

Fort Ward
Alexandria, Virginia

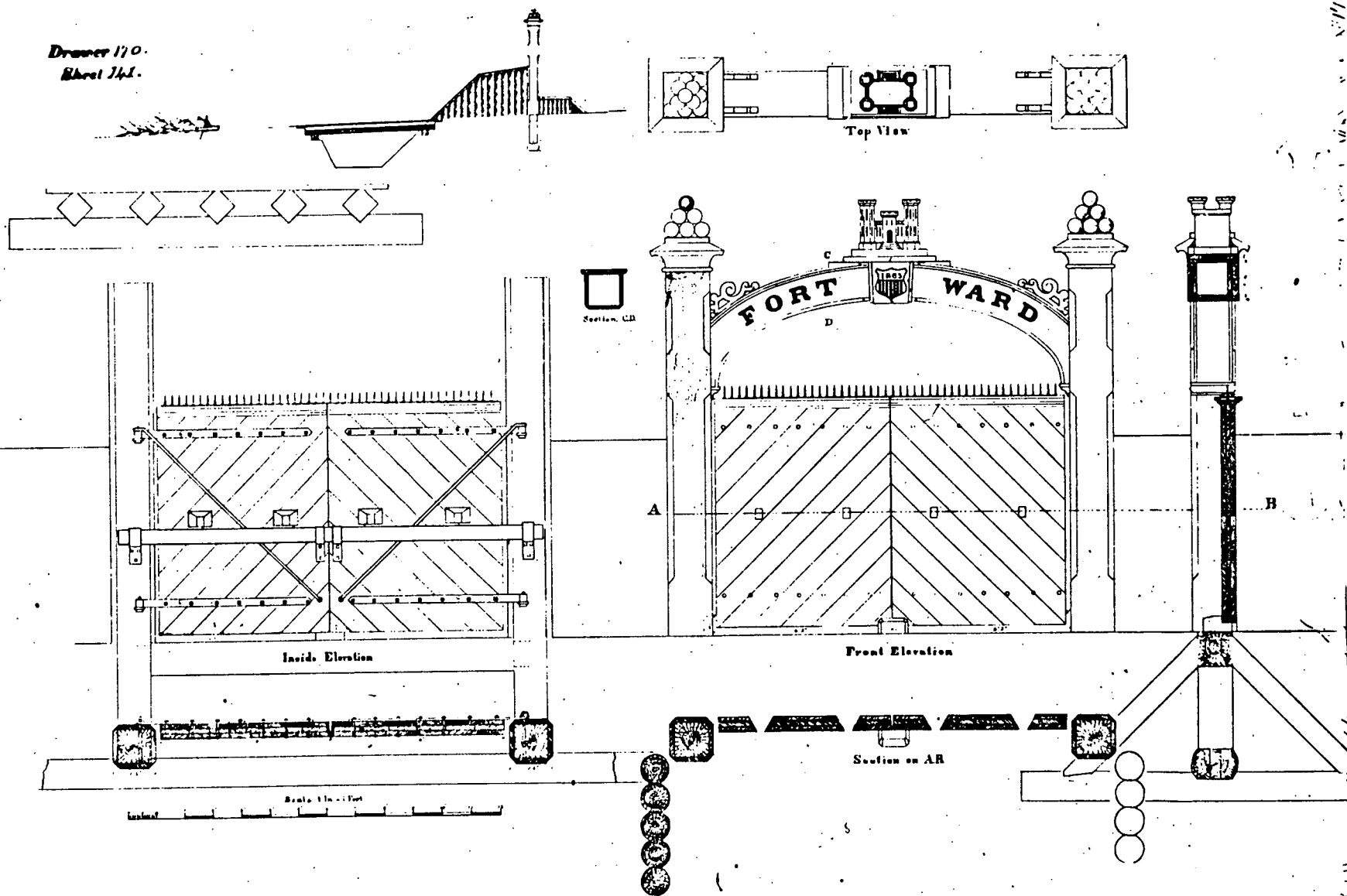
Exploratory Excavation
of the Northwest Bastion

June-July, 1961

by Edward McM. Larrabee
Contracting Archaeologist

August 28, 1961

Drawer 170.
Sheet 141.



170-141

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FORT WARD, by its location and COMEANDING site is one of MOST IMPORTANT of the defenses of ALEXANDRIA, and, indeed, after its reconstruction, one of the largest of the forts constituting the defenses of Washington....In its original form it was typical of the most hasty constructions of the period in which it was built; as modified and enlarged, it is equally typical of our latest methods of construction. On these accounts it is deemed worthy of more particular description. (Barnard, Report on Defenses (1871), pp. 37-38)

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I - INTRODUCTION

Throughout this report various features of the fort are referred to by their technical names. Appendix I explains and illustrates these.

Project History:

Fort Ward Park has an area of nearly twenty-five acres at the time of this writing. The City of Alexandria first began purchasing this property in the fall of 1954. Mr. Eugene Barnwell, the Acting City Manager received expert advice concerning excavation here from Drs. John Corbett and B. Bruce Powell of the National Park Service, after they visited the site in the fall of 1960 and contacted the writer about the work in February, 1961. In April the City Council approved making the investigation, which was covered under an agreement signed June 8, 1961. After a week spent in establishing an office and other preliminaries, field operations began on June 12. Exploratory digging was completed on July 10. Refilling the main trench and rebuilding one section across the parapet and ditch required two additional weeks of work and was finished on July 27.

The permanent members of laboring crew were Melvin Gray, Jr., and David G. Madison. Part time work was done by John Estey, Joseph Moraski, David Rasmussen, and Mr. Lester Fraley of Knoxville, Maryland, and Harpers Ferry, West Virginia. Several machines were rented to perform special tasks. A number of tedious jobs during reconstruction were done by Miss Joanne McNeill, often with help from Frank Fishburne, II. Both Mr. William D. Hershey, Business Manager, and Mr. Herbert Mark, Architect, were called on to do many tasks besides the already time-consuming work of their specialties. I must reserve my most special thanks for Mr. John E. Littleton, my Field Assistant. He worked hard for long hours, held much responsibility, and was always willing to do cheerfully what was asked of him. A large part of the restoration of one cross section was done under his direction.

Site Description:

Topography:¹ Other than clearing, I know of little cultural disturbance on this site before the Civil War, except for Braddock Road, which still followed approximately the course laid out in 1753 and 1754. The area occupied later by the fort was the top of a gentle hill. Small ravines ran NW, N, and ENE, while the ground sloped away more gradually elsewhere. The altitude at the top of this hill was probably a little more than 280 ft. above sea level. Within two hundred yards the bottom of the deepest ravine was over 30 ft. lower, giving an average fall of one foot in twenty. Toward the S and on other gradual slopes, the fall was only about one foot in forty.

The fort was built to take advantage of this natural relief and improve upon it. It ran along the N-S crest, facing W. The earth-walls were raised about 10 ft. above the natural surface, and the earth cover over the protected magazines and rooms was even higher. The maximum height of any part of the fort was probably about 295 ft.² Most of the crest of the parapet was about 290 ft. above sea level, and the interior floor of the fort had the altitude of the original hill crest, about 282 ft. The floor of the Northwest Bastion was about 3 ft. higher than that of the rest of the fort. The ditch around the fort extended about 7 ft. below the original ground surface.

¹ The following historical sources were used in compiling this description:

Bvt. Maj. General J. G. Barnard, Colonel, Corps of Engineers, United States Army, Report on the Defenses of Washington (Washington, D.C.; Government Printing Office, 1871). (Hereafter cited as Barnard, Report on Defenses (1871), p. 4 and plates 1 & 4. Maps and Plans, National Archives, Historic Drawings 170-138 and-139, (undated, 1863-64?)

The modern sources were as follows:

A set of excellent topographic survey sheets and finished contour maps of Fort Ward Park and surrounding territory made in August-November, 1960, by L. A. Brown and W. O. McIntosh of the Department of Public Works, City of Alexandria. The reference number of these sheets is LB-582 A (2 sheets and supplementary survey of Rifle Trench, July, 1961.).

I also used a Fairchild Aerial Surveys, Inc. Stereoscopic Pair of Photographs (Nos. 8849-11-15 and 17, taken March 20, 1951), and Aero Service Corporation aerial photograph, (No. 1014-2-146, taken March 27, 1960).

² Barnard, Report on Defenses (1871) gives a terreplein altitude of 300 ft. and Historic Drawing 170-136 gives a maximum altitude of 314 ft. for the crests of the bomb-proofs. These two figures can be correlated, but are from 10 to 15 ft. higher than modern measurements of features which have not changed appreciably. Apparently the measurement of elevations here during the Civil War was off by this amount.

When excavation started in 1961 the topography had changed very little. Two parallel N-S roads, averaging 125 ft. and 200 ft. W of the fort, had been graded in the late 1920's or early 1930's, when it was proposed to subdivide the site. They made two steps in the hill slope and had partially levelled the S.W. Bastion. Braddock Road had originally been blocked or diverted by the S Bastion of Fort Ward, during the enlargement of the fort. This road had gradually resumed its direct line after the fort was abandoned, climbing over the point of the bastion, and gradually wearing it down. Within recent years this was graded level, which removed the small rise that was left from the bastion.

The main outline of the fort and the locations of most features within it, even including gun embrasures, were still visible in 1961, where the ground was not obscured by brush. There were long depressions created by the collapse of the earth covered rooms of the fort. More erosion had occurred at the S end than at the N, partly due to the various road grading near or across it, partly due to the naturally lower relief of the land to the S, and probably partly due to inhabitation of the S end after the Civil War, and the construction of several small residences there.

Environment: The climate is best described as Atlantic Coastal humid. At present it rains frequently during the summer and winter precipitation is even greater, although not as intense. The relatively high elevation of Fort Ward Park exposes it to the prevailing westerly breezes, but the present forest cover prevents these from the reaching the ground. The atmosphere under the trees often reaches a very high moisture content.

The forest cover at present consists of a thick stand of short-lived scrub pine on the level ground and older dogwood, sassafras, black oak, ash and maple on the steep sides of the ditch and parapet and inside the fort. There are many types of climbing or crawling plants - virginia creeper, honeysuckle, berry vines, and poison oak or ivy. In some of the more deeply shaded woods the floor is quite open, with a few ferns, but in open spots there is a profusion of weeds and brush. The largest tree we saw had fallen from four to eight years ago, and when we sectioned it we counted only forty-two annual growth rings. Thus it is safe to say that none of the present cover (except perhaps a handsome stand of oak at the NW corner of the park) is over fifty years old.

The heavy cover has ^{helped} ~~helped~~ to preserve the ground and prevent erosion, except where trees have been uprooted. Where the branches and leaves are not so dense that wind cannot penetrate, the woods serves to shade and cool the ground. Therefore, any thinning or clearing should be done very carefully. Ground cover, bushes, and trees to be removed should be cut off at ground level, not pulled out. This will help preserve the rest of the fort.

Soil:³ Since Fort Ward is an earthwork defense, the soil here is even more important than at most archaeological sites. The underlying material of the Potomac mouth coastal plain is Patapsco Clay or Patuxent arkose and sand, both deposited as sea bottom during the early Cretaceous. At the nearly three hundred foot elevation of Fort Ward there may be some more recent deposits.⁴ On top of this parent material there has developed a "Fairfax silt-loam", perhaps of an typical variety. This is a fully developed Podzolic soil, strongly acid, and well drained, which forms under forest cover, in a moderate, moist climate over a silicate bed rock (in this case, quartz). A significant feature of Fairfax soils is a compacted horizon (nearly a fragipan) occurring at the water line, with a concentration of quartz fragments.

Test pits were dug two hundred yards N and W of the Northwest Bastion, at the beginning of excavation, to establish the soil profile. Both revealed a similar sequence, with the difference that one was in open field of some duration, the other in woods. A combined profile follows. It is almost perfect Fairfax soil.

- 0 - 1" A₀ Surface - Raw humus
- 1 - 2" A₁ Mottled Clay - Olive Brown 2.5 Y 4/3
- 2 - 5" A₂ Silt Loam - Light Olive Brown 2.5 Y 5/4

³ I am indebted to Mr. Clarence Coleman, Soil Scientist for Fairfax Co., Va., and Mr. Elvin F. Henry, Soil Scientist with the Federal Housing Administration, for their interest and help in identifying the soils at Fort Ward.

The general information in this section is derived from the following sources:

Bureau of Reclamation, Earth Manual (Washington, D.C.; U. S. G. P. O., 1960) 751 pp., pp. 192-194.

I. W. Cornwall, Soils for the Archeologist (London; Phoenix House, Ltd., 1958) 230 pp., pp. 108-112.

Federal Housing Administration, Engineering Soil Classification for Residential Developments (Washington, D.C.; U. S. G. P. O., 1959) 107 pp., pp. 30-32.

Color designations are from the 1954 edition of the Munsell Soil Color Charts.

The specific information is from Soils of Fairfax County, prepared by the Agronomy Department of Virginia Polytechnic Institute (Blacksburg, Va., 1952) 15 pp. mimeographed.

Soils of Fairfax County, 2nd Ed., prepared by Fairfax County in cooperation with Virginia Polytechnic Institute and the U. S. Soil Conservation Service (1958). 167 pp. mimeographed.

"Fairfax Series", National Cooperative Soil Survey (1957) 2 pp. mimeographed.

- 5 - 8" B₁ Silty Clay Loam - Yellowish Brown 10 YR 5/6
 8 - 20" B₂ Plastic Silty Clay Loam - Yellowish Brown 10 Y 5/6
 20" + B₃ Fragipan, of hard Silty Clay Loam - Yellowish Brown
 10 YR 5/6 combined with sub-angular quartz fragments.

At the fort itself, about 20 ft. higher on the natural slope, the soil profile was somewhat different. The original profile was found preserved under the main parapet. This buried soil was as follows:

(under from 2 ft. to 5 ft. of military construction fill)

- 0 - 4" A₁ Silt Loam, Light Gray 10 YR 7/2
 4 - 14" A₂ Silt Loam, Brownish Yellow 10 YR 6/5
 14 - 30" B₁₋₂ Clay Loam Fragipan, densely compacted with much quartz. Yellowish Brown 10 YR 5/7
 30 - 48" B₃ Clay Loam, Brownish Yellow 10 YR 6/8
 48 - 90" + C Loose Sandy Clay Loam - Red - 2.5 YR 4/8 with decayed quartz rocks - Brownish Yellow 10 YR 6/8

The red sandy C layer makes this one of those Fairfax soils which are like Elioak soils. This C horizon may be a fossil B ~~of~~ ~~an~~ of an earlier soil. The C drains very well, but the very dense hardpan above it is quite impervious to the movement of water. The C layer is very unstable and poorly graded, but the B₁₋₂ hardpan maintains a steep slope easily.

