

Phoenix Park Magazine Fort

Assessment of surfaces



GIACOMETTI & BARRY

17/07/2020

AP2010

15E0540

archaeology plan
HERITAGE SOLUTIONS

SITE NAME

Magazine Fort, Phoenix Park, Dublin 8

CLIENT

Office of Public Works, Jonathan Swift Street, Trim, Co. Meath

RMP

DU0018-0719; also RPS 6896

PLANNING

N/a

LICENCE

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PROJECT REF

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ABBREVIATIONS USED

DoHLGH	Dept. of Housing, Local Government & Heritage
NMI	National Museum of Ireland
NMS	National Monuments Service
OS	Ordnance Survey
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
NIAH	National Inventory of Architectural Heritage
LAP	Local Area Plan

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Introduction

Aims and methodology

The project described in this report is a survey and assessment of ground surfaces in the Magazine Fort. This was carried out from 06/07/2020 to 15/07/2020 by Giacometti and Barry. 'Ground surfaces' for the project were defined as an outdoor surface that could be walked on, which included surface gutters and cast-iron manhole covers but excluded walls and internal floors.

The primary aim of the survey was to identify the materials used in the ground surfaces and to digitally map them to inform the long term conservation of the fort. Nine surface materials were identified: granite pavements, limestone pavements, cobbles, stone setts, brick surface drains, asphalt/tarmacadam, concrete, cast-iron utility covers, and grass. Small test-pits were excavated through overgrown areas to establish the former surface and get information about phasing. All the surfaces were recorded (drawn, written and photographic) and were mapped di-

gitally over the existing detailed survey of the fort (file 08130_200.dwg by BPM Surveys, 2008).

In this report, the digital image of the modern ground surfaces is presented, as well as detailed written descriptions of each of the surface materials. The conclusions set out some of the more interesting findings and compare the modern surfaces with historic maps.

The terminology for buildings is based on the Statement of Significance by Paul Arnold Architects (2008), which labelled each building with a letter. A key is provided in this report. Frequent reference is also made to a 1859-1861 survey of the fort in the Military Archives (Kew National Archives WO78/4743/15), which was reproduced in an unpublished report by John McCullen (2015). The original survey (see page 26) used colours to indicate various ground surfaces, which was particularly useful for this project.



Background

The Phoenix Park Magazine Fort is an impressive mid-18th century fortification situated in the south of the Phoenix Park, near the Island-bridge Gate, in Dublin 8.

In 1734 Lord Lieutenant Sackville, Duke of Dorset ordered the construction of a powder magazine in the Phoenix Park and an initial sum of £2,300 was made available for the project. Part of the impetus for the construction of the fort was the need for safe store for gunpowder. The Powder Tower in Dublin Castle had almost exploded during a fire at the castle in 1684, after which it was moved to a flanker at the Royal Hospital of Kilmmainham (McParland 2001, 140). The relocation of the powder magazine to the Phoenix Park reduced the risk of large-scale damage in the event of an accident, while keeping the valuable stores in easy reach of Dublin Castle and the Royal Barracks (ibid, 4), and other nearby military institutions near the Phoenix Park.

The site selected for the fort was a hill with commanding views south across the Liffey valley, and across the river to the Dublin Mountains, and called Thomas' Hill on the first-edition 6-inch map (OS 1837). Thomas' Hill was the site of an early seventeenth-century house built by Sir Edward Fisher c. 1611 (Litton-Falkiner 1901, 470). Fisher's dwelling was set in substantial grounds and included 300 acres of land and 60 acres of woodland, known as Kilmmainham Wood. His holding became Crown property in 1618, and from at least 1619 the house was known as 'the Phenix'. The Phoenix House became the principal residence of the Chief Governors of Ireland until 1665, and its occupants included the Earls of Strafford, Henry Cromwell, and the Duke of Ormond (Ibid, 470-1). The house was augmented by its owners, including the addition of stables, an additional wing, and a chapel (Ball 1901, 182). Ormond's most significant achievement was the development of the landscape around the house. He purchased lands contiguous to Phoenix demesne enlarging the holding to above 2000 acres and commenced the construction of a stone wall emparking the lands for deer (Litton-Falkiner 1901, 476).

By 1734, when the Lord Lieutenant decided to build the Magazine Fort, the viceregal residence had long ago moved to Chapelizod (in 1665) and the Phoenix House had been demoted to a residence for the Lord Lieutenant's staff. In 1719, for example, it was occupied by an official with the title 'Gentleman of the Horse' (ibid, 473). The house was completely demolished during the construction of the fort, and the building was supposedly used as a quarry for stone (Litton-Falkiner 1900-2, 473; McCullen 2015, 4), but there is no evidence of any stone or brick of the Phoenix House being re-used anywhere in the Magazine Fort (Giacometti 2015, Gleeson 2017).

The Magazine Fort was designed by Irish Ordnance military engineer John Corneille (Casey 2005, 306). Construction was started in 1734 and completed in 1736 (McParland 2001, 140). Corneille's design was for a bastioned fort, a form whose origins lay in early modern Europe. The development of artillery from the 1400s had a profound impact on military architecture. Defences came to include thick earthen ramparts to absorb the shock of gun fire and wide platforms with space to mount cannon (Barrass 2011, 2). Bastioned forts first appeared in the first quarter of the sixteenth century in the north of Italy, and they remained a mainstay of military architecture into the nineteenth century (Kerrigan 1995).

The fort is quadrilateral in plan with demi-bastions on each corner. Its ramparts are thick stone-faced earth and rubble banks, and it is surrounded by a flat-bottomed dry ditch. The main gate to the fort had a date inscription of 1736 on the keystone and a Latin inscription above stating it was constructed during the reign of George III by Lord Lieutenant Lionel Sackville, Duke of Dorset (the gate was dismantled in c. 1980 and these fragments are stored in the coopeage/wagon shed).

In addition to the ramparts, the earliest building at the site were the powder magazines. These have large brick vaults and incorporate complex ventilation systems within their thick brick walls. Two of the magazines are original to the fort, and the first documentation of powder and shot supplied to the fort dates to 1738 (Kerrigan 1995, 136, cited in Arnold 2008, 7).

Gunpowder was produced locally during the 18th century, for example at the Kilmatead Powder Mills in Clondalkin (SDLLS 2013). The magazine building was expanded in 1758, when the Duke of Bedford (Lord Lieutenant) requested the construction of an infill between the two original valued magazines (McCullen 2015, 4) designed by Thomas Eyre, Surveyor General. The Magazine Store design and engineering are heavily influenced by the 17th century work of Sebastien le Prêtre de Vauban, Chief Engineer to King Louis XIV of France (McParland 2001, 140; Gleeson 2017, 72-4).

One of the earliest depictions of the fort is on Roque's 1756 map of Dublin. The map shows the original rampart line with circular towers protruding from each corner. The fort is surrounded by a ditch which is crossed by a causeway leading to its east gate. Four buildings are depicted in the interior: the two magazines enclosed by a boundary wall, and two other structures either side of the entrance near the east wall. Brown's map of the Phoenix Park (1789) shows the magazine buildings and the drawbridge accessing the fort.

The fort was surveyed in 1793 by George Armitage. The survey shows the original ramparts with five internal buildings: (i) the magazines, (ii) an ammunition magazine, (iii) officers' rooms, (iv) a guard room and (v) a sentry box. The survey shows a howitzer gun protecting the entrance, which is accessed by a drawbridge over the ditch. It depicts ramps accessing the ramparts at the NE, SE, and SW bastions, and watchtowers at the corner of each bastion.

An extensive programme of renovation took place at the fort between 1793 and 1801 perhaps reflecting the threat imposed by the French Revolutionary Wars. During this phase, the ramparts were widened at the bastions to accommodate gun emplacements and four corner cavaliers, the parapet was raised, and a stepped parapet walkway was added (Giacometti 2015). These alterations considerably altered the fort and greatly improved its defensive nature.

Possibly as part of these works, a ravelin or barrack block was added in 1801 to the east of the fort. The addition was designed by Francis Johnston (Casey 2005, 305), and comprised

buildings arranged in a V-shape that housed quarters for sergeants, officers, and soldiers, as well as offices, a guard room and a cookhouse (Arnold 2008, 10). The fort continued to develop in a piecemeal fashion throughout the 19th century. During this period additions include a cooperage, cooperage stores, a wagon shed, a blast wall, an engine house, and stores (Arnold 2008, 8). Dated plans housed in the Military Archives provide 19th century dates for the construction of a new wagon shed (1875), a shifting room (1877), and an exam room/laboratory (1878) (*ibid.*, 9). Another phase of building occurred at the turn of the 20th century with the addition of an ablution rooms, toilets, a women's wash-house and a coal store (*ibid.*, 9, 11, 13). Circa 1903 plans were drawn up for the conversion of the cavaliers for use at guncotton stores. The fort was handed over to the Irish Army in December 1922 (McCullen 2015, 13). Other 20th century additions to the fort include the replacement of the NW cavalier with a concrete cordite store, the construction of a mass concrete sentry box, and an iron reception shed/bakery c.1921 (Arnold 2008, 7, 10).

