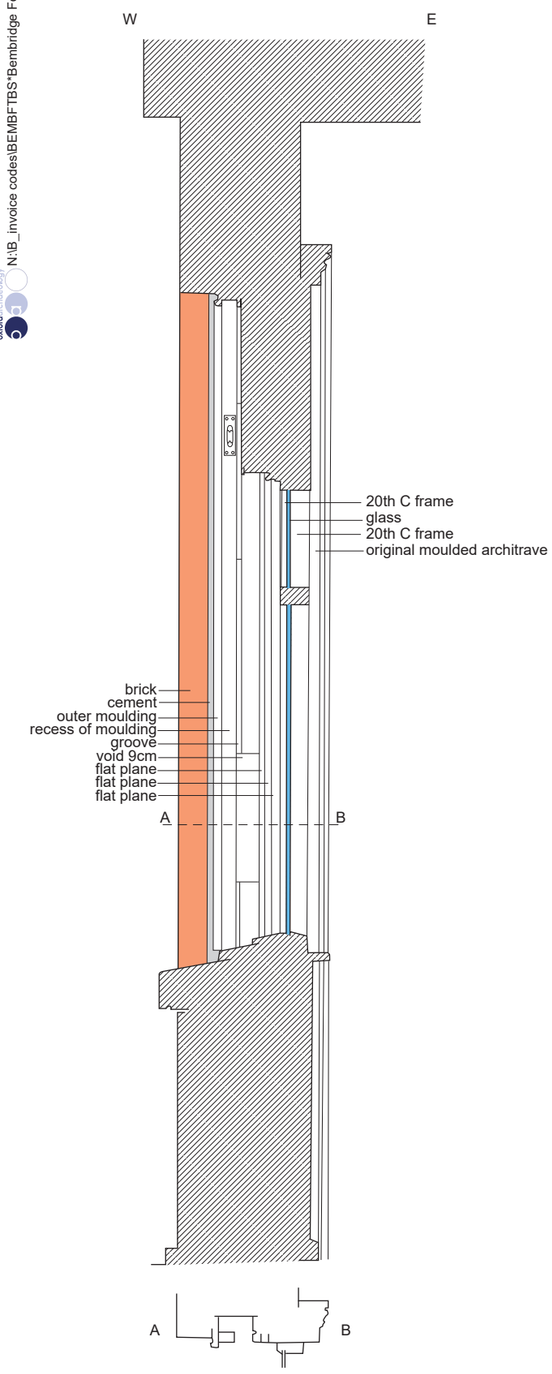
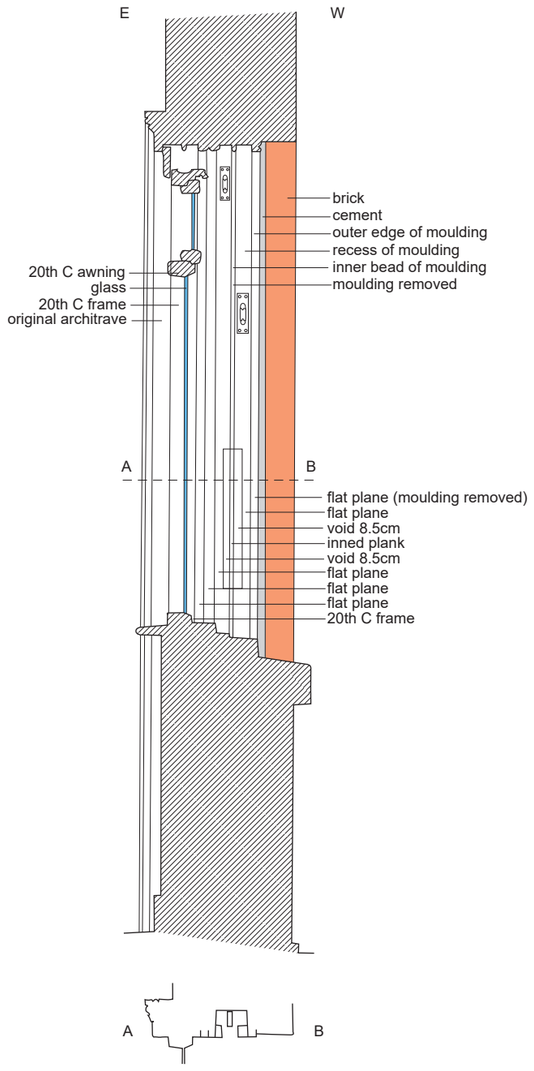