1915 Map of soils of Fairfax County.

Interview 2 July 1961 with Mr. Coleman and Mr. Henry.

⁴The geologic information is from:

Barnard, Report on Defenses (1871), pp. 1 and 74-76.
Geologic Map of Virginia, prepared by State Conservation and Development Commission, Virginia Geologic Survey. (Scale: 1/500,000), (Washington, D. C.; USGS, 1928)

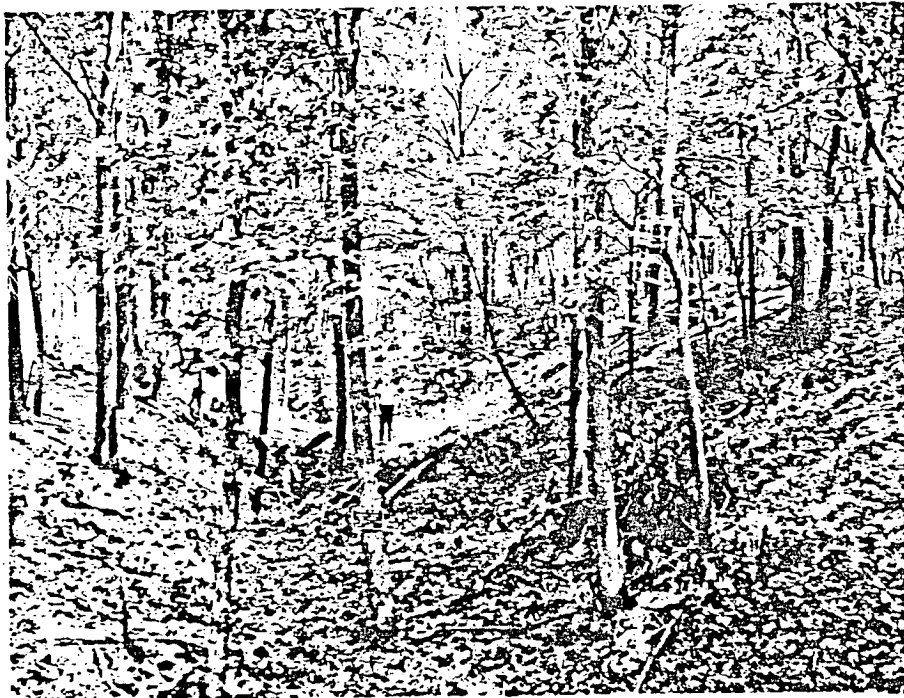


↑
SW x S

PLATE I

15 JUNE 1961 35MM ROLL I, EX 1

TYPICAL UNDERGROWTH AT
BEGINNING OF EXCAVATION



↑
N

PLATE II

23 JUNE 1961 11:00 F.P. I, EX. 4

PRESENT PROFILE OF DITCH, AFTER CLEARING
COUNTERSCARP TO LEFT, PARAPET TO RIGHT

Brief History:⁵

Fort Ward was built in two distinct phases. An early fort of 540 yards perimeter, with "very defective tracé" was started about 1 September 1861, when Confederate forces appeared on Munson's Hill, three miles to the north.⁶ Various repairs, minor alterations and improvements were made during the succeeding two years. By that time the deficiencies of the early plan and the increased effectiveness of artillery made a complete reconstruction necessary. In 1864 an enlarged fort was built on the same site using only sections of the back wall. All other features of the older fort were removed or buried. This new fort was built according to improved specifications which had been worked out as the war progressed and was considered an outstanding example of military engineering in what was, in its day, the strongest system of fortifications in the world.

Work continued on the fort until completion of final details in July, 1865. It was one of the forts recommended for maintenance after the Civil War, but in December 1865 the timber in the fort was sold. Presumably the buried rooms, gun platforms, and revetments were removed soon after this and the earth walls, retained by wood, began to erode. The rest of the fort must have held its shape well,⁷ because in 1892 it was still considered to be in "good condition".⁷ The excellent condition of the fort even now speaks well for the original construction.

⁵See the Historical Report by William D. Hershey, submitted together with this archeological report.

⁶Barnard, Report on Defenses (1871), p. 38.

⁷"Map of the District of Columbia...including the present condition of the Defenses of Washington", prepared by F. L. Averill (1892).

II - EXCAVATION AND FINDINGS:

A. Filling Room:

A test trench 5 ft. wide and 60 ft. long was dug across the Filling Room depression, at nearly a right angle to the long axis of the room. It was offset slightly to avoid some large trees which would have disturbed the stratigraphy. The bias had the effect of lengthening all measurements. This trench was intended to duplicate Section I-K on Barnard's plan of Fort Ward. The trench extended from level terreplein in front of the Filling Room to terreplein in back of it. One 5 ft. square was left unexcavated at the top of each of the two ridges which represented the front and back walls of the room.

No artifacts of any significance were found in this trench, nor any structural features other than those shown in the profile. The profile, however, revealed the location of the Filling Room, and the construction of the earth fill which covered it.

Square 2 contained the raised ramp of the gun platform for the Six-Pounder Gun. The line between Squares 3 and 4 was the low point of a depression left by a drain which carried water out of the Northwest Bastion. Squares 4 and 5 exposed the earth fill on the front side of the Filling Room. The strata of packed earth were from 4 in. to 8 in. thick and were laid on horizontally, although the outer face of the wall was ramped back at an angle of nearly 45°. This wall rises 5 ft. above the terreplein at present. Originally it was 9 ft. high, at a point 10 ft. back from the base of the slope, at the exterior crest.

Squares 7, 8, 9, and 10 covered the depression of the interior of the Filling Room. The most significant feature was the mixed brown fill in the lower part of the trench. Where the original strata of the fort were undisturbed, as in the front wall of the Filling Room just discussed, the strata were differentiated by vivid color and textural differences. This is because the natural soil profile in this site contains three very different colors. (Light Gray 10 YR 7/2, Yellowish Brown, 10 YR 5/7 and Red 2.5 YR 4/8). These are fairly sharply divided in their natural positions, but blend somewhat at their boundaries. When excavated by layers, however, and deposited and tamped, the boundaries between them are extremely sharp and the colors are often juxtaposed in such a way as to emphasize the color contrasts.

On the other hand, at the bottoms of slopes and in ditches such as this depression, where erosion has mixed all types of dirt into one uniform deposit, these distinct colors are lost, and a new color is found. This is a Yellowish Red (5 YR 5/6) which lies between the color extremes of the natural profile, as one would expect in mixed fill. The texture, too, is mixed. These features make it possible to distinguish easily between undisturbed soil, military construction, and subsequent erosion.

The bottom of the Filling Room depression was a deposit of this mixed brown fill at least 4 ft. deep, as tested by auger below the floor of our trench. At the front end of this section the distinctively colored strata appeared, but were somewhat broken. The same was true at the back, in Square 10. The strata there ran level and then sloped down into Square 9 to the front. The width of the disturbed area was between 13 ft. and 15 ft. The wooden structure of the Filling Room must have rested within this area. However, the condition of the disturbed strata and the absence of any trace of wood suggested that the timber structure had been dug out and removed.

This theory was reinforced by the appearance of the trench wall in Squares 12 and 13. The strata here were still fairly distinct, but not so clearly defined at their meeting, and somewhat mixed in color. Most unusual was their uniform downward slant toward the interior of the fort, away from the Filling Room. In all other places where construction stratigraphy had been seen it was horizontal. This slanting earth seemed to be dirt which once covered the timber structure of the Filling Room and was thrown to the rear when the timbers were exposed for removal. This interpretation also explained a discrepancy between the measurements of our profile and an Army survey of the original Filling Room contours. A comparison of the two profiles in Drawing No. 3 will show that our structure is much wider from E to W than that measured by the Army. If the slanting dirt in Squares 12 and 13 was all thrown down from above the middle of the timber structure and the original back wall slanted down in Square 11, the two sets of measurements fit very nicely. The angle at which the dirt came to rest in Squares 12 and 13 shows the angle of the back wall on which it fell.

SQUARE 15

14

13

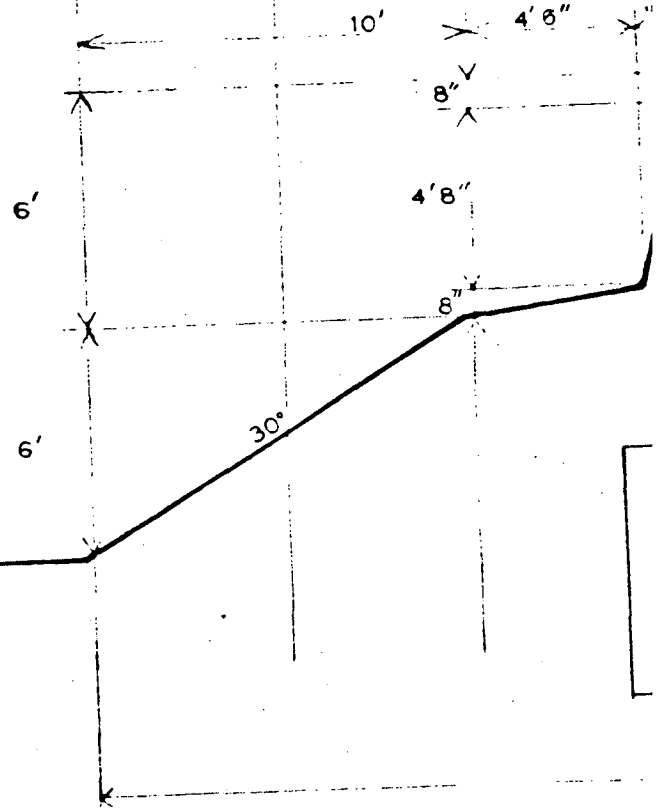
12

11

10

DIRT EXCAVATED IN 1865-66
(TO REMOVE TIMBERS)
THROWN TO E

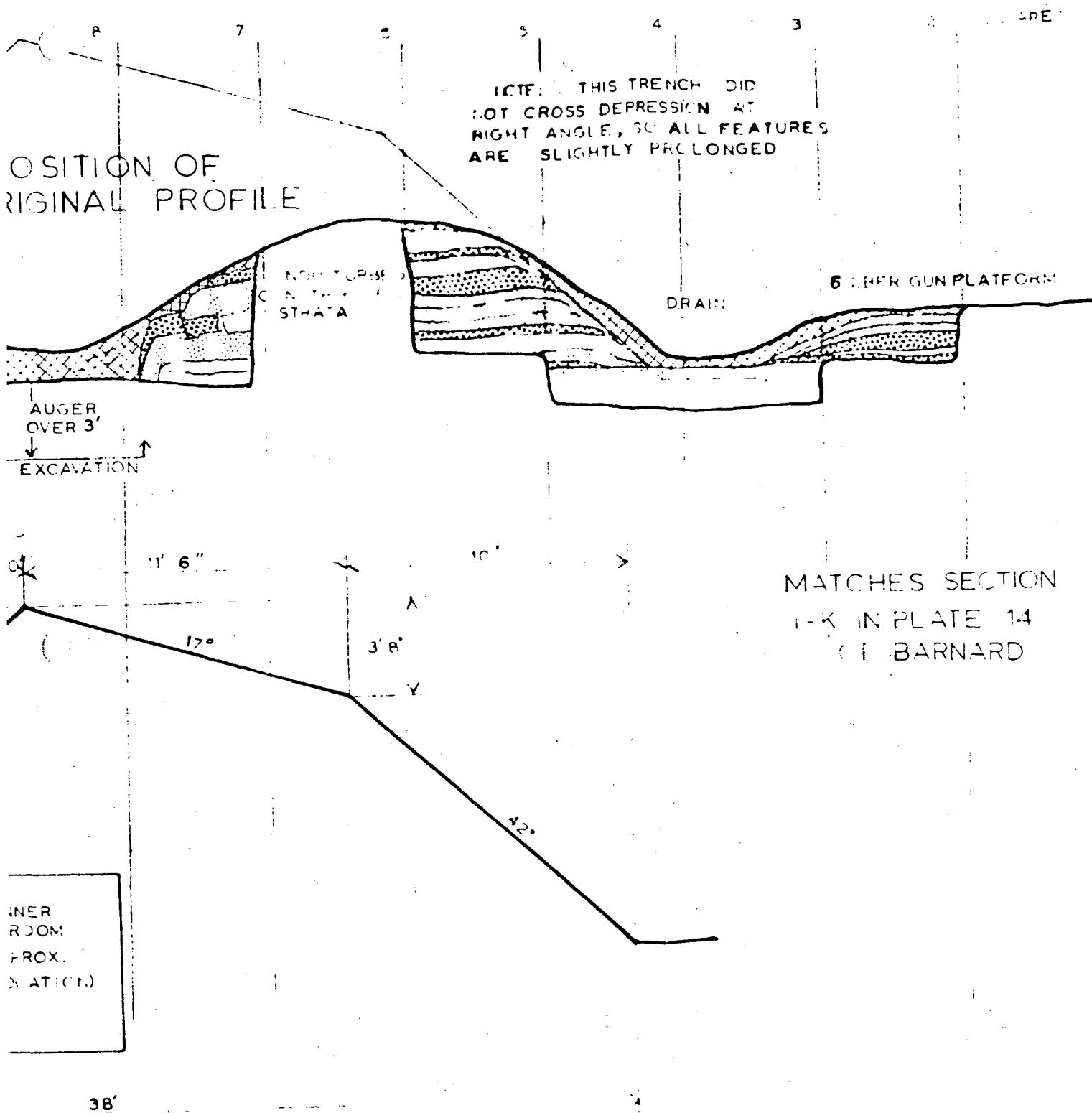
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EDGES OF ORIGIN



LEGEND:



ORIGINAL SURFACE, UNDISTURBED SOIL
A TOP SOIL (LIGHT GRAY) - 10 YR 7/2
B SOIL (YELLOWISH BROWN) - 10 YR 5/7
C SUB SOIL (RED) - 2.5 YR 4/8
MIXED FILL (YELLOWISH RED) - 5 YR 4/6



PROFILE OF FILLING ROOM as excavated & as surveyed, 1865

5 SEPT 1961

FMCM

drawing no. 3

SCALE: 1" = 5' (1/60)

0 1' 2' 3' 4' 5'



PLATE III

22 JUNE 1961

F.P. I, Ex. I

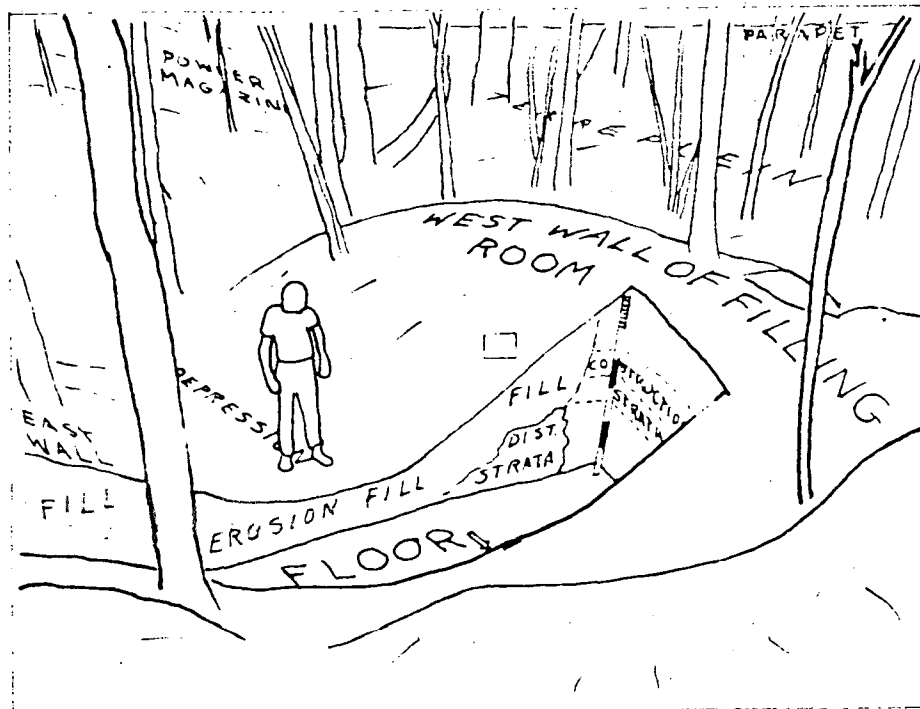


DIAGRAM OF PLATE III
TEST TRENCH ACROSS FILLING ROOM DEPRESSION

B. Powder Magazine:

A 5 ft. wide trench was run across this depression like that which had tested the Filling Room. Because the relief was higher, the features were expected to be deeper, and more dirt would have to be moved, this trench was made shorter. We did not dig any squares on the front slope of the Magazine, where there was least reason to hope for significant structures. A section of trench 30 ft. long ran across the depression between the front and back walls. We then left a 10 ft. section unexcavated on the crest of the back wall and dug another section of trench two squares (10 ft.) long on the back slope.

The same general situation existed here regarding stratigraphy. Undisturbed soil was recognizable as a natural grey clay - yellow stony hardpan - red sandy gravel sequence. Original construction appeared as layers of vividly contrasting dirt averaging about 6 in. thickness. There were horizontal and hard, even, tamped surfaces. Disturbed construction had these same strata broken, while excavated back-dirt was shown by uneven, loose, slanting strata, somewhat mixed. Finally, soil washed from these walls and soil deposited by erosion had no clear seriation, lay in gentle natural curves and was a mixed brown color.

Within Square 4 we found a vertical wall cut into the undisturbed soil. The floor of this military excavation was 8 ft. below the original ground surface. At least another 5 ft. of earth is packed on top of the original surface now. At one time there must have been perhaps twice that much. The wall was very slightly undercut, but presented a flat surface, so that the bottom was perhaps 3 in. W of the top.

The original floor was cleared for a distance of 4 ft. toward the center of the Magazine. It fell 3 in. in that distance, as if the floor were sloping down to the central drain which was supposed to have run under the plank floor. Several holes, perhaps the casts of rotted wood, were found in Square 5.

A rotted beam, the only piece of wood found in situ, was uncovered while clearing the floor. This was apparently a half-round split log, about 6 in. in diameter, lying with the flat side up. Two 8 in. cut nails were found driven through it, point up. It was across the trench at an angle, so that only 8 ft. were uncovered. The fragmentary condition made it unclear whether it was once longer. The E end of the beam was resting higher than the W end. Presumably the flat side of the log had once rested against the earth wall to retain it. When other wood was removed and the earth cover fell in, the top of this log was forced away from the wall to its present position.

An interesting phenomenon could be seen beside the earth wall. The layers of earth which had once rested above it, supported by the wooden structure, had slid straight down beside the wall after the wood was removed. Thus the stratigraphy seen above the wall was repeated about 3 ft. or 4 ft. lower alongside the wall.

One stratum was of considerable interest, as it contained many fragments of coal-tar mixed with gravel. This had been used to cover the roof of the timber structure and presumably the level at which we found it was the exposed level of earth when the roof of the timber structure was completed. As alternate layers of tar and gravel were spread on the wood roof, some spilled on the dirt beside it, which had been brought up to the ~~same~~ level. Then more dirt was laid on top of both the earth walls and the tarred timber roof and a bomb-proof cover built up. Large pieces of this tar, up to 6 in. thick, were found in the mixed fill in Squares 5 and 6. Probably they were part of the covering layer which had been broken up when the wood was removed.

In Squares 8 and 9 another wall was found, although it was not as sharp as that at the front of the Magazine. The entire natural stratigraphy of the Fairfax soil was well preserved here, with tamped horizontal layers of fill above it. At the top of Square 9 the tamped construction strata were no longer distinct. There seemed to be a buried surface of the tamped fill, slanting down to the E. The distance between the front and back walls cut into the undisturbed soil was 21 ft. at the original surface level. Since both walls were slightly undercut, they were probably about 22 ft. apart at floor level, 8 ft. or 9 ft. below the original surface.

Squares 12 and 13 were cut into disturbed layers of loose fill which slanted regularly down toward the interior of fort, i. e., to the E. This was similar to the stratigraphy on the back slope of the Filling Room, which suggests that the Powder Magazine also was dug out and the excavated earth thrown to the rear.

An extremely interested feature was found in the bottom of Squares 12 and 13. The original surface had been cut away through the hardpan to produce an 18 in. step and a 40° slope down toward the E. This step and slope were later buried by a thick layer of red subsoil. We did not cut through this early excavation, but removed the red subsoil fill and cleared the step and slope. The slope continued down into Square 14, which we did not dig. Consequently we do not know the full depth of the buried feature.

The step and slope are apparently the counterscarp and berm of the ditch which surrounded the earlier fort. The location of this feature corresponds with the line of the front of the earlier fort shown by General Barnard. When Fort Ward was rebuilt in 1864-65,

this ditch was filled and the Powder Magazine built in front of it. The terreplein at that time was represented by a levelled surface of packed top soil material above the red subsoil fill. Later this was all covered with loose dirt thrown to the E when the wooden Powder Magazine was dug out and removed.

The original army survey of the Magazine earth cover showed that it was slightly more than 44 ft. from back to front. Since we did not excavate the front wall, it is not possible to give an exact measurement. However, our profile is about 3 ft. longer than this. A likely explanation is that some of the earth cover here was thrown forward because there was more dirt than on the Filling Room. This would also account for the volume of dirt, since there is not enough earth behind the Magazine to cover it adequately. At the crest of the Magazine, two-thirds of the way back, the top of the breast-height was about 12 ft. above the present surface of the depression.

SQUARE 14

13

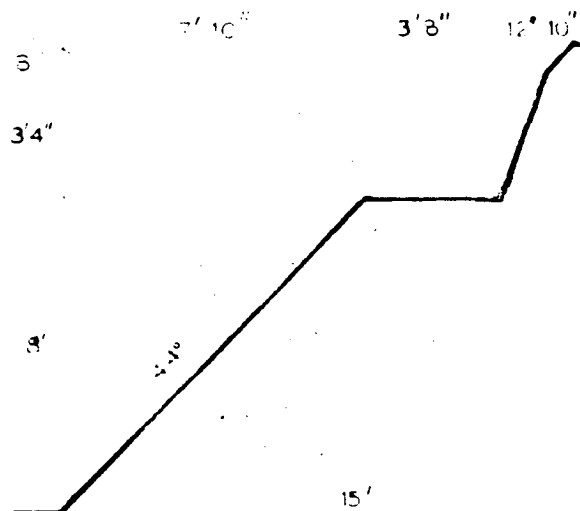
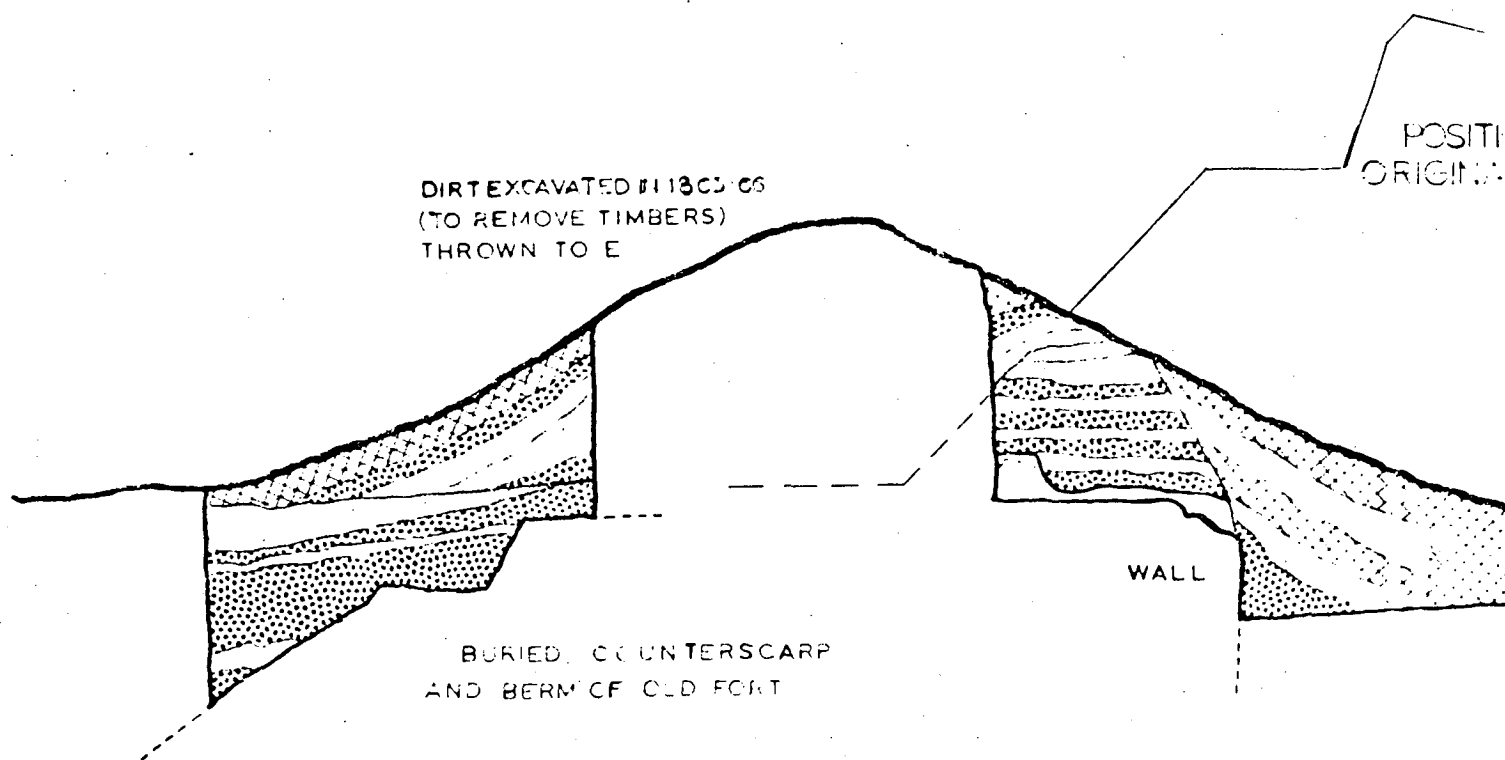
12

11

10

9

8



LEGEND:		ORIGINAL SURFACE, DISTURBED SOIL
		A TOP SOIL (LIGHT GRAY)-10 YR 7/2
		B SOIL (YE. LOWISH BROWN)-10 YR 5/7
		C SUB SOIL (RED)-2.5 YR 4/8
		MIXED FILL (YELLOWISH RED)-5 YR 4/6

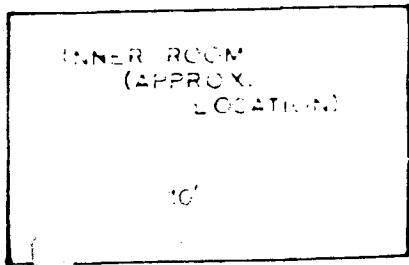
LOOKING S ► W

LOCATION OF
ORIGINAL PROFILE

FISSURE LINE

FLOOR

ALTITUDE OF SECTION
FROM SEA LEVEL 14
OF BARRETT



PROFILE OF POWDER MAGAZINE

as excavated, 1961, & as surveyed, 1865
drawing no. 7

SEPT 1961
SCALE 1"=5' (1/80)