The Magazine Fort was raided twice during the 20th century. On Easter Monday 1916 a failed attempt was made to blow up the fort, acting as a signal for the Rising. Another raid on the fort took place on 23 December 1939, when the IRA attacked with the aim of capturing munitions. The raid was initially successful but most of the stolen arms were recovered in the days following (McCullen 2015, 13). The fort was managed by the Irish Defence Forces until 1988, at which point the Commissioners of Public Works took over ownership (Gleeson 2017, 6).

Previous research on the fort

Unpublished reports and surveys of the Magazine Fort include a statement of significance prepared by Paul Arnold Architects in 2008, a comprehensive topographical survey by BPM Surveys Ltd in April 2008, a historical report on the fort by John McCullen in 2015, a detailed archaeological assessment and survey of three of the fort bastions by Giacometti and Campbell in 2016, and a thesis on the Magazine

Stores and their conservation with an emphasis on brick by Pauline Gleeson in 2017.

Two unlicensed programmes of metal detection have been carried out near the fort. One of these in 1984 (NMI Topographical File IA/136/84) uncovered a cache of military equipment near the fort that included 18th century musket balls, an 18th century Scottish lead token, 19th century military uniform buttons, an eyelet-type fastener, a bone spoon and a horse-harness ring. It appears these were taken from the backfill of a pipeline being archaeologically-monitored by Margaret Gowan (NMI Files). The second is documented by McCullen (2015, 7) and relates to the discovery of a cannon now in Collins Barracks (no Topo file ref). There is no other record of the investigation and according to Lar Joye in the NMI the cannon in question originated from a ship rather than a fort (pers. com. 2016).

Archaeological testing was carried out at two locations in the rampart in 2010 (Johnston, unlicensed) which found relatively little of interest. A second programme of archaeological testing was carried out in 2015 in three locations of the rampart and identified three phases of rampart construction (Giacometti 2015, License 15E0540). A subsequent programme of archaeological monitoring (Giacometti 2016 & in prep, License 15E0540) uncovered further detail about the three phases of construction in the north-western demibastion, and documented military artefacts found in the Magazine Stores.

Archaeological significance

The Phoenix Park magazine fort is a Recorded Monument (RMP DU0018-0719) and Protected Structure (RPS 6896). The 2008 Statement of Significance notes that it is one of the major surviving magazine forts in the country and, on the basis of its architectural, historical and technical aspects, assigns the fort complex a 'National' rating (Arnold 2008, 1-15), further noting that the fort's highly recognisable form makes it one of the Phoenix Park's most important landmarks (ibid).

From an archaeological point of view, however, the fort forms a key element of the wider ar-

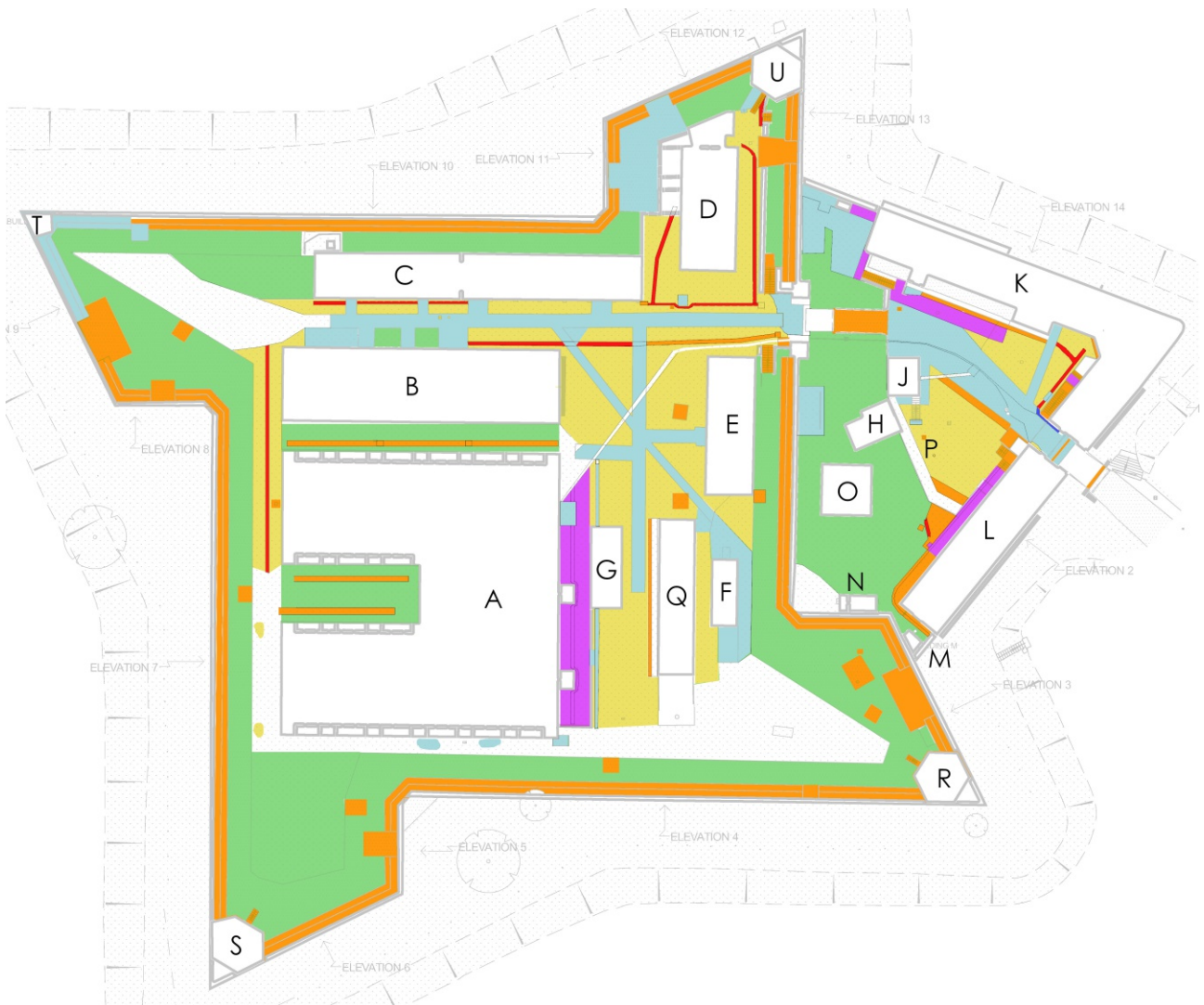
chaeological landscape of the Phoenix Park (RMP DU018-007---), which includes the 17th century deer park and the site of the 17th century Phoenix House (RMP DU018-0713), as well as numerous other archaeological monuments such as the nearby abandoned star fort ('Wharton's Folley'). It is also set within the wider historic military quarter of west Dublin which includes military and institutional buildings both within and outside the Phoenix Park including the Royal Hospital Kilmmainham, Royal Infirmary, Collins Barracks, Ordnance Stores, etc. This setting enhances the archaeological significance of both the Magazine Fort and the Phoenix Park, and consideration should be given to the archaeology and landscaping of the areas surrounding the fort in future plans for the Phoenix Park.

Another key factor of national archaeological importance is the role the fort played in Irish independence, from symbol of the British military presence in Ireland to site of Nationalist struggle at key moments in history. In 1882 the Invincibles (Fenians) assassinated the British secretary Lord Frederick Cavendish nearby; in 1916 the Magazine Fort was captured by rebels and failed to explode properly to signal the beginning of the Easter Rising; in 1939 the IRA stole a huge quantity of arms in the Christmas Raid; and in 1939-46 massive bread ovens still visible in the fort supposedly baked for soldiers during the Emergency, but may have also had a more sinister role related to the manufacture of phosphorous weapons (Myles pers.com. 2016). Thus, the physical survival of the 18th century fort into modern times, as well as the 20th century modifications, graffiti and bullet holes, form part of the fort's national archaeological importance. Great care must therefore be taken in any future programme of conservation not to erase these 20th century interventions in a misguided attempt to return the fort to an earlier-looking aesthetic.

Gleeson (2017, 18) sets out the factors that make the Phoenix Park magazine fort a national - if not international - archaeological monument: 'the rarity of the monument, its setting within the internationally important Phoenix Park, its wider connection to military infrastructure of Dublin in the same period, its early use of brick in wide spanning structures, its design

associated with Corneille, Eyre, Johnson and de Vauban and its role on Easter Sunday 1916'. Similar forts in other countries have become UNESCO World Heritage Sites, and at the very least the Phoenix Park Magazine Fort should be treated as both a National Monument within the meaning of the National Monuments Acts 1930-2014, as well as a critical component of a wider archaeological landscape of national significance that encompasses the Phoenix Park as a whole.