Figure 8: Elevation of Bays B and E (in part), and bays C and D (31st January 1862) (TNA – WORK43/213)

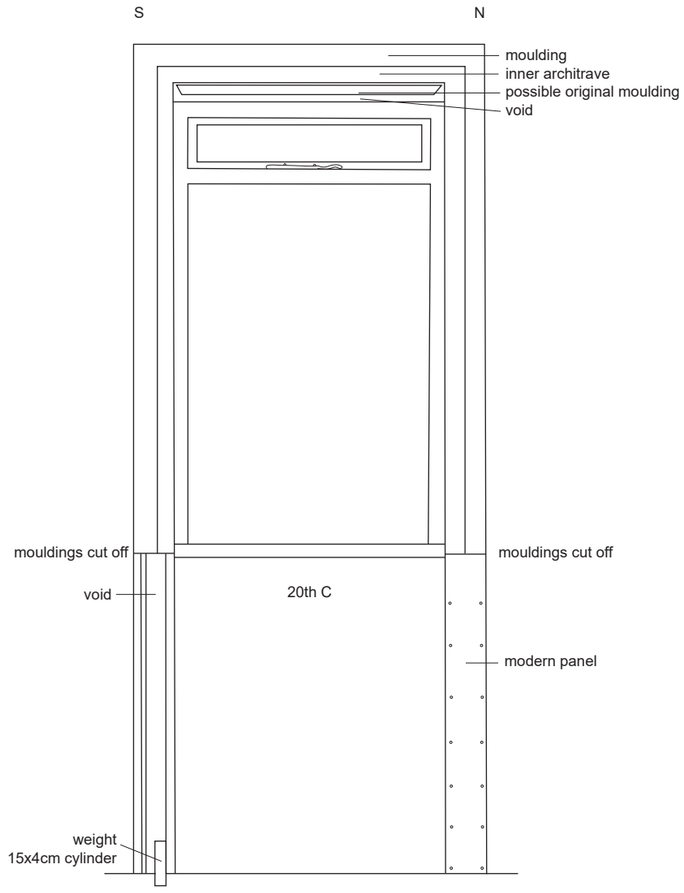
Opening C8



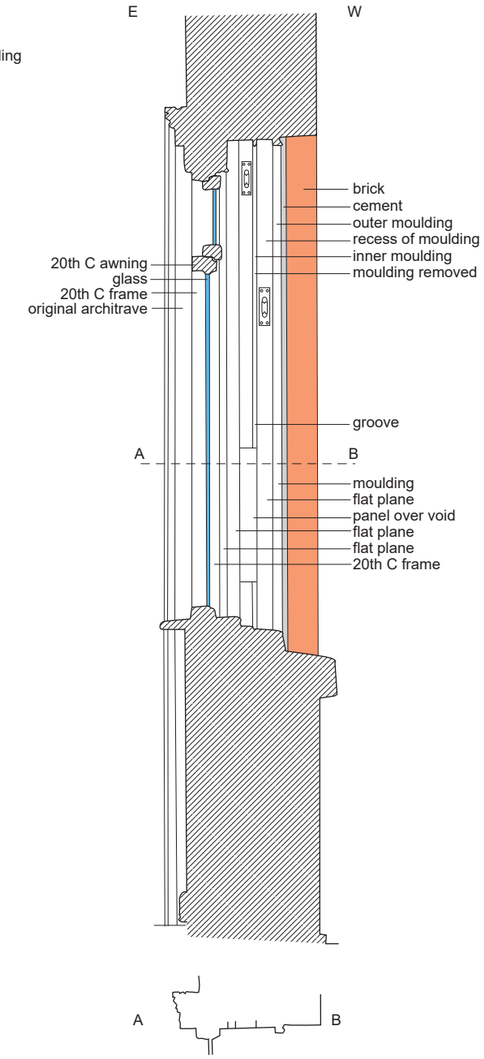
Opening C9



Opening B4



Opening H20



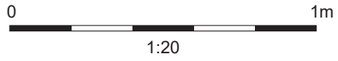


Figure 9: Section drawings of sash windows in Bays C and H

Figure 10: Surviving Second World War Features

Plate 1: Entrance to Bembridge Fort

Plate 2: View of south edge of fort looking east towards the entrance

Plate 3: View of south edge of fort looking west

Plate 4: East facing view of Officer's Quarters

Plate 5: Bay B, showing original construction

Plate 6: Bay H, showing later infill and insertion of door

Plate 7: 1930s salt-glazed pottery air-brick

Plate 8: Bay A, opening A3, showing deteriorated sill

Plate 9: Bay D, bootscrape

Plate 10: Bay A, opening A2 showing superior type of primary sash window

Plate 11: Bay C, opening C9, showing inferior type of sash window

Plate 12: Cast-iron axle-pulley removed from window (A2), dating from the 1862-67

Plate 13: Secret axle dating from 1925-39, probable replacement

Plate 14: Bay A, external view

Plate 15: Bay A, opening A1

Plate 16: Bay A, bootscrape

Plate 17: Bay A, opening A2

Plate 18: Bay A, opening A3

Plate 19: Bay A, internal view of openings A2 and A3

Plate 20: Bay B, external view

Plate 21: Bay B, openings B4 and B5

Plate 22: Bay B, internal view

Plate 23: Bay B, internal door on east wall leading to connecting corridor

Plate 24: Bay C, external view

Plate 25: Bay C, opening C8

Plate 26: Bay C, internal view of sash frames

Plate 27: Bay D, external view

Plate 28: Bay D, opening D10

Plate 29: Bay D, internal view of opening D11

Plate 30: Bay D, skirting board