PLATE IV

23 JUNE 1961

F.P. 1, Ex. 6

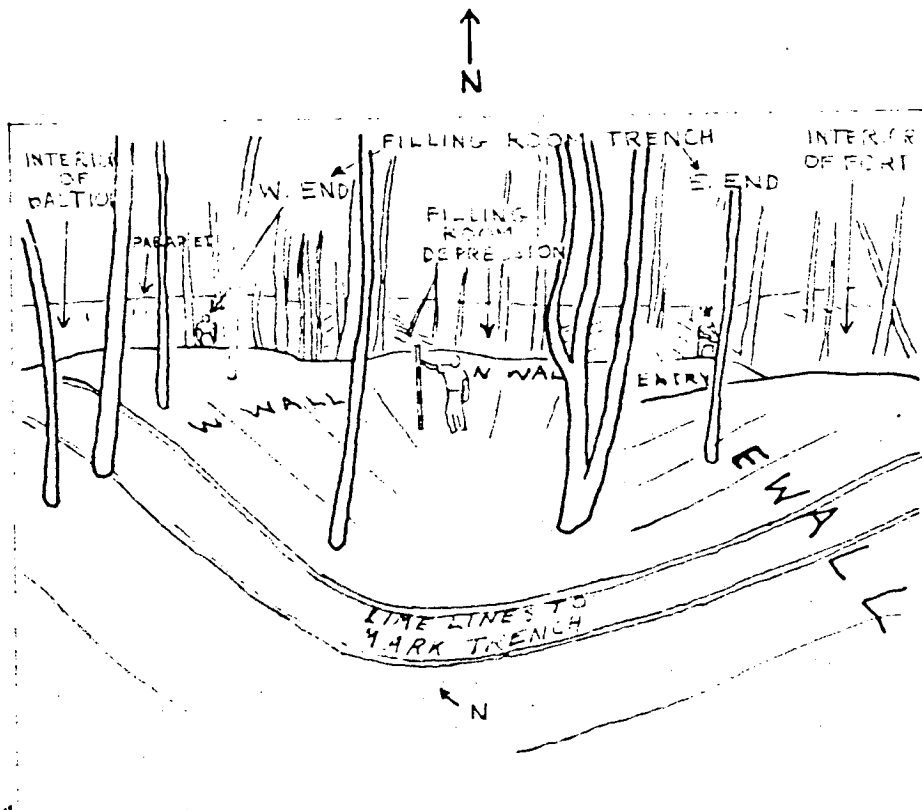


DIAGRAM OF PLATE IV
POWDER MAGAZINE DEPRESSION MARKED
FOR EXCAVATION

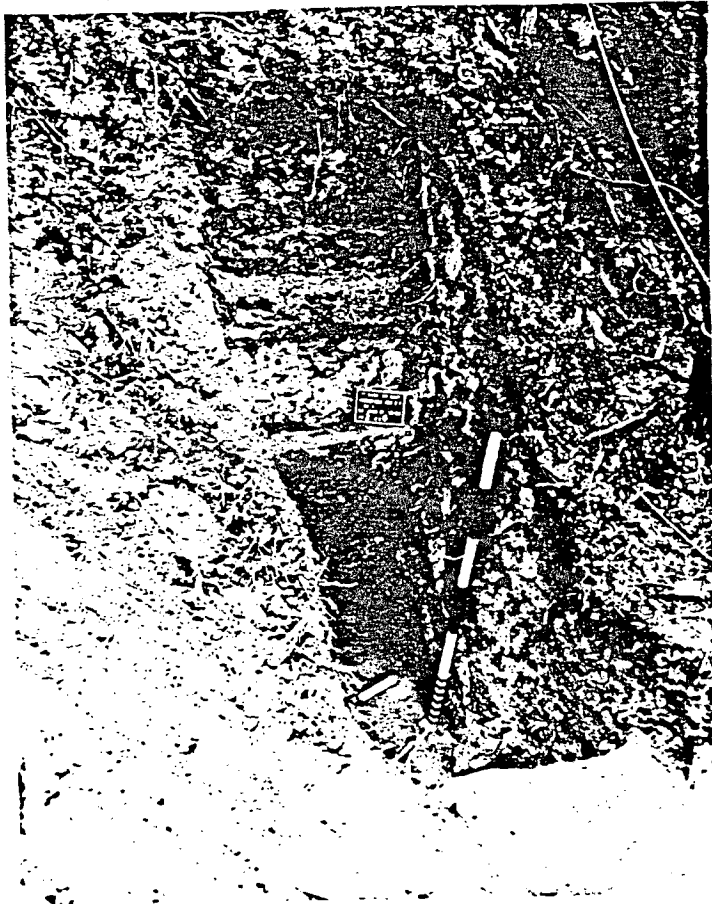


PLATE V
28 JUNE 1961
15:23
F.P. 2, Ex. 6

↑
NW

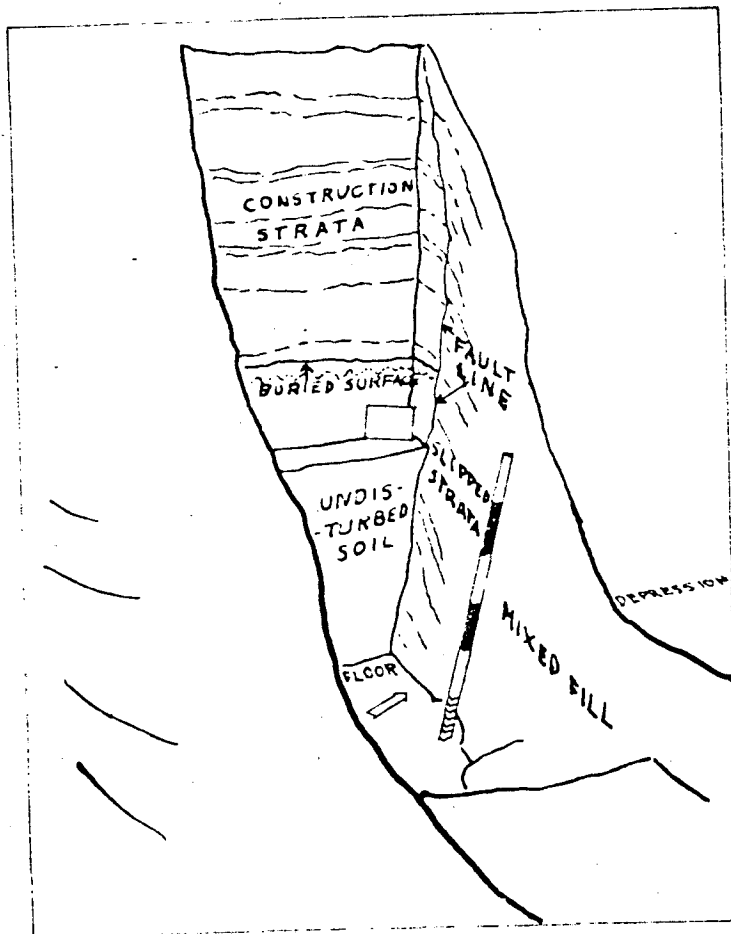


DIAGRAM OF PLATE V
W WALL OF
POWDER MAG-
AZINE TRENCH



PLATE VI
28 JUNE 1961
15:15
F.P. 2, Ex. 4

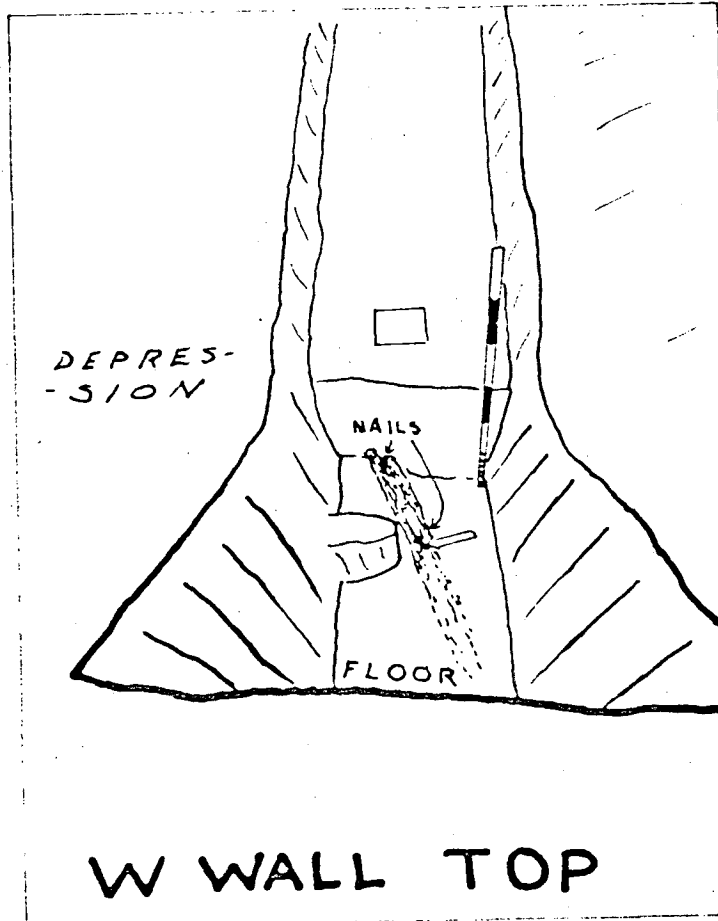


DIAGRAM OF PLATE VI
ROTTED BEAM AT W
END OF POWDER
MAGAZINE TRENCH

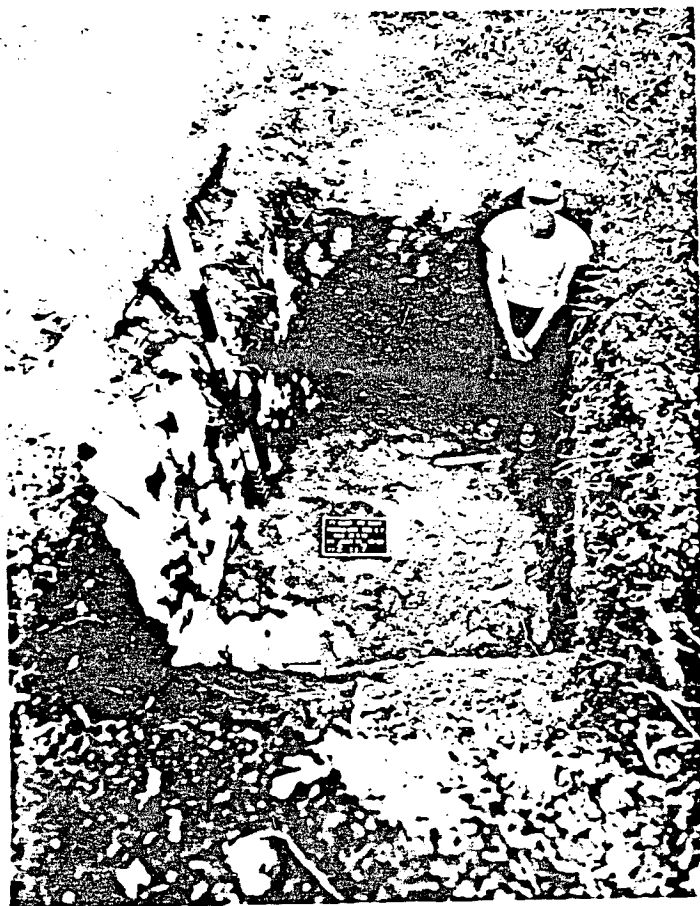


PLATE VII

28 JUNE 1961

15:27

F.P. 2, Ex. 7

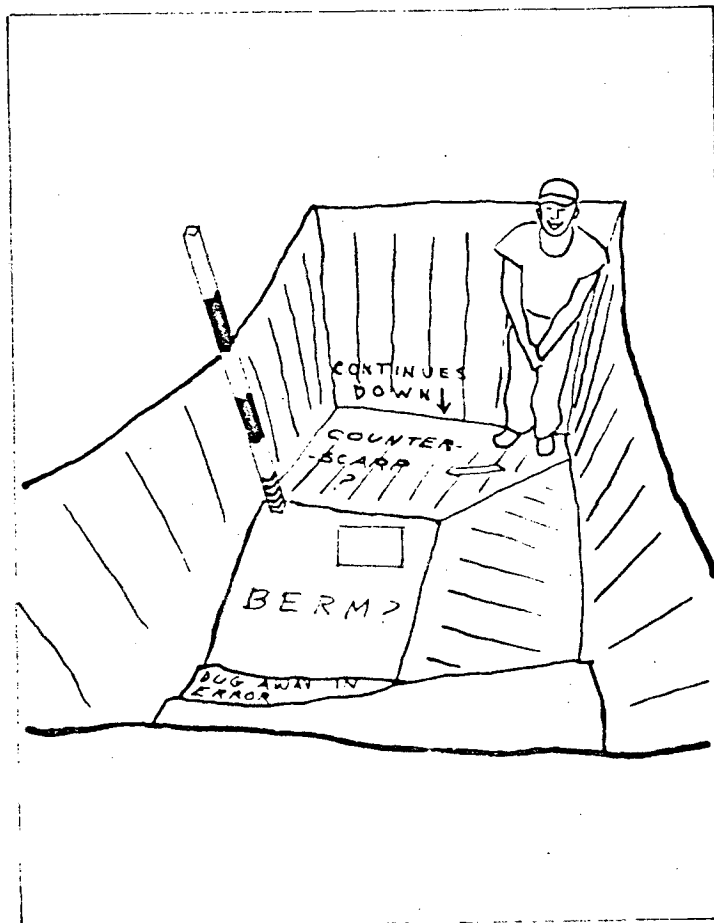


DIAGRAM OF PLATE VII

BURIED DITCH OF OLD
FORT AT E END OF
POWDER MAGAZINE
TRENCH

C. Parapet and Ditch:

A continuous trench 90 ft. long was dug to duplicate Section G-H on Barnard's plan. This was designed to start on terreplein inside the fort, to run along the edge of a gun platform and cut through the main wall or parapet in order to expose the angle of the exterior slope or scarp, the bottom of the ditch and the angle of the counterscarp. The trench was also extended out past the abattis on the glacis slope. Besides doing this the trench sectioned the left cheek of a gun embrasure.

The major portion of this trench, from the superior crest of the parapet across the ditch to the glacis slope, was dug by a Gradall in one day. At this point the trench was about 40 in. wide. Inside the wall, the trench was dug by hand and the deep trench made by the machine was trimmed and scraped before drawing. Before the Gradall came we cut a 10 ft. wide trench through the counterscarp to section it and to make a ramp down into the ditch for the machine. Smaller machines were used in refilling this trench. A rotary tiller with blade was used to move some of the back-dirt, a gasoline power-tamper was used to make the fill more compact, and much of the dirt was carried back up to the top of the parapet by a conveyor belt.