- Granite
- Limestone
- Cobbles
- Brick
- Stone setts
- Concrete
- Grass



Granite

Areas present

Ravelin

- 750mm wide strip with gutter running alongside building K
- Two thin strips of granite, one with a gutter outside entrance to ravelin
- Granite paving on bridge into main fort
- Reused to cover water service in north end of concrete driveway
- 1.3m wide strip with gutter south of ravelin road, cut by a modern service to the north
- Top of coal hole in southern coal cellar
- Light wells of building K (along with limestone and concrete)
- At southern tip of upper area over tank, incorporating a pump hole
- Thin strip with gutter running along southern end of the late phase of building L
- Flagstones outside Building K and ablution room in lower area of ravelin incl. a pump
- All external steps of buildings K and L
- Raised walkway into building L, and step into corner building K and west porch building K

Main fort

- Rampart walkways and steps up to rampart
- Steps up to cavaliers
- Cannon emplacements
- Sentry posts on rampart and on lower level
- Sentry walkway to north of blast wall
- Granite setts forming gutter to west of main entrance to fort
- Covering tanks on rampart and in main fort
- Drains to rear and north side of magazine stores

Granite pavement over bridge from ravelin to main fort



Description

Granite paving slabs, large slabs, often larger than the limestone slabs, with wide variation in sizes. One example is c. 1.7m long and 700mm wide, which is larger than the limestone. The granite paving frequently incorporates shallow (c. 50mm deep) gutters of various widths: 100mm southwest of building L, 170mm south of building K, 450mm south of the access road in upper ravelin, and 500mm just inside main fort.

In several cases the granite is used in key areas, for example pump sockets, flag poles, gun platforms, above water tanks and surrounding coal holes. They are also used in high-wear areas such as steps and walks. The external steps down the side of Building L have been grooved to provide additional grip, a feature which is almost certainly much later than the construction of the steps as this is not seen elsewhere in the fort except for at the entrance to the fort and on concrete surfaces.

The thin (20cm wide) strip of granite paving running to the west of the blast wall is likely to be the lower step of a sentry walk labelled here on 19th century maps. The upper step is now missing but likely filled the 630mm strip directly abutting the blast wall, which would make it about the same width as the ravelin sentry walk.

The granite used in the gutter to south of the entrance to the main fort uses much smaller rectangular pieces of granite (c. 300mm by 600mm). These are effectively large granite setts, and are similar to the granite sett floor in Building D.

Discussion

Most of the granite features are depicted on the 1859 survey and are at least as old as the 1790s-1801 phase of renovation to the fort. Areas of granite and limestone paving are grouped together as 'Flag Paving' on the 1859 survey of the fort, and in the ravelin they sometimes appear to have been used interchangeably, with granite preferred over limestone, especially in high-wear areas. This makes sense as granite is



Granite 'sentry walk' to south of concrete driveway in ravelin



Granite 'sentry promenade' to west of Blast Wall in main fort. Note abrupt end of cobbles at base of image indicating missing upper step



Granite gutter at entrance to ravelin



Granite pavement covering tank in centre of main fort



Granite stones forming gutter at entrance of main fort



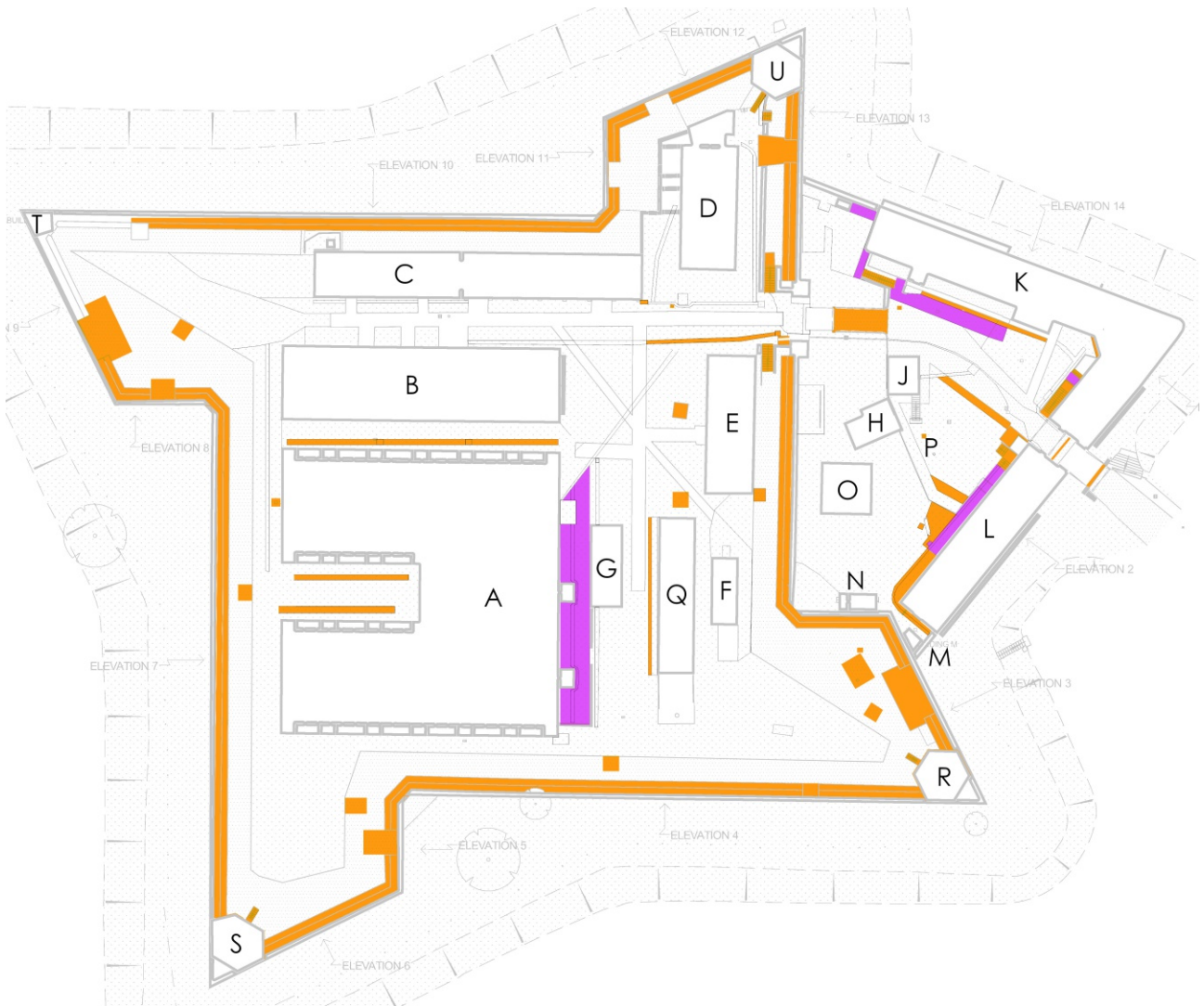
Granite gutter outside building K

less slippery and harder wearing than limestone. However, outside Building L at the lower level of the ravelin the use of granite and limestone paving is distinct, and comparison with cartographic sources suggests two phases of construction. The limestone paving and gutter probably dates to the beginning of the nineteenth century and the construction of the Johnstown Ravelin, as this part of building L is integral to the ravelin and gate. The granite paving relates to the 'Married Quarters' extension, first documented on the 1883 corrected survey, and was thus laid between 1859 and 1883, most likely in the 1870s when numerous construction works were carried out at the fort.

On the 1859 survey, the granite pavement just inside the ravelin is labelled as 'sentry's walk', and the granite pavement west of the blast wall is labelled as 'sentry promenade'. Both are superficially different today. The ravelin pavement is 9m long (E-W), 1.3m wide and incorporates a gutter. The blast wall pavement is 18m long (N-S) and 200mm wide. However, in the past the ravelin pavement was longer (it is truncated by a modern drain leading into Building H), and the narrow blast wall pavement is missing an upper step that would have widened it to c. 850mm. This upper step is depicted on the 1878 map (Military Archives AD119292-009). Thus, both sentry walks/promenades are similar in scale, well-drained, and positioned on the left as one enters the fort or turns towards the magazines, which are the two key areas of the fort.

The remnant of a third sentry walk/promenade may survive in the form of a granite sett gutter 14m long and 500mm wide. Although unlabelled on the map, this pavement is likely to be an earlier version of the sentry's walk inside the main entrance of the fort in a similar left-hand side position as the two other sentry pavements. A better image of this is included on page 14 (Folkestonejack 2016).