Plate 31: Bay E, external view

Plate 32: Bay E, external view of opening E13

Plate 33: Bay F, external view

Plate 34: Bay F, external view of opening F15

Plate 35: Bay F, internal view

Plate 36: Bay G, external view

Plate 37: Bay G, external view of opening G17

Plate 38: Bay G, external view of opening G19

Plate 39: Bay G, internal view

Plate 40: Bay G, door on east wall to connecting corridor

Plate 41: Bay H, external view of opening H20

Plate 42: Bay H, external view of opening H20 with panel removed

Plate 43: Bay H, external view of opening H21

Plate 44: Bay H, internal view

Plate 45; Radar Building, external view

Plate 46: Radar building, internal view showing re-used sash window and roof support

Plate 47: Radar building, external view of north end

Plate 48: Radar building, internal view of south end

Plate 49: Radar building, roof, looking south

Plate 50: Remains of both radar supports

Plate 51: Remains of radar support (north-east)

Plate 52: Remains of radar support (south-west)

Plate 53: Position Finding Cell, external view

Plate 54: Position Finding Cell, external view of rear elevation and roof

Plate 55: Position Finding Cell, internal view

Plate 56: Identification of Friend or Foe building, external view

Plate 57: Allan-Williams Turret (west)

Plate 58: Allan-Williams Turret (east)

Plate 59: Spigot Mortar emplacement (west)

Plate 60: Spigot Mortar emplacement (east)

Plate 61: Remains of Spigot Mortar emplacement

Plate 62: Motley Stalk (west of access)

Plate 63: Motley Stalk (east)

Plate 64: Possible surviving Motley Stalk (south)

Plate 65: Rifle Trench

Plate 66: Open Machine Gun Position

Plate 67: Crane Post

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