The inner end of the trench showed the ramped earth of the S side of the gun platform along the N face of the trench. This platform had been disturbed when the timbered floor was removed, so that we found a line of excavation along the center of our trench. From 13 ft. to 16 ft. W of the E end of our trench, an area of deep disturbance was visible along the S face. This cut about 18 in. below the surface which had been the banquette tread. At the W end of this disturbance were stratified construction layers. A surface was cut rising at an angle of more than 60° to the present surface. The deep disturbance was interpreted as the excavation for the buried bottom of the vertical poles which revetted the breast-height at the time of timber removal. The pole revetment probably rose at about a 75° or 80° angle and loose dirt was packed between the poles and the more stable 60° slope of the construction fill. The top of the breast-height (pole revetment and 16 in. sod topping), which is synonymous with the crest of the interior slope and of the superior slope, was about 2 ft. 6 in. above the present surface here.

A few feet W of this was the inner end of the deep trench, cut by the machine. From the present top of the wall this trench was 15 ft. deep. As the present wall sloped down the depth of the trench decreased to 5 ft. at the bottom of the ditch. It was 7 ft. deep at the crest of the counterscarp and 3 ft. deep along the glacis slope. The slope of the scarp was visible in the lower part of the profile,

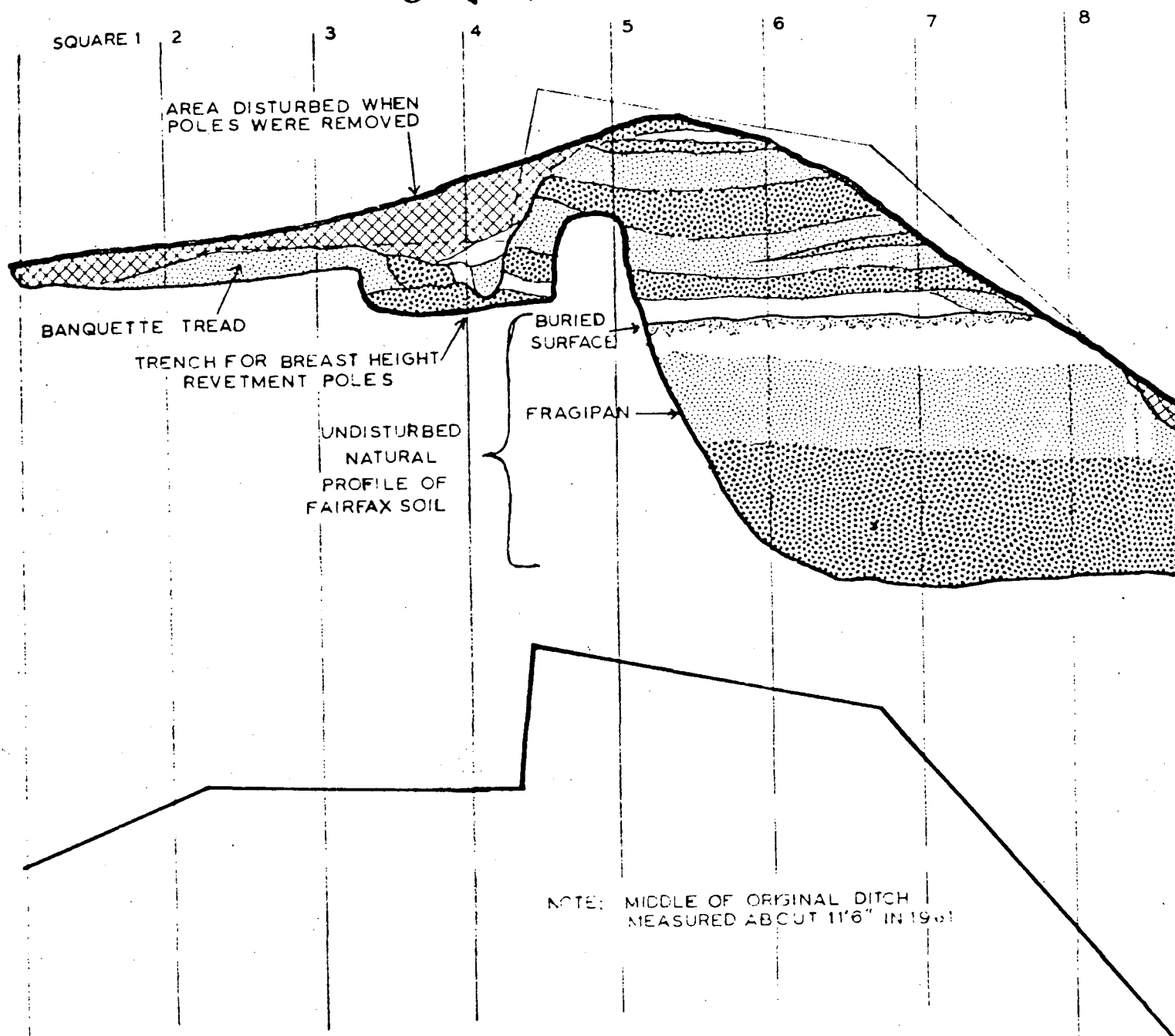
but had been destroyed by erosion in the upper part. The historic surface was irregular, so that the angle varied between 40° and 50°. The lower half of the wall profile thus exposed was the natural profile of undisturbed hill cap Fairfax Soil described in the section on soil.

The upper 7 ft. was composed of layers of tamped fill resting on top of the buried surface. Since the excavation in the ditch was by levels and this dirt was used to build the parapet, a mirror effect was created. The natural profile was reflected in inverted form, with exaggerated divisions on top of the undisturbed earth. Thus A soil was packed on top of undisturbed A, B was tamped on top of that, and finally red C subsoil from the bottom of the ditch was packed on the top of the wall.

The bottom of the original ditch was roughly level, about 11 ft. across, and had accumulated from 3 ft. to 4 ft. of fill as the walls on both sides washed down into it. On the other side the counterscarp rose at an angle of over 50°. The depth of the ditch, from berm to bottom, was about 8 ft.

Most of the crest of the glacis slope had been eroded, so that it was impossible to determine its original height from purely archeological evidence. The general surface of the glacis slope was quite clear, however, and was very close to the slope today. This glacis had apparently been carefully built up, since the original top soil had been removed, down to the hardpan and then 18 in. of dirt packed on top of it and sloped down to the W, to bring the entire glacis slope within the direct line of fire from the superior slope of the parapet.

e ← PARAPET & DITCH LOOKING

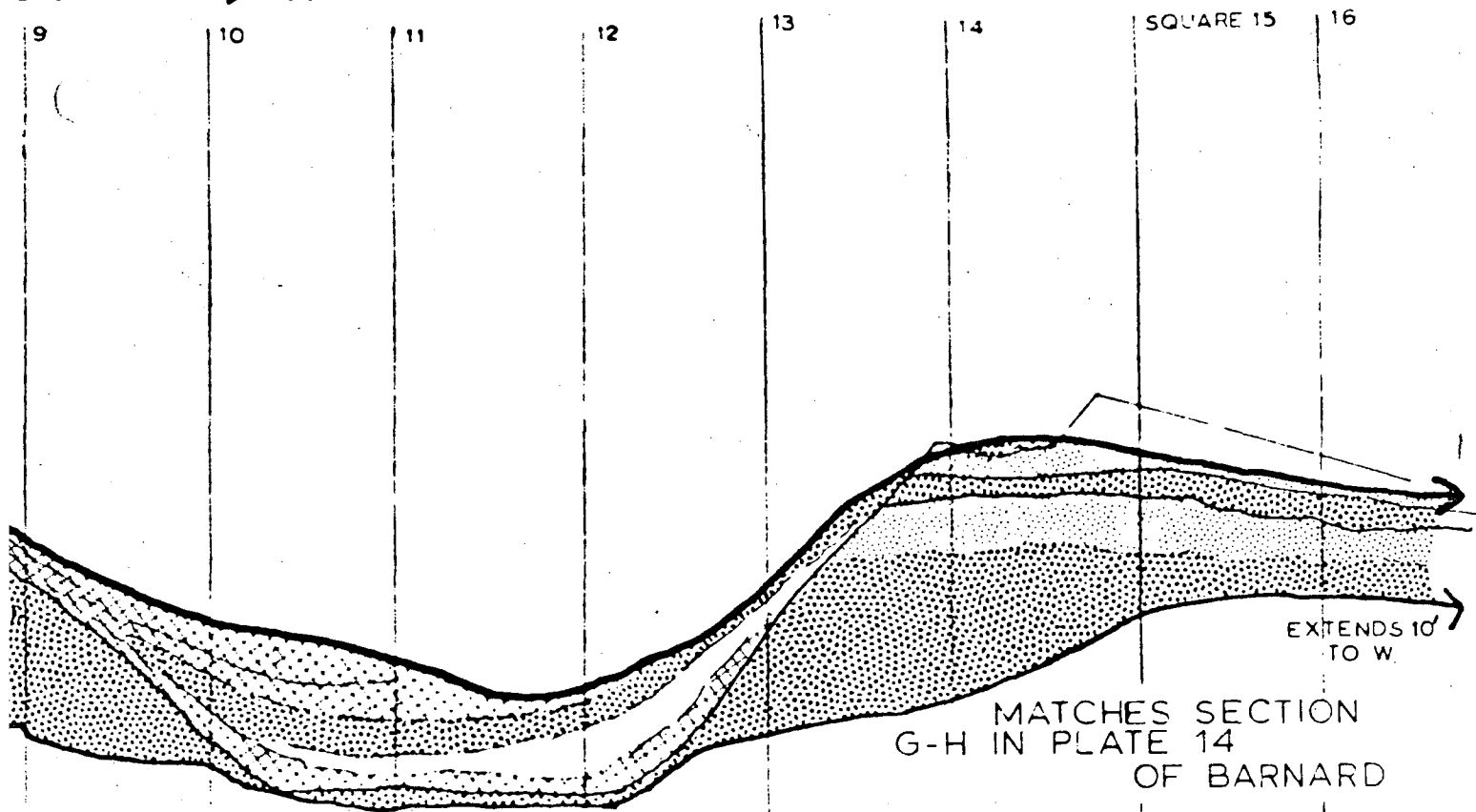


LEGEND:		ORIGINAL SURFACE, UNDISTURBED SOIL
		A TOP SOIL (LIGHT GRAY) - 10 YR 7/2
		B SOIL (YELLOWISH BROWN) - 10 YR 5/7
		C SUB SOIL (RED) - 2.5 YR 4/8
		MIXED FILL (YELLOWISH RED) - 5 YR 4/6

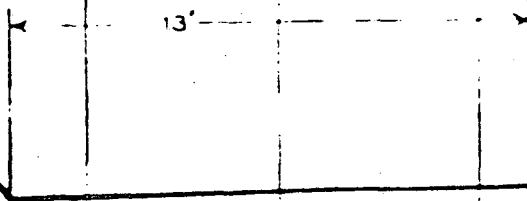
8 SEPT 1961

SCALE
0 1

SOUTH → W

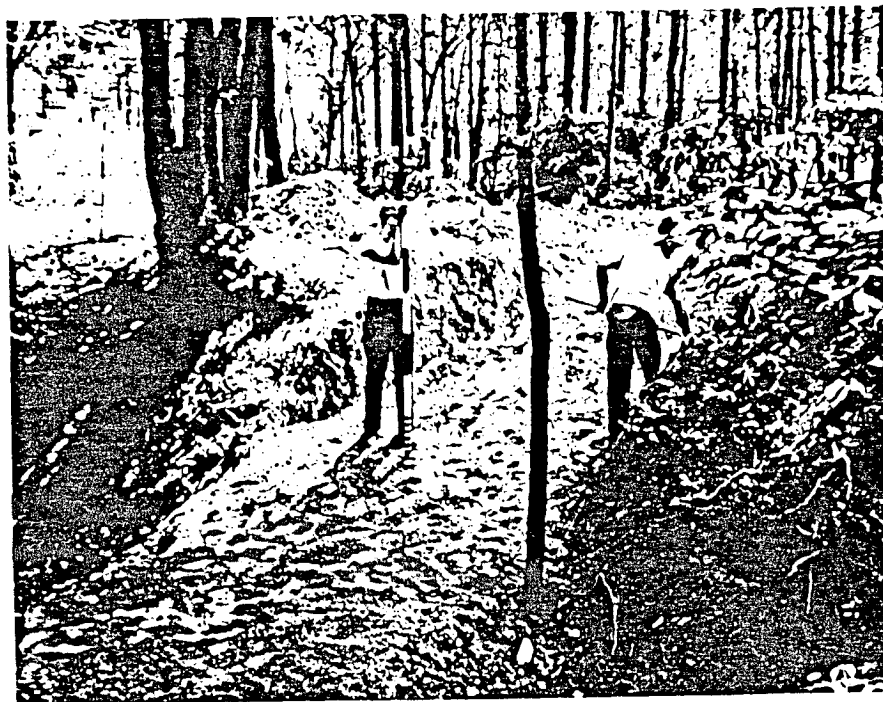


(1865 SURVEY FIGURES FOR DITCH AND COUNTERSCARP DIFFERED FROM 1961 MEASUREMENTS)