The strip of granite just outside the entrance to the Johnstown Ravelin, abutted to either side with tarmacadam, probably formed the top of a stone revetment to the exterior of the ditch dating to 1801.



Granite (orange) and limestone (pink) surfaces in the magazine fort. Note how limestone is restricted to the exterior of three buildings: A, L (early phase only) and K. Granite is used much more frequently.

Limestone

Areas present

- Limestone pavement south of Building K in upper level
- Limestone pavement west of Building K in lower level
- Limestone pavement with gutter north-west of building L in lower level
- Limestone pavements in lightwells of K and L
- Limestone floors in room below draw-bridge and 'Ablution Room' accessed from southern lower level of ravelin to southwest
- Limestone paving in raised entrance into west of Building K
- Limestone pavement with gutter in front of Building A in main fort

Description

Large rectangular limestone flagstones from c. 600mm by 1m to c. 400mm by 600mm. Usually in strips alongside buildings 1.25m-1.4m in width in front of Buildings L and K in the ravelin, and 3.6m width in front of Building A in the main fort. These three limestone pavements each incorporate a different type of surface gutter. In building L the gutter (100mm wide and 20mm deep) is cut directly into the paving stone. In Building K the gutter is cut into a thinner strip of granite pavement running alongside the limestone. Outside Building A, thin gutters (80mm wide and 30mm deep) are cut into a 300mm strip of limestone set into the wider limestone pavement, with some later concrete alteration around the later porches.

Discussion

The three limestone pavements in front of Buildings A, K and L are depicted on the 1859 survey of fort and shaded in a grey colour for



Limestone pavement in front of Building A



Limestone pavement west of Building K



Limestone pavement northwest of Building L

‘Flag Paving’. The central gutter through the Store A pavement is also depicted on the survey, and this pavement could be original to the fort, i.e. 1736. It was left in place when the raised wooden walkway was constructed over it in the 1870s, and also remained when the porches were added between 1878 and 1883 (IE/MA/MPD/AD119292-006 and 009 Irish Military Archives; Gleeson 2017, 17), through the gutter was modified at this time to go around the store porches.

The limestone paving and gutter running along Building L is significant as it only runs along the early nineteenth century part of the building, indicating it is almost certainly original to it (i.e. 1801), and predates the later granite paving to the south. Limestone is also present on some wall parapets, e.g. south of Building K. The limestone in the raised upper-floor entrance to building K is later, as this walkway was created after 1883. The earlier raised upper-floor entrance to building L uses granite.

Limestone pavement south of Building K

It is notable that the three largest - and in several ways the most significant - buildings in the fort (A, L and K), and the only three buildings with a limestone front façade, are the only three with limestone pavements in front of them.



Cobbles

Areas present

- Upper level of ravelin, either side of concrete driveway
- South side of Johnstown Ravelin entrance gate, extending just outside gate.
- In the central area of the main fort
- In the space formed by the northern demi-bastion, around Building D
- To the west of the Magazine Stores (very patchy to the southwest)

No cobbles are visible in the lower level of the ravelin, in any basement areas or light wells, or in coal cellars. Cobbles were not identified on the ramparts, in the spaces formed by the east, west or southern demi-bastions, nor to the north and south of the magazine stores.

Description

The cobbles are not uniform in shape or size and are generally sub-rounded dark grey coloured stones 70-100mm in diameter. They appear to be set directly into gritty sandy soil with no trace of tar or bitumen or mortar bedding surviving, except alongside concrete paths or around manholes where they are set into concrete. They may have been set into sand which has since been mixed into the underlying soil.

In the north of the upper ravelin, two distinct styles of cobbling were identified. In this area, brick-lined surface gutters run through the cobbled area and appear to be roughly contemporary with it. The cobbles closest to the gutters



Cobbles in main fort, from Folkestonejack 2016 (and also see cover image)



Cobbles in main fort, from Folkestonejack 2016

are sub-oval and rectangular in form and measure c. 100mm in length and are set in the same north-south alignment as the gutter. Further from the gutters, the cobbles are smaller (c. 700mm diameter) and rounded and set with no obvious orientation. This is likely to indicate repair of cobbling close to the gutters (which themselves appear to have been repaired in the 20th century, based on the use of modern brick).

Photographs from 2016 (Folkestonejack 2016) show the cobbles in the centre of the fort in detail just after they were cleaned (see cover image). These show linear arrangements of cobbles which may have formed surface gutters predating the 19th century brick drains.

Discussion

The 1859 survey shades the cobbled areas in a light brown colour and identifies them as 'Pitch Pavement' in the key. A pitch pavement is made

up of small stones set flat-side up and is a more correct term than cobbles to describe this surface. Confusingly, a later correction of the survey dating to 1881 labels an area of pitch/cobbling as 'gravel'. The reason for this is not known.

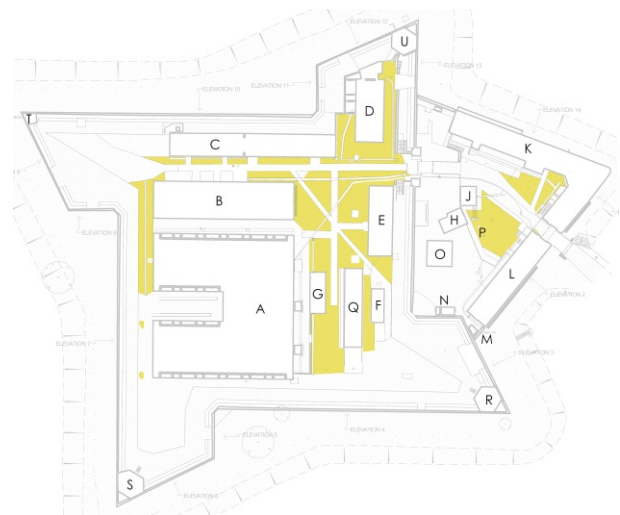
The cobbles do not extend underneath the limestone or granite paving stones, but they do appear to extend under some of the concrete driveway and concrete paths. In the main fort the cobbles have been re-set in concrete either side of several concrete paths to form gutters. A roughly square area c. 1.5m across northwest of the manhole cover outside Building K is missing cobbles, and it is likely that this area previously had cobbles which were removed to facilitate drainage to the cover.

The cobbled surface is likely to be original to the construction of the fort in the 1730s and was repaired and probably extended up to the end of the 19th century. The cobbles in the ravelin are likely original to that extension in the



Cobbles in ravelin, from Noel Fitzgerald 2017 ('save the magazine fort' facebook page). Note brick-lined gutters, in contrast to cover image which shows possible cobblestone gutters in lower left and lower right.

early 19th century. Areas of 20th century cobble repair were identified in the ravelin associated with repairs to the brick-lined gutters in the northeast of the ravelin. In the main fort, cobbles were reused to form gutters running alongside concrete paths in the 20th century.



Above: Cobbles in Magazine Fort, shown in yellow



Left: Cobbles just inside main fort entrance, from Folkestonejack 2016. Note brick-lined gutter to left and granite-lined gutter to right.

Brick

Areas present

- On floors of southern coal cellar and northern coal cellar (south of building K) in ravelin
- Lining gutters in upper area outside building K and in lower area outside building L in ravelin
- Lining gutters of main fort to west of building A, north of B, south of C and surrounding D
- Lining a small gutter south of Cavalier 4 (Building U) at the base of the steps up to the rampart

Description

Most of the brick surfaces use red-dish-brown brick of poor quality identical to the brick used in the construction of the 19th century buildings on the fort. This brick is browner than the brick used in the 18th century stores building and rampart wall and measures a standard 230 by 80 by 90mm. In the gutters, these are set lengthwise along its length forming the base of a shallow gutter (300mm (4 bricks) wide and c. 30-50mm deep).

Discussion

The brick gutters are depicted accurately on the 1859 survey, but the bricks are not highlighted or mentioned. In several cases, such as outside Buildings D and K, the line of the gutter on the ground does not appear to match the line of the gutter on the map exactly, which probably indicates 20th century re-



20th century brick gutter repair outside building K



19th century brick gutter outside building K

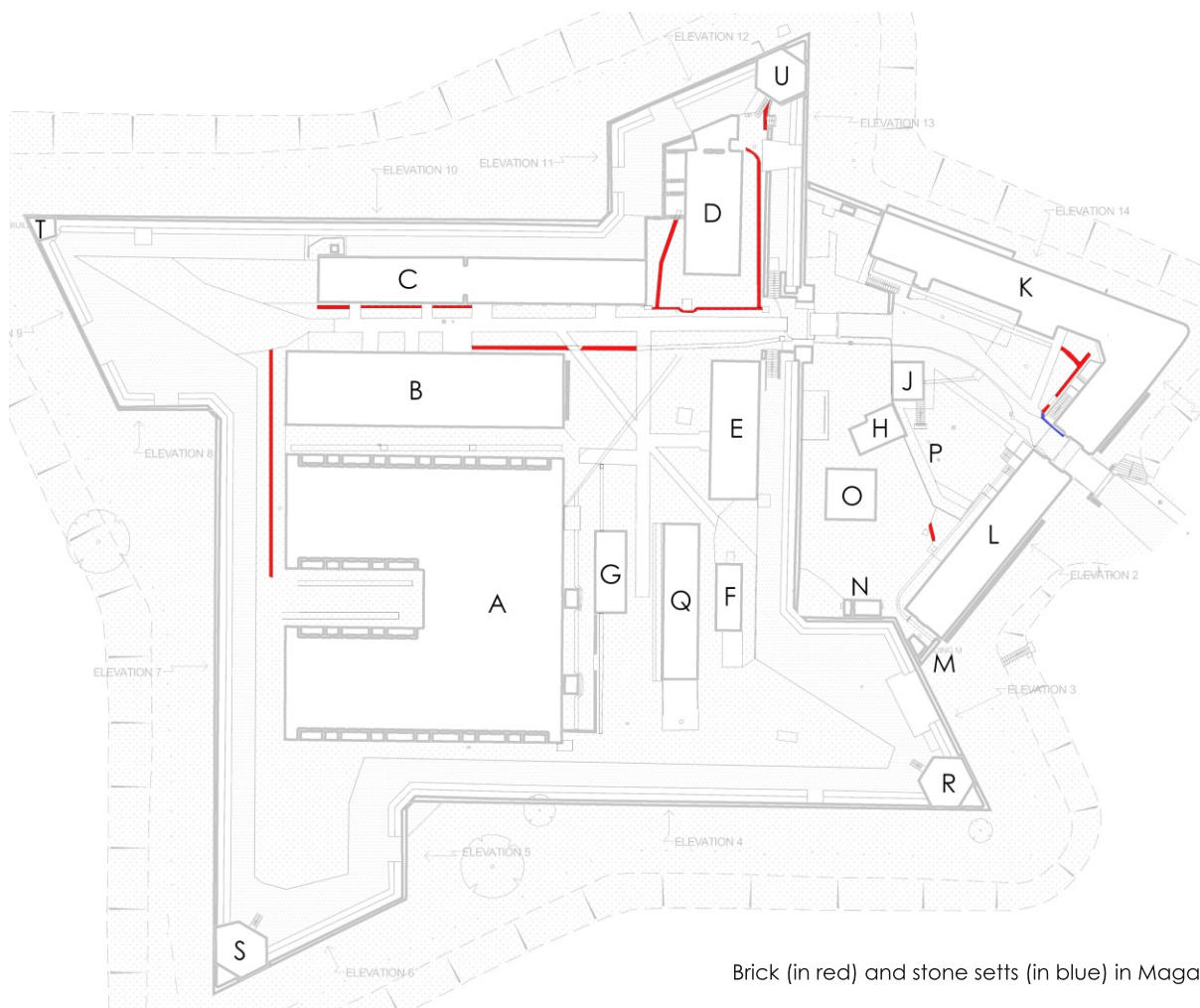
pair. 20th century repair was certainly identified in the Building K gutter by use of 20th century brick.

The brick gutters are primarily associated with 19th century buildings on the fort (K and L in the ravelin, and B, C and D in the main fort). The brick gutters are always associated with cobbled surfaces, and never associated with granite or limestone surfaces. The brick-floored coal cellars are also 19th century in date. This suggests that the brick surfaces and gutters are all 19th century in date.

At the entrance to the Johnstown Ravelin the gutter in front of Building K changes material from brick to stone setts as it passes through the ravelin entrance gate. This might indicate an earlier (or less likely) later 19th century phase of gutters using stone setts rather than brick, however it is more likely that stone was used in the entrance as it better withstands heavy wear.



Example of 20th century brick in gutter outside Building K



Brick (in red) and stone setts (in blue) in Magazine Fort

Stone setts

Areas present

- Running along northern side of entrance gate into the ravelin, forming a gutter, and connecting with the later repaired brick gutter outside building K

Description

230mm by 80mm (brick-sized) hard dark-

coloured stone setts, set on their narrow side down along line of gutter.

Discussion

Gutter shown on 1859 survey. Possibly original to the ravelin (1801), and likely to predate the 20th century. However, it is also possible that the setts are contemporary with the modern brick and used specifically in higher traffic areas.

Stone setts lining gutter at entrance to ravelin



Asphalt and tarmac

Areas present

- Just outside the main gate to the fort ravelin (modern tarmacadam)

Discussion

Tarmacadam is only present on the access bridge into the ravelin just outside the magazine fort. Despite this, the 1859 survey includes a key for 'Sysse Asphalt Paving'. The location of the sysse asphalt on the fort is unclear on the plan, however it appears to have been laid along the concrete driveway through the ravelin, an area currently concreted over. Sysse asphalt was a novel material in the mid-19th century, and was

used for elegant pavements in France in the 1830s (e.g. in Paris on the Pont Royal in 1835, and at Place de la Concorde in 1835 in a black and white mosaic) (Forbes 1958, 24). The material was favourably compared to stone and was said to be indistinguishable from granite. It was used sporadically on pavements in England from the 1830s but did not become commonly used for pavements and roads until much later in the 19th century (ibid). It is recorded as being laid in Dublin for footpaths in the 1880s (RP-CLC 1880, 485)

The presence of sysse asphalt at the magazine fort in the mid-19th century is therefore a relatively early use of the material in Ireland, and the identification of this would be interesting.



Concrete

Areas present

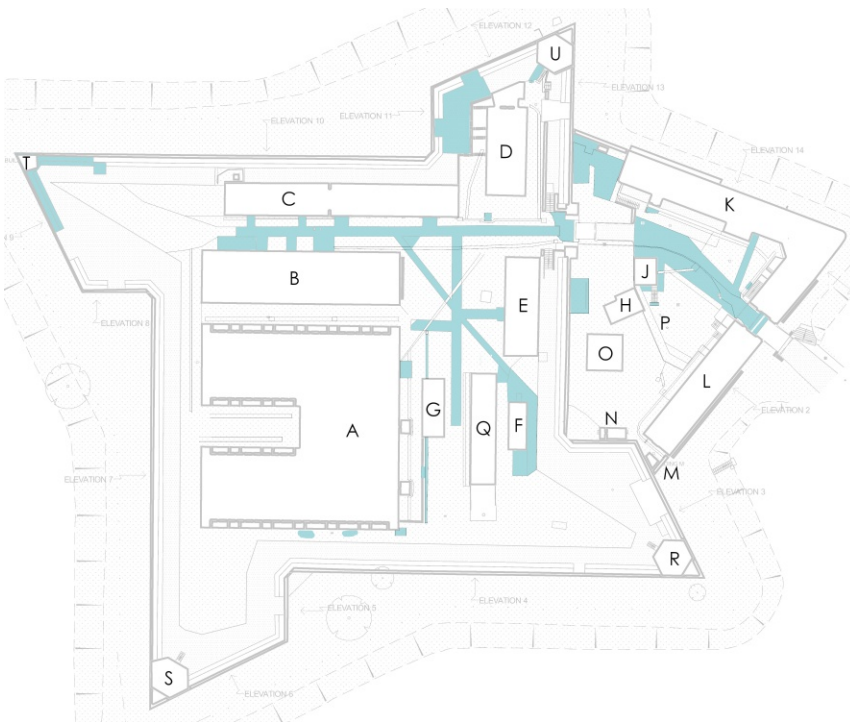
Ravelin

- Driveway running through the ravelin, between two bridges, and providing a small turning area to the north. The concrete driveway has been cut through by two service trenches: one running NW-SE through the centre of the driveway runs along the line of an underground drain connecting the pipe under the drawbridge to drainage outside the main gate or one of three manhole covers set into the road, the northern part of which has re-laid modern concrete; and the second running from building J to the large manhole PAM manhole cover in the centre of the driveway
- A concrete path running from the driveway extends NNE to Building K and covers the brick gutter and cobbling

- A concrete ramp covers the drain and approaches a now blocked entrance across the sunken area on the west side of Building K
- Concrete plinth surrounding Building J, and concrete at base of Building J steps
- In lower level of ravelin, concrete plinths surrounding buildings H, N and M
- Concrete plinth around un-named concrete structure in west of ravelin

Main fort

- Paths in centre of main fort
- Concrete gutter to north and south of Building G
- Concrete plinth and surrounds of Building F
- Concrete surface outside Store C (northern Building A)
- Patches of concrete to south of Magazine Stores (Building A)
 - Concrete rebuild of rampart walkways and sentry post in western demi-bastion
 - Concrete surface of northern demi-bastion rampart
 - Concrete steps near northern cavalier



Concrete (shown in blue) in Magazine Fort

Discussion

The concrete in the fort appears to be early 20th century in date. In the ravelin it is primarily associated with buildings H, M and N which are dated to c. 1901 by the Paul Arnold survey, and the concrete surfaces of the driveway and concrete paths post-date the 1881 corrected survey so are also likely to be of 20th century date.