PARAPET & DITCH
as excavated, 1961, & as
surveyed, 1865 drawing no. 5

ENLML
" = 5' (1/60)
3 4 5



↑
SW

PLATE VIII

20 JUNE 1961 15:30 35mm ROLL I, Ex. 8
WIDE TRENCH AND RAMP CUT THROUGH
GLACIS AND COUNTERSCARP



↑
E

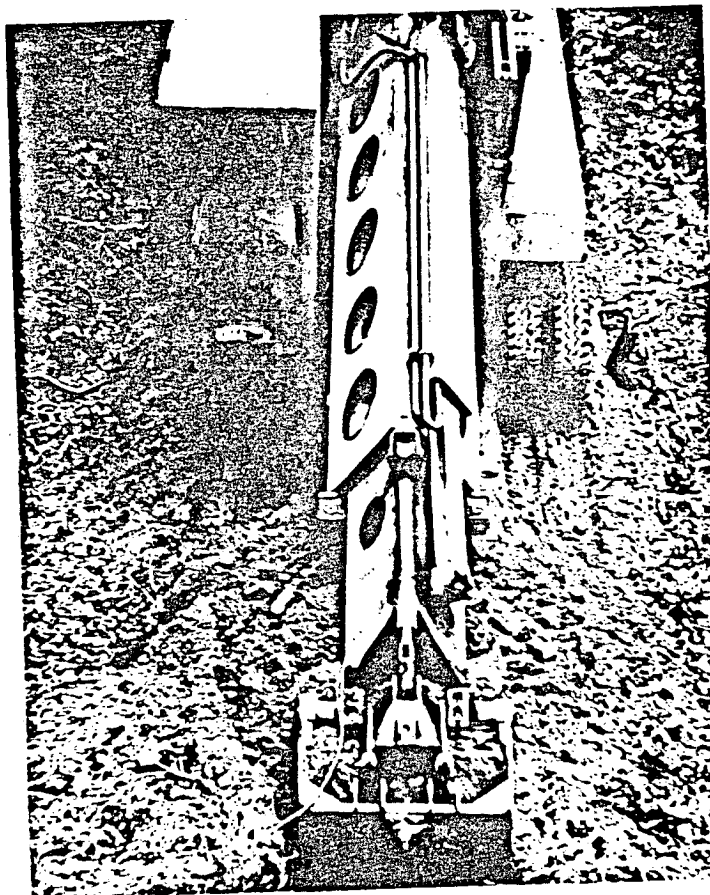
PLATE IX

23 JUNE 1961 8:45 F.P. I, Ex. 8
PARAPET AND WIDE TRENCH THROUGH COUNTERSCARP
SEEN FROM GLACIS. WHITE LINE ON LEFT RUNS ACROSS GUN EMBRASURE
DEPRESSION IN TOP OF WALL



NE
↑

GRADALL STARTING TRENCH IN PARAPET
CREST OF COUNTERSCARP IN FOREGROUND



W
↑

GRADALL CUTTING
TEST TRENCH
SEEN FROM TOP
OF PARAPET

PLATES X&XI

ROLL 35mm, Ex's.
14 & 17

27 JUNE 1961



SE
↑

CONVEYER BELT BEING USED TO REFILL
PARAPET TEST TRENCH



SW
↑

POWER TAMPER
ON GLACIS SLOPE
ROTARY TILLER &
GRADER IN REAR

PLATES XII & XIII

F.P. 5, Ex. 2
F.P. 3, Ex. 3

11 JULY 1961 8 45
7 JULY 1961 16 10

Gun Embrasure:

This was cleared to confirm the projected level of the top of the parapet and to help fix the line and angle of the breast-height more securely. The deep trench had intersected one of the wicker, sod-filled gabions, which formed the sides or "cheeks" of the gun embrasures. This showed up as a light yellowish brown rectangular block, about 2 ft. wide and nearly 3 ft. high, surrounded by red subsoil fill on the N face of the trench at the top of the highest part of the wall.

We cleared the surface of an irregular area about 12 ft. long E-W, 5 ft. wide at the E end and flaring out to 11 ft. wide at the W end, where it was connected with the deep trench after that had been sufficiently refilled for safety. All loose forest top soil and eroded fill was removed until we exposed and made a shallow cut into the construction material. We found that each gabion showed up clearly in horizontal section as a light yellowish brown (2.5 Y 6/4 - decomposed sod color) circle from 20 in. to 24 in. in diameter, surrounded by red fill.

On the S side of the embrasure we found three full gabions, and the half of the one sectioned by the deep trench. There were supposed to have been six gabions to each cheek of a normal embrasure. It was apparent that all evidence of one further out than the four we found was removed during the excavation of the deep trench. This gives five gabions. A faint suggestion of the sixth was detected at the back of the line at the throat, or narrowed part of the embrasure. However, the ground surface here had been washed down below that a few feet W. Since the gabions were higher toward the rear, this erosion would have destroyed all evidence except for the outline of the posts at the base of the circle.

We did find the casts of two small (3 in. diameter) poles along the line of the breast-height, between the throat of the embrasure and the main trench S of it. There was also fragmentary evidence of a horizontal beam. The location of this line of post revetment also helped confirm that there once have been a gabion at the back end of the line.

The circles on the N side of the embrasure were not as well defined, since the color of the surrounding soil did not contrast so much as on the other side. However, the area was less disturbed, so that the casts of the poles forming each circle were well preserved. The configuration of the N cheek was thus not as apparent, but with careful excavation it was possible to determine it with considerable accuracy. There were suggestions of a second row of gabions behind the row actually forming the cheek, but the area was not fully excavated. A gabion was found as far out as the exterior slope on the N side. This confirmed the theory that there was one

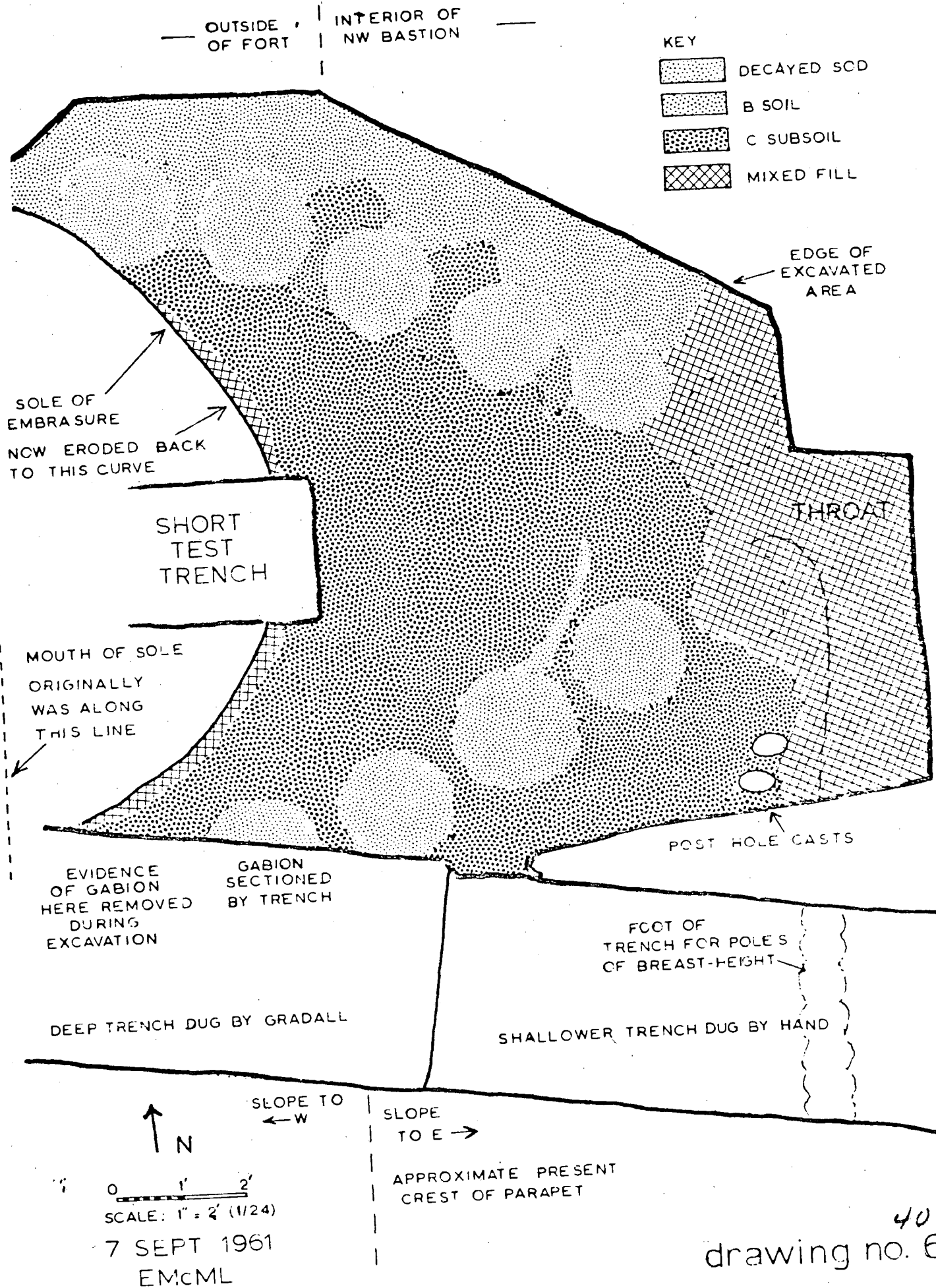
in this position on the S side, for which all evidence was lost in the deep trench. The two gabions at the rear of the N side were indistinct, but there was a definite change in earth texture where they should have been.

The differences between the remains of the two cheeks of the embrasure thus enabled us to reconstruct it in detail. The angle of splay was 48° as was called for in specifications. The throat of the embrasure was about 16 in. wide, and the mouth was 10 ft. wide. The "sole", or floor of the embrasure was clearly evident as a grey sod layer, overlying red fill. This sloped down to the front at an angle of about 10° , which paralleled the Superior Slope 3 ft. above the sole.

Each gabion was from 20 in. to 24 in. in diameter. Some of them had as many as twelve poles. The poles were about 2 in. across, spaced from 6 in. to 8 in. apart. The gabions were set vertically with respect to the cross section of the wall. Each was about 6 in. higher than the one in front of it, so that the bottoms formed steps to match the slope of the gun embrasure sole.

A very interesting discovery was that of strands of iron wire used to hold each gabion together. In five or six places pieces of wire were found in situ around the edges of gabions, and in two places the ends of wires projected out of the middle. Probably wire was wrapped around the weakest gabions, and tied across the poles inside them, prior to filling with sod trimmings, to hold them in shape. The wire was $1/8$ in. diameter. Sometimes several strands were twisted together. Artifact No. 3 is a sample of this. Other pieces were left in place along the N cheek of the embrasure.

GUN EMBRASURE



B. Auger Line:

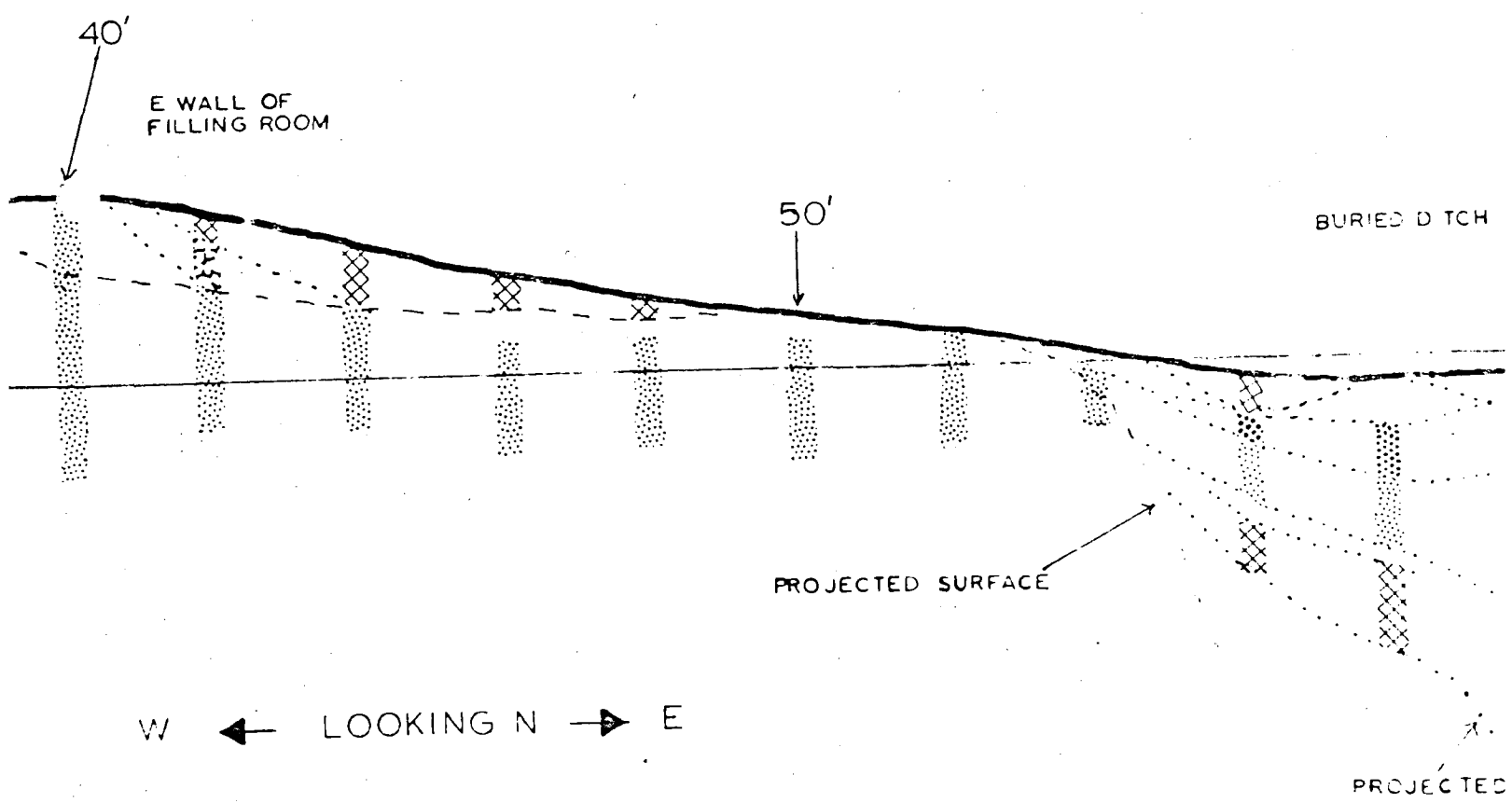
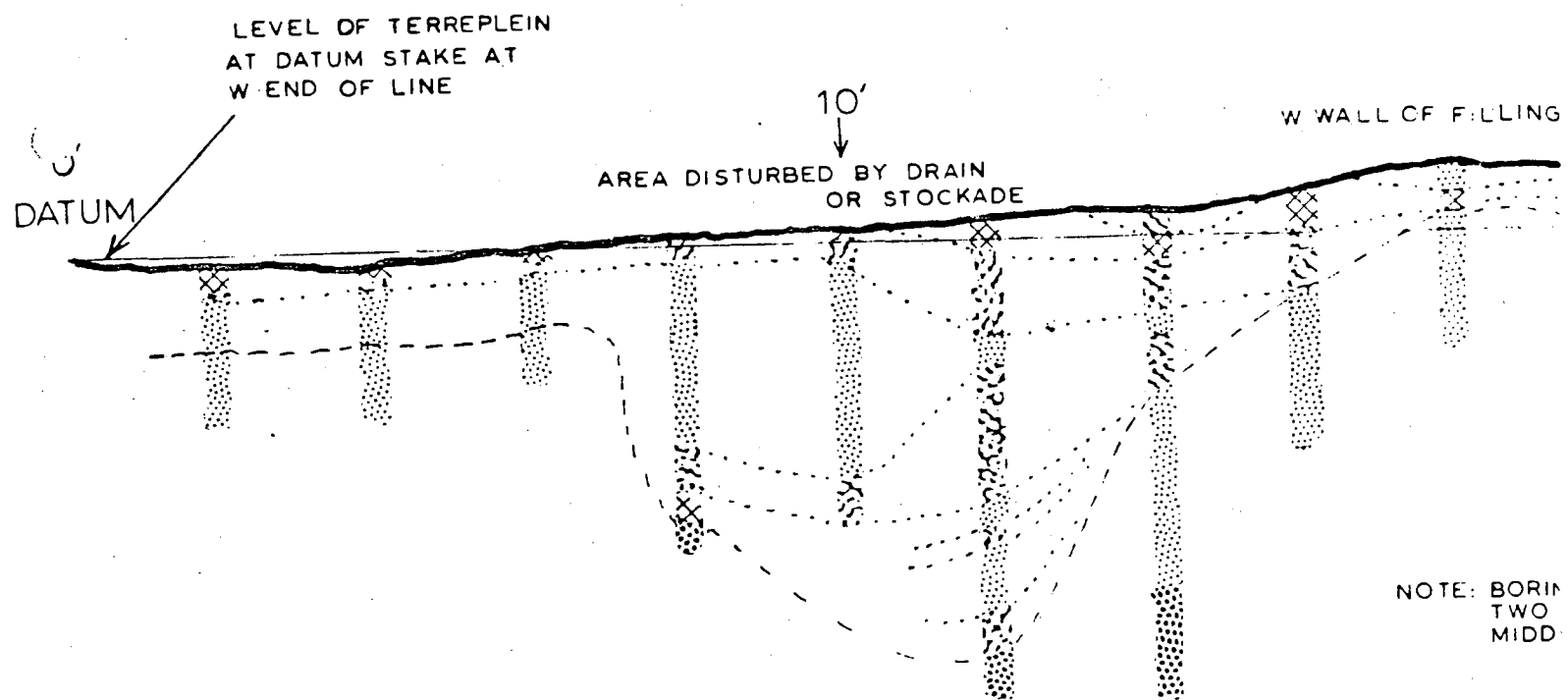
A line 80 ft. long approximately E-W was marked with lime. It ran along the narrow gap between the S end of the Filling Room and the N end of the Powder Magazine, paralleling the test trenches N and S of it. At 2 ft. intervals cross bars were marked with lime. The holes were bored until rock, roots, or hard pan made it impossible to turn the auger. Depth of holes ranged from 8 in. to 96 in. Each sample (representing from 3 to 4 in.) of soil was placed on paper separate from the preceding sample. These samples were described as to color, mixture, and consistency, and then the holes were refilled.

The sampling of strata obtained by this means was not exact in detail. However, it did reveal major changes below the surface with much less effort than it would have taken to dig a narrow trench of the same length and depth. Since the auger line lay between two trenches, it served to fill out our knowledge of the ground between them.

Two major areas of disturbance appeared when the borings were plotted. Otherwise, the profiles were normal for the terreplein of the fort. The normal borings averaged 3 ft. The first 6 in. to 1 ft. was of mixed reddish brown fill (5 YR 4/8). The remaining 2 ft. were brownish-yellow (10 YR 6/6), becoming harder and containing more gravel, until the auger was stopped by the B₂ hardpan. The upper 6 in. or so of the brownish-yellow soil was probably the packed terreplein of the fort, made of A and B₁ material. Below that was undisturbed soil.

The disturbed areas were by the entrance of the Filling Room (30 ft. from the W end of the line) and where the auger line crossed the buried ditch of the old fort (56 ft. to 68 ft. from the W end of the line.) Another area of disturbance was detected from 8 ft. to 14 ft. from the W end, in front of both the Filling Room and Powder Magazine. The most likely explanation for this is that the wooden box drain located N of this point drained under here. It is possible that the palisade suggested in Historic Plan 170-134 ran here, and was dug out. This palisade would have completely closed the gorge of the bastion. The slopes, counterscarp and scarp of the buried ditch behind the fort were clearly evident from the readings.

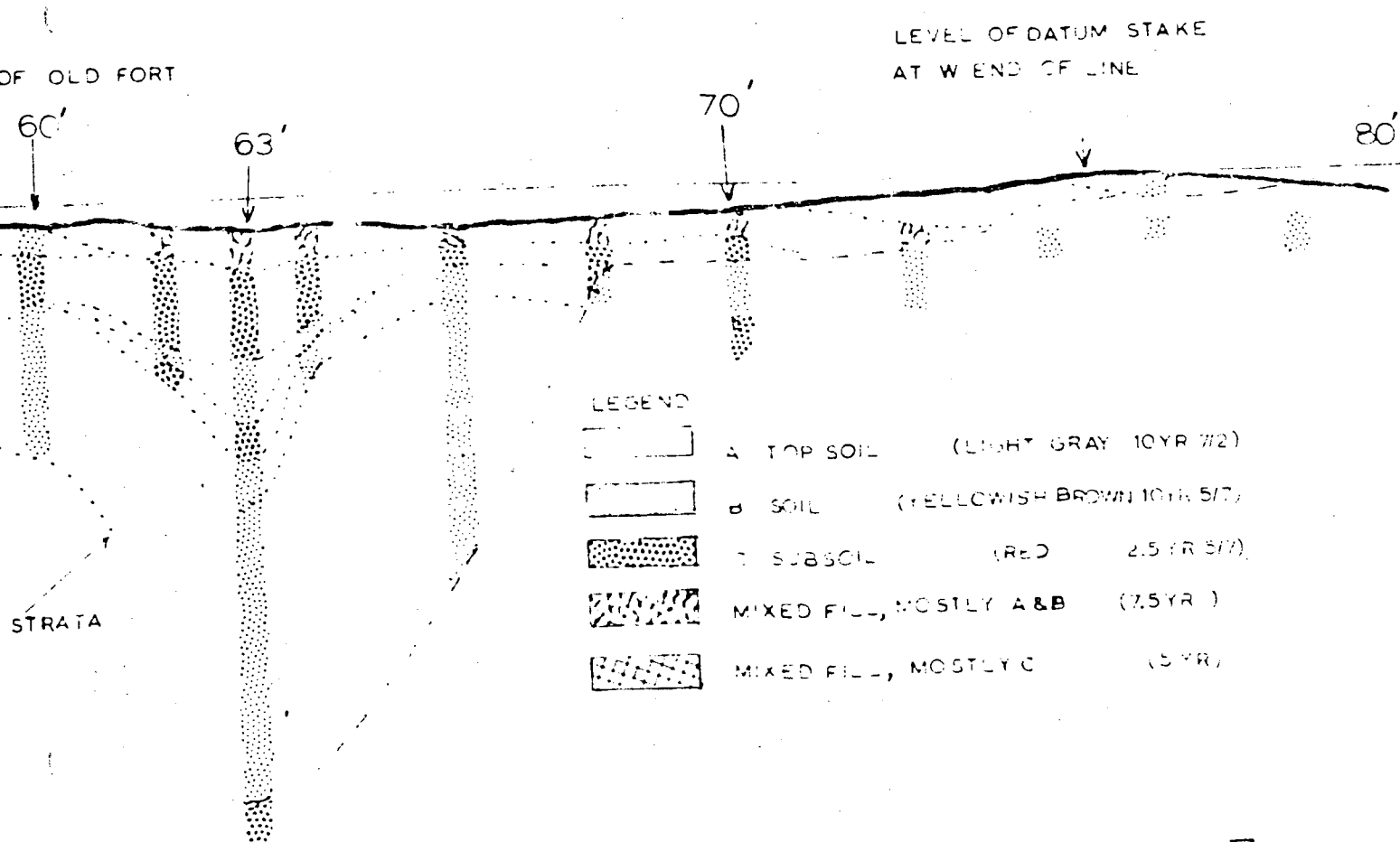
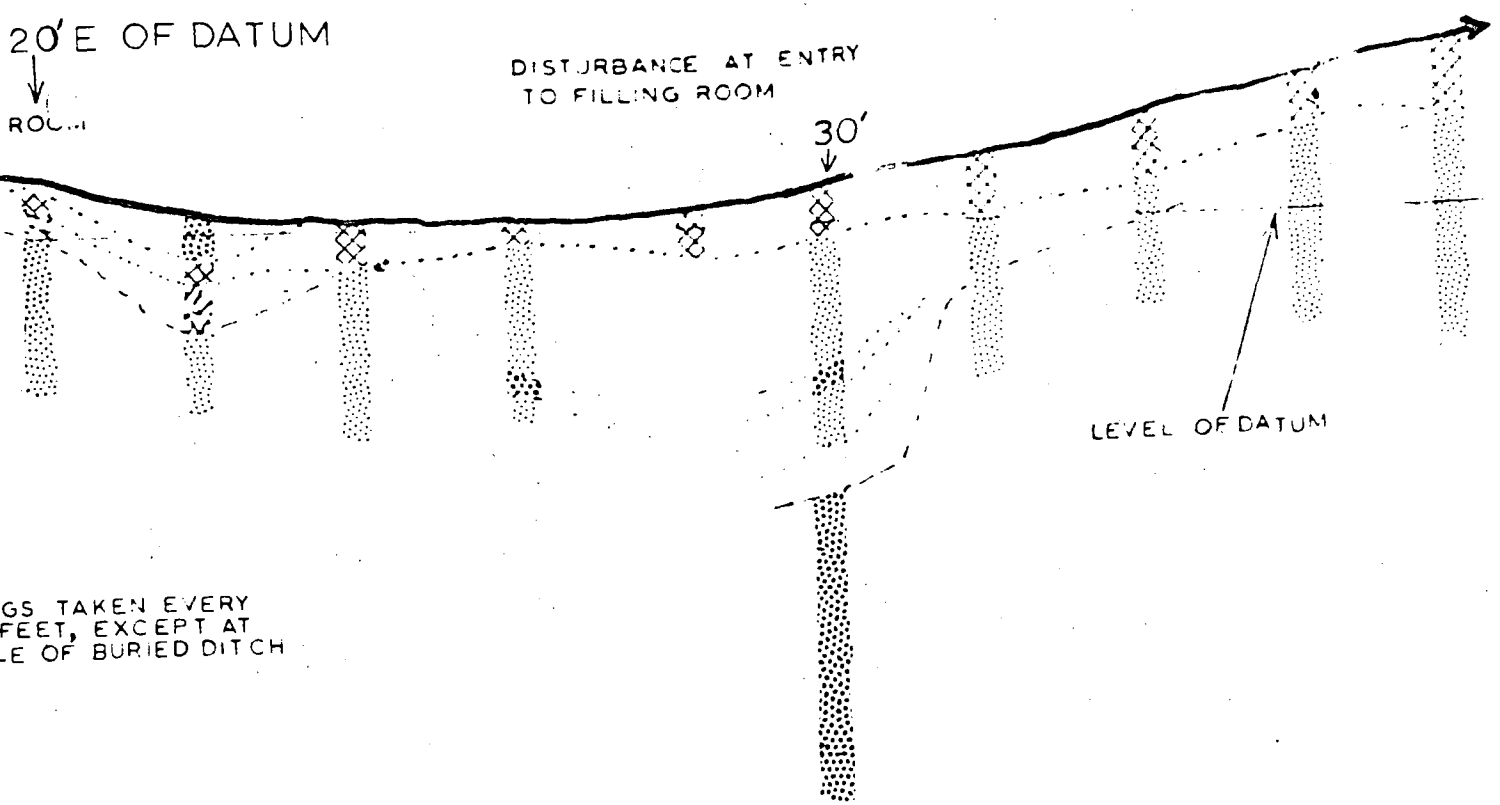
PROFILE OF AUGER



0 1' 2'

SCALE: 1" = 2' (1/24)

8 SEPT 1961
EMcML
& JEL



drawing no. 7



PLATE XIV

28 JUNE 1961 15:45 F.P. 2, Ex. 9

↑
S x SE



DIAGRAM OF PLATE XIV

AUGER TEST LINE MARKED BEFORE BORING

III - SAMPLE RECONSTRUCTION

The deep trench across the main parapet, ditch, counterscarp, and glacis slope was used for a sample restoration of the profile of the bastion. This trench was refilled and tamped where we had cut into undisturbed soil or into military construction, but not where we had removed erosion fill. The extra soil remaining was used to build up parts that had been washed down.

We restored a profile which followed the soil marks until they reached the present surface. Then we extended our reconstructed profile above the present surface along a line projected from the sub-surface soil mark. The height of missing features was determined by the interrelationship of various surfaces, by the relative elevations of features as measured by the Engineers in 1865, and by knowledge of standard dimensions for military construction of this period.

There were some discrepancies, particularly on the width of the ditch, between the profile we found, that measured in 1865, and the standard text book model. When necessary, as in locating the berm above the counterscarp, we tried to use as many sources of information as possible, and to correlate them as well as we could. In general, we found that few of the slopes had been as steep as the 1865 survey indicated. It is likely that the slopes as we restored them are not as steep as they once were, since we followed surfaces of which the upper part had eroded slightly before being covered by debris from a higher level. However, they are somewhat more stable as a result.

The Glacis slope has changed very little in a century, so we needed to build up only the crest at the rear of the slope above the present surface. We cut and packed a sharp slope (45°) from this Glacis Crest down 18 in. to a level berm 18 in. wide. From that berm down to the floor of the ditch (about 8 ft.) we built a slope of sod blocks. These were laid in courses like bricks, grass down to hold their soil and to bind them better. Each course was set back slightly from that below it, and dirt was packed behind it. Long bricks of sod were occasionally laid extending into the soil to bond the sod wall to the dirt behind it. Wooden pegs were driven through alternate courses to further secure them.

The slope obtained was about 50° . In the original fort this slope was probably only covered with a skin of sod, rather than actually built of sod blocks. However, that was done to stabilize a slope cut into undisturbed subsoil. Since we had dug our test trench into this subsoil it was broken, and we could not hope to

pack it so that it would be as stable as in its natural condition. Consequently we had to make a strong sod wall to hold it.

The bottom of the ditch we left open a few inches below the original bottom, to compensate for rapid silting. The steep sides of the test trench, although cut entirely into erosion fill 2 ft. to 3 ft. deep, seemed to hold up fairly well.

The surface of the scarp-exterior slope we built by pegging long rolls of sod at the bottom, and packing dirt behind them as we unrolled them up the slope. Otherwise we could not make the dirt stay where it was thrown. The narrowness of the restored section here (2 ft.) was a particular disadvantage on the upper part of the slope. Here our restored section projected beyond the present eroded surface, and the sides of our section tended to fall away. Also we found that it was very difficult to work on the exterior slope, even now, since it was too steep for a person to keep his balance. This is why the military engineering handbooks of the day specified that slopes should be built up as a series of steps to the desired steepness. They were cut smooth only at the final stage of construction.

The superior slope was gentle. We made it slope down to the front at an angle of about 10° , so that a line projected along it ran along the glacis slope. This relationship was specified at the time. It helped the infantrymen inside the fort aim their muskets at an approaching enemy, since they rested their elbows on the superior slope while firing.

The pole revetment for the breast-height was restored to original specifications. We cut hardwood poles 4 in. thick and 5 ft. 6 in. long. Then we buried a half-round bed log in the position indicated in the profile, running along the axis of the parapet. The ends of the poles were set side by side on the flat side of this log, and spiked into it. Earth was packed behind them until they leaned slightly toward the outside of the fort. More earth was filled behind them to within a foot of their tops. A sleeper pole was laid on the earth at this level, about 4 ft. π of the revetment. The sleeper or anchor log was fastened to the revetment with two anchor ties which were notched and spiked between the poles of the breast-height revetment.

The sleeper and anchor ties were then buried. When the earth was within about 6 in. of the tops of the vertical poles they were sawed off to make an even surface. Another half-round log was spiked on top of them. Finally three tiers of sod bricks were laid above the pole revetment. This constituted the superior crest. The earth was brought up to this level and sloped off toward the front of the wall. This slope, from the sod bricks forward was the superior slope mentioned before.

To the E of the pole revetment earth was piled to cover the bottom 18 in. of the poles. This was levelled and tamped to form the banquette tread. The breast-height proper was the 4 ft. 6 in. high interior slope from the banquette tread to the superior crest. The men who were firing, leaned against this. They were protected so that only their heads and shoulders were exposed.

Besides restoring the profile of the parapet we rebuilt the southern half of the gun embrasure. To do this we built three gabions. Each made of nine 1½ in. poles driven into the ground in a 2 ft. circle. Then twigs or withes were woven between these to make a circular tube 30 in. high of basket work. Six gabions were needed but we found it was too much work to make them. The construction of each gabion required nearly six man-hours of labor, due to our need to experiment and to the absence of suitable material. The forest cover of the site has changed considerably in a century. Consequently we made only three gabions, and simulated the other three with snow-fence. The six gabions were then set up along the S cheek of the embrasure, lined with a skin of turf, and filled with dirt.

The superior slope was extended N to the cheek of the embrasure where it covered half of the top of each gabion. The sole of half of the embrasure was sloped down and smoothed. Then all surfaces of the restored section were seeded with grass and covered with straw. The N half of the embrasure was cleaned off and left as we excavated it, to show evidence for the restoration. Each gabion circle there was accented with small pegs for better visibility.

To complete the restoration we placed suitable forked tree sections on the glacis slope. Oak made the best material for this wood entanglement. These trees were cut off a few feet below a main fork, and that butt end was placed toward the fort, about 7 ft. down the glacis slope. All leaves, twigs, and small branches were cut off to leave large branches with sharp points. The forked sharpened branches were intertwined with the branches of trees on either side, to make a section of the abattis which once surrounded the entire fort.

This restored section of wall, which is higher than the present surface at the crests of the superior and glacis slopes, and below the present surface of the ditch, may be regarded as a template. While it should not be followed as an exact guide for the profile of other sections of wall, it does indicate approximately how the rest of the bastion will look when restored. Besides this, it has been valuable for what it taught us about problems and methods of reconstruction. Some of the estimates of labor and recommendations for procedure are based on this experience.



HAND TAMPING
BEHIND WALL OF
SOD BLOCKS IN
COUNTERSCARP

7 JULY 1961 16:05



WEAVING A
WICKER GABION
FOR THE GUN
EMBRASURE

ON CREST OF
COUNTERSCARP.
PARAPET TRENCH
IN BACKGROUND

11 JULY 1961 14:25

PLATES XV & XVI

FP 3, EX'S 1 & 7

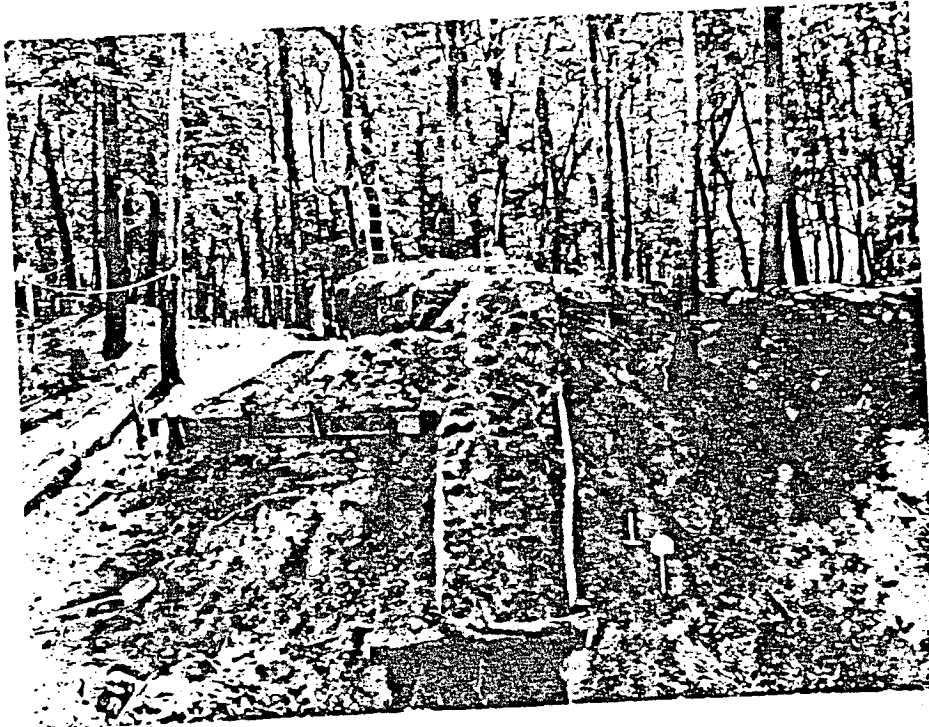


PLATE XVII

27 JULY 1961 11:26 F.P. 5, EX. 9

↑
E

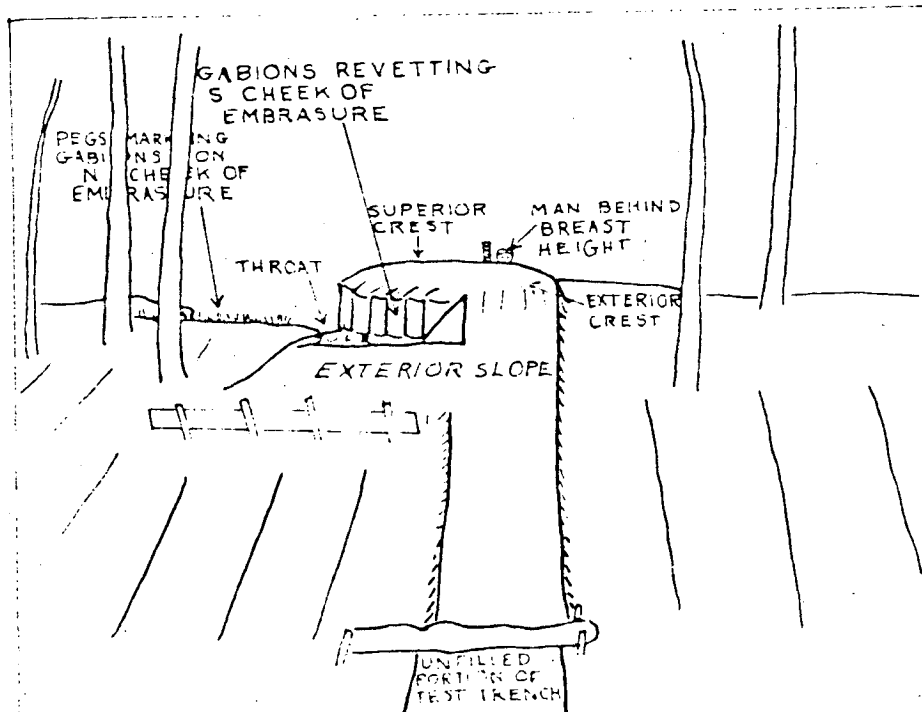


DIAGRAM OF PLATE XVII

RESTORED SECTION OF PARAPET AND GUN EMBRASURE
LOOKING TOWARD FORT. COMPARE WITH PLATE IX



PLATE XVIII

27 JULY 1961 11:31 F.P. 5, Ex. 11

↑
S

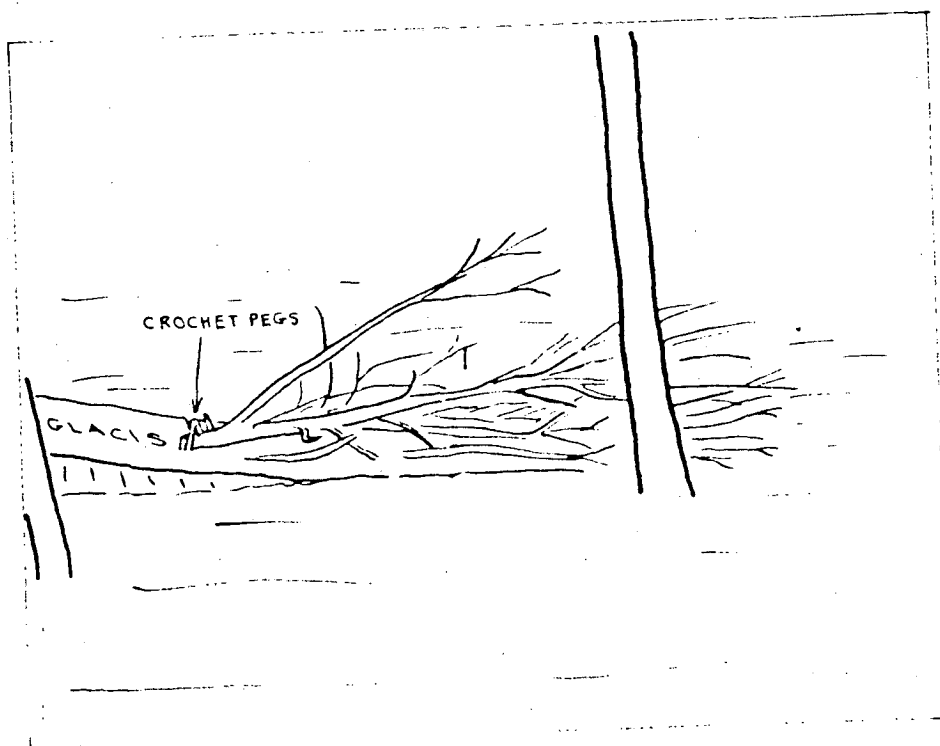


DIAGRAM OF PLATE XVIII
ABATTIS IN PLACE ON GLACIS SLOPE

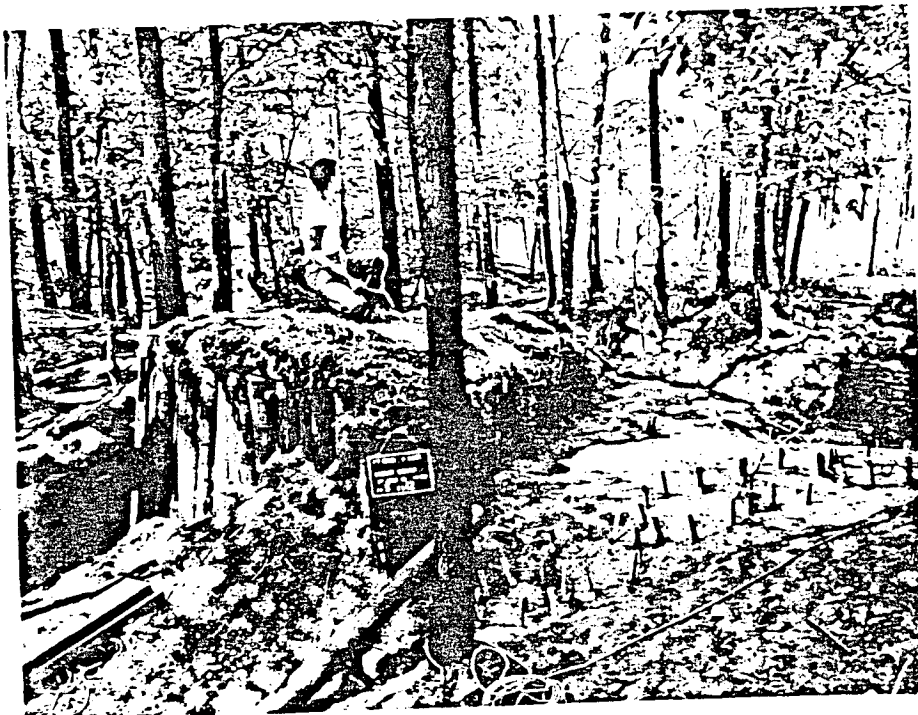


PLATE XIX

27 JULY 1961 11:38 F.P. 5, Ex. 12

↑
SW