Grass

Areas present

- Ramparts of main fort
- Grass area in north of northwest demi-bastion
- Grass area in east of southeast demi-bastion
- Grass strip between Buildings A and B
- Grass strip to rear of Building A
- Majority of lower level of ravelin

Description

The areas described as grass are currently in grass, moss and weeds, and investigation revealed no surfaces below them. In the majority of cases the material below the grass, mosses and weeds comprises organic dark brown topsoil which is high in grit and sand inclusions.



Grass (shown in green) in Magazine Fort

In the southwest corner of the lower ravelin small-scale test investigation established the grass overlay a modern rubble structural feature, which may date to the 19th or 20th century and be constructed over the earlier wall marked here on 19th century maps.

Discussion

The 1859 survey shades 'grass plots' with areas of a green tint, and in the main fort these correlate well with areas of modern grass: in the interior of the northwest and southeast demi-bastions, on the ramparts, and north and west of the Magazine Stores. Gravelled paths are depicted on the 19th century survey running along the ramparts and the northwest rampart ramp, and these paths have since become indistinguishable from the grass areas.

None of the ravelin is depicted as being grassed in the 1859 survey, and the existing grass cover here lies over the former garden area which may have been flowerbeds, gravelled or fully planted. Evidence for paths running through the gardens was not identified in 2020, however may survive below ground, and were almost certainly gravel. The 1859 survey also appears to depict a former cobbled path leading along the eastern side of the lower level of the ravelin, around the garden and towards the postern gate in the north ravelin. This was not identified in the survey and is currently covered in long grass.

Cast-Iron utility covers

Areas present

Ravelin

A square cast-iron utility cover north of driveway

B square cast-iron utility cover north of driveway in cobbled surface

C small scallop-shaped cast-iron utility cover with, leaded in granite in driveway

D large square cast-iron utility cover in centre of driveway, PAM manufacturer (1850s+), probably 20th century. 'FP' on 1859 survey.

E small rectangular cast-iron utility cover 'FIRE VALVE' in driveway labelled H on survey

F rectangular cast-iron utility cover 'TONGE & TAGGART LTD DUBLIN' (1869+)

G hydrant with missing cover near building J south of driveway

H square cast iron utility cover, covering coal hole of cellar south of driveway

I Cast iron drain grate outside building L in lower level of ravelin. Shown on 1859 survey, and probably the same one. 19th century.

J Cast iron drain grate outside building N in lower level of ravelin.

K Square cast-iron utility cover outside building M in lower level of ravelin.

X Granite utility surround missing cover, for pump in lower level of ravelin.

Main fort

L square manhole cover 'JOHN JONES PATENT CHELSEA LONDON', dated c. 1900 (Grace's Guides).

M rectangular plain manhole cover in concrete

N square plain manhole cover in concrete

O small scallop-shaped cast-iron utility cover with 'W', leaded in granite in driveway

P rectangular cast-iron utility cover 'FIRE

HYDRANT HAM BAKER & Co Ltd, WEST-MINSTER sw', dated to 1903 at the earliest (Grace's Guides).

Q former drain hole, now just granite rubble

R Granite and concrete manhole surround with cover missing, iron grate adjacent ex situ

S Ex-situ cast-iron grate attached to granite surround with lead, over hand-made brick manhole of surface gutter

T Granite manhole surround, grate missing, over hand-made brick manhole of surface gutter

U Large square iron manhole cover over granite manhole surround and brick-lined manhole

V Cast-iron grate over concrete drain, thicker bars than S and T and likely to be 20th century

W Flagpole set into former water tank, with granite surround with notch. Second granite block to north has hook for flagpole support



Fire hydrant cover P dating to the 20th century

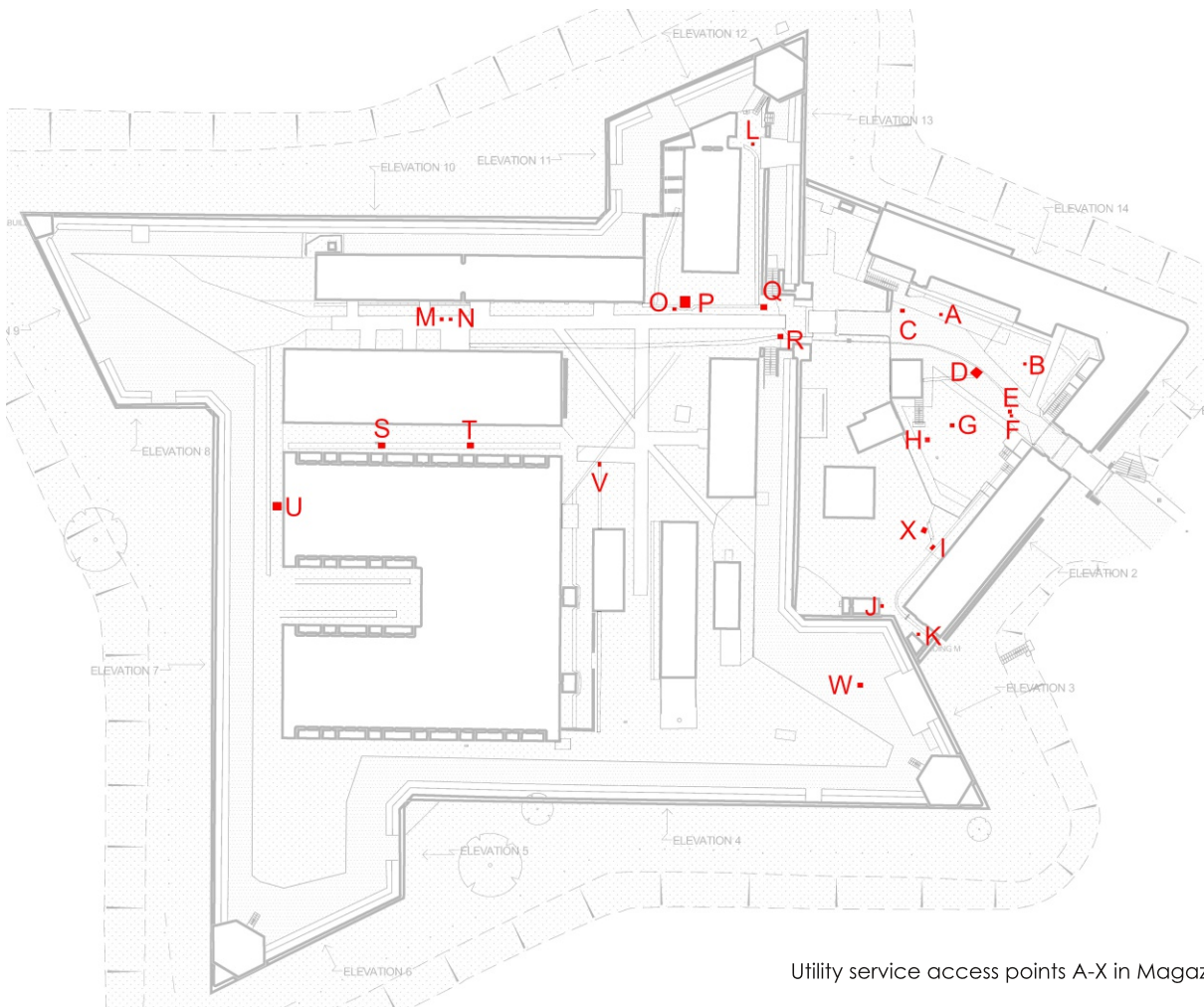
Discussion

Twelve utility features were identified in the main fort. Two utility access points noted on the modern survey in the south of the fort were not found, probably because they were concealed by the 2016 temporary ramps. Three of the utility features are missing their cast-iron covers (Q, R & W) and several others (R, S) had their cast-iron covers lying ex-situ nearby rather than in place.

All the existing covers are likely to be of 20th century date except for S. S is an ex-situ cast-iron drain grate led into a shaped granite surround that drained water from the surface gutter north of the Magazine Stores (Building A). The grate has bars with a diamond-shaped section and a hooped handle for lifting and is distinct from the other cast-iron grates. This



water utility cover C dating to the 20th century



Utility service access points A-X in Magazine Fort

cast-iron grate is of mid-19th century date or earlier but given its location and distinctive style there is a strong possibility that it is original to the fort and dates to 1736.

Of the eleven utility features identified in the ravelin (A-K), ten relate to utilities and one (H) comprises a modern utility cover used to cover the historic coal hole of a coal cellar. Of the ten utilities, nine were covered by cast-iron covers or grates, and one (G) is missing its cover. All of the existing covers in the ravelin are likely to be 20th century in date with the exception of the drain grate I, which is probably of mid-19th century date or earlier. The manhole covered by D was probably in existence in some form from the mid-19th century at least as it is labelled as 'FM' on the 1859 survey, however the current PAM-manufactured cover is modern.



Top right: U, behind magazine stores

Above left: W, flagpole set into former water tank, with granite surround with notch from tank cover.

Above right: I, the earliest utility cover in the ravelin, dating to at least the mid-19th century if not the early 19th century.

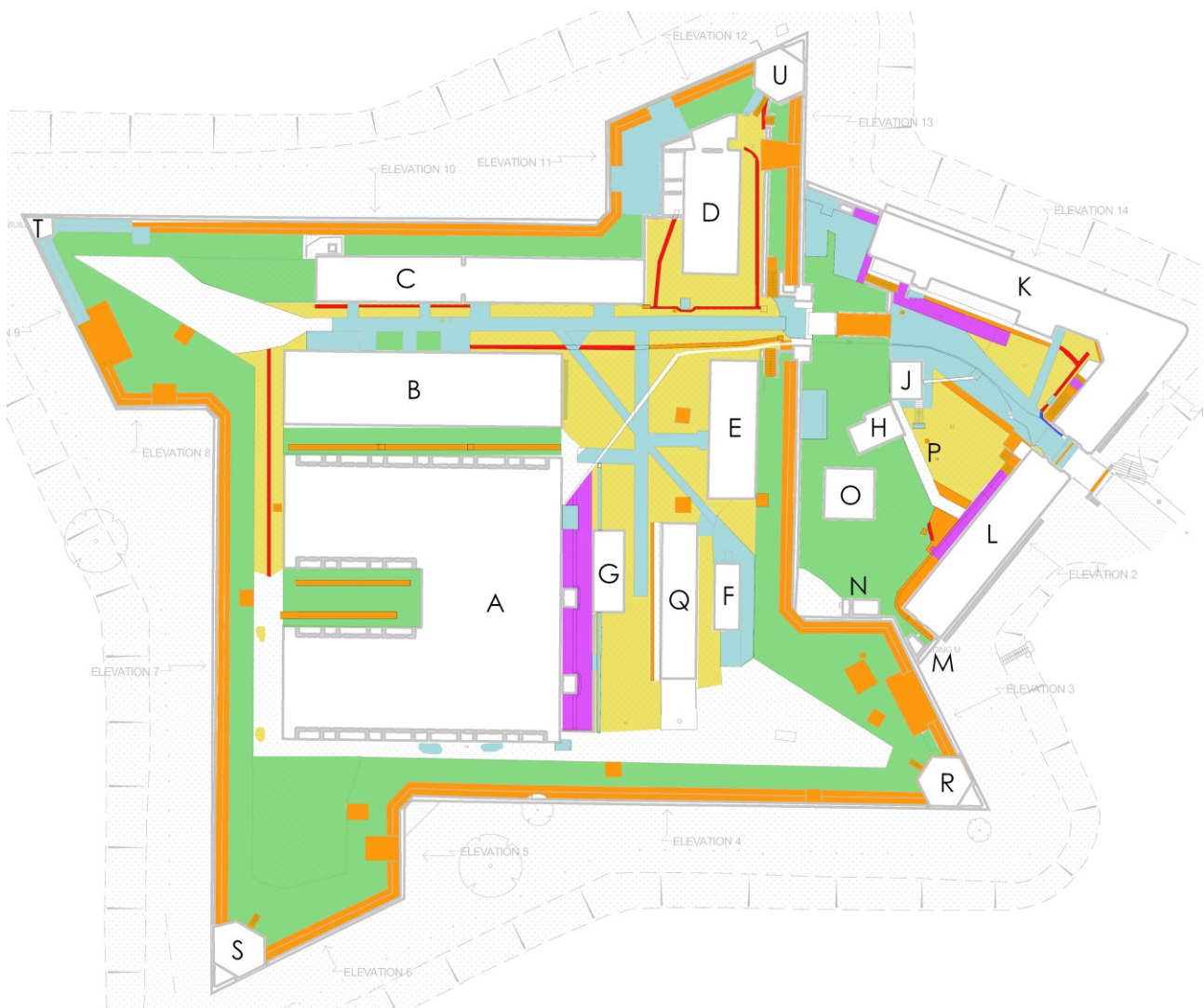
Left: T, the earliest utility cover in the main fort, dating to at least the mid-19th century if not the 18th century.

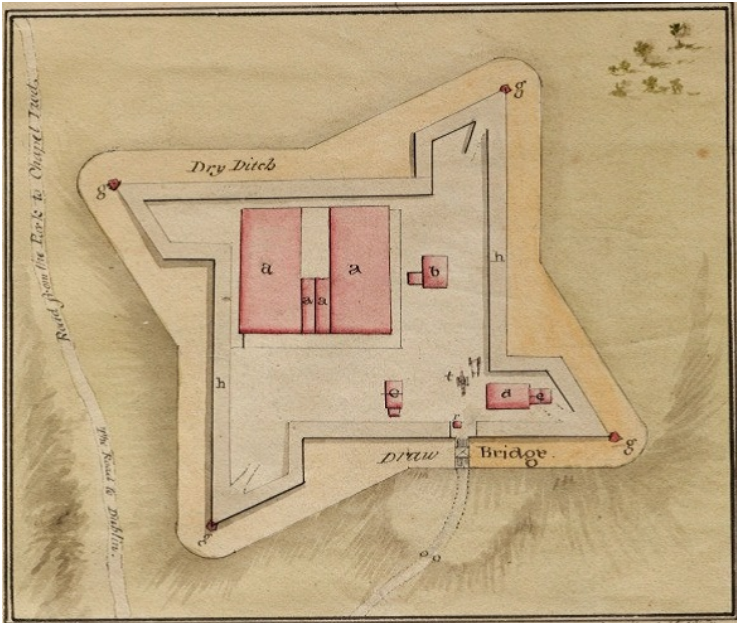
Conclusions

The survey of the fort surfaces identified the following materials:

- Granite pavements
- Limestone pavements
- Cobbles
- Brick gutters
- Stone sett gutters
- Concrete
- Grass
- Asphalt/tarmacadam
- Cast iron utility covers

- Granite
- Limestone
- Cobbles
- Brick
- Stone setts
- Concrete
- Grass





1793 Armitage map showing 18th century layout of Magazine Fort

Limestone pavements

Three limestone pavements were identified in front of Buildings A, K and L (the Magazine Stores and the two range buildings in the ravelin). Elsewhere in the fort granite was generally preferred, perhaps as it is hard-wearing and less slippery when wet than limestone. It is notable that limestone was selected in front of three of the largest and most significant buildings in the fort, and indeed these are the only three buildings in the fort with limestone in their front facades. The K and L pavements date to the early 19th century and may have consciously echoed the earlier limestone pavement in front of the Magazine Stores, which may date to 1758 when Magazine B was added (Gleeson 2017, 36).

Building L extension

Analysis of the limestone pavements demonstrated that Building L had been extended to the south in the late 19th century (between 1859 and 1883). The extension is not visible on the west-facing front facade of the building, which must have been extensively rebuilt in the later 19th century. However, comparison between the east-facing rear of Building L, and the north-facing rear of Building K, provides the evidence

that the southern third of Building L is later. The extension is also clearly visible from the interior of Building L on both levels. This is important, because the statement of significance by Paul Arnold Architects (2008) rates Building L as regionally significant and states that it is ‘highly significant as it forms part of the inherent fabric of the fort...’ due to the way that Buildings K and L together form the Johnstown Ravelin.















Granite sentry walks

The remains of three granite sentry walks or promenades have been identified. The first comprises a narrow granite strip and gutter just inside and left of the entrance gate to the Johnston Ravelin. The second comprises a narrow granite sett gutter just inside and left of the 18th century entrance gate. The third comprises a narrow strip of granite missing an upper step to the west of the blast wall, which again was situated to the left as a person walked towards the Magazine Stores. The third walk lines up exactly with the three entrances into the Magazine Stores prior to 1868 (at which point the three doors were infilled and the sentry walk may have become obsolete), which allowed the sentry to monitor access to the three stores. Thus, all three sentry walks have a similar position in relation to a person entering the fort and approaching the magazines.

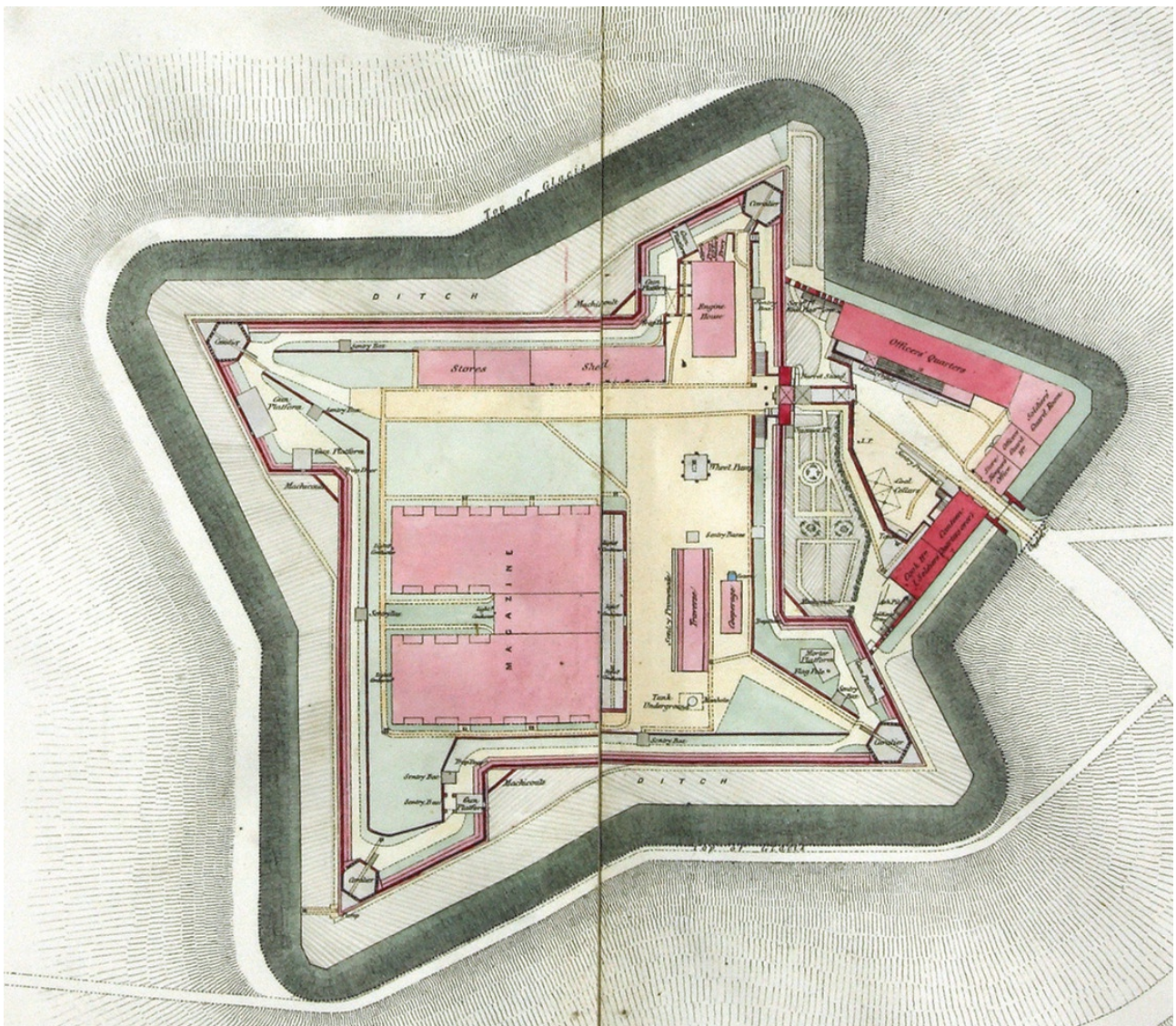
The three sentry walks may have provided a formal well-drained and hard-wearing surface for one or two sentries to patrol up and down, providing good views of the main accesses and magazine accesses of the fort. Additionally, the sentry walks may have provided a formal location for soldiers to stand to attention during an inspection or when officers and dignitaries visited the fort. The consistent location of the three sentry pavements to the left as one enters is likely to have been a conscious and it would be interesting to compare this with modern practices of the defence forces.

Grass and gravel

It is perhaps surprising that large parts of the fort were covered in grass in the mid-19th century, according to the 1859 survey. In general, the areas of mid-19th century grass cover equate broadly with the modern areas of grass and weed cover, however in the mid-19th century the grass areas were bisected by gravel paths. The survey also distinguishes between grass cover (for example on the ramparts) and flowerbeds (in the lower ravelin). Gravel paths also defined the garden flower beds, which extended past the summerhouse and formal gardens in the lower level of the ravelin, northwards towards the postern gate.

REFERENCE	
The light Ochre tint denotes the Gravelled surface.	
The light Brown tint denotes the Pitcher Pavement.	
The dark ditto denotes the Sessel Asphaltic Paving.	
The Grey tint denotes the Flag Paving.	
The Surface Gutters are represented thus	
The Underground Drains are represented thus	
The Drainage is conducted into the River Liffey.	
Gratings to Underground Drains in Surface Gutters are denoted thus	
Pipes for Rain Water and Water Supply are represented thus	
The Drying Posts are represented thus	
Note. The small Arrows indicate the direction of the fall in the Drains.	
The Green tint denotes the Grass Plots.	
One Storied Buildings are tinted and marked.	
Two do do do	
Three do do do	
The Barracks are lighted internally by Candles.	
do do externally by Oil.	
War Department Boundary shown thus	

1859 Survey (published 1861) courtesy of John McCullen (WO 78-4762) in original colour, with key above



Ramps up to the ramparts

The 18th century fort had three ramps leading up to the north, east and west demi-bastions, according to the 1793 Armitage map. These are likely to have been surfaced in gravel, based on the 19th century ramps. The absence of a ramp in the southern demi-bastion is interesting, and while it may be a cartographic error, a test-pit excavated by the author found evidence for steps inset into the earlier rampart at this location.

By the mid-19th century the ramp in the northern demi-bastion was removed and replaced by steps. The eastern and western demi-bastion ramparts were significantly widened in the early 19th century to install large cannon emplacements and a mortar emplacement (later a flagstaff platform) in the western demi-bastion. The 18th century ramps in the eastern and western demi-bastions were retained in the 19th century. Despite smaller cannon emplacements being installed into the north and south demi-bastions, much less rampart widening occurred here in the early 19th century and both of these demi-bastions were accessed by steps rather than ramps by the mid-19th century.

Cast iron service covers & grates

Twenty-three utility features were documented, the majority of which were covered with cast-iron utility covers. Most of the cast-iron covers are probably 20th century in date, however two of the covers are mid-19th century or earlier. One of these is an ex-situ cast-iron drain grate leaded into a shaped granite surround that drained water from the surface gutter north of the Magazine Stores (Building A). The grate has bars with a diamond-shaped section and a hooped handle for lifting and is distinct from the other cast-iron grates. Given its location and distinctive style there is a strong possibility that it is original to the fort and dates to 1736. The second is a cast-iron grate with a curved profile and narrow bars located in the limestone pavement in front of Building L. This grate is likely to date to the beginning of the 19th century.

Historic surfaces

The survey allows a reconstruction of the surfaces of the mid-19th century fort. This is based on the survey results compared with historical maps. Unfortunately, the data does not allow for a reconstruction of the 18th century fort surfaces at this stage.

The reconstruction is presented overleaf. A number of items on the reconstruction may be of interest.

There are two additional granite sentry posts in the northern ramparts, which are not present there today, one in the northeast and one in the northwest. These now form a clear pattern: one in each demi-bastion near the cannon emplacements, and one roughly in between each demi-bastion, making a total of eight. A ninth sentry post is situated in the centre of the fort. The northwest and southeast demi-bastions are accessed by ramps, unlike the other two which are accessed by steps. The northwest ramp is surfaced in gravel, but there is a possibility that the southeast ramp was surfaced in cobbles (as depicted on the 1859 survey), though gravel is more likely and is depicted that way here.

The gravel paths continued across the ramparts, widening at each demi-bastion. These gravel paths created a clear route for circumnavigating the fort and ramparts.

The large granite platform in the southeast demi-bastion is currently used to hold a flagpole support and covers a sunken tank. On the reconstruction this platform is larger as it includes a platform for a mortar gun. This gun appears to have been able to fire from well behind the parapet wall due to its indirect fire arc.

The formal gardens in the ravelin take up the entire lower area of the western ravelin, which prior to the 19th century was the dry moat of the fort. These were traversed with gravel paths, which also led from the former entrances in the south of the ravelin near building M to the postern gate in the north of the ravelin.

The syssel asphalt driveway is a very early use

of this novel material in Ireland, and is significant for that reason.

The data do not currently allow for the reconstruction of surfaces outside the fort.

- Granite
- Limestone
- Cobbles
- Brick
- Stone setts
- Gravel
- Grass
- Flowerbeds
- Syssel asphalt

Reconstruction of c. 1850s Magazine Fort surfaces



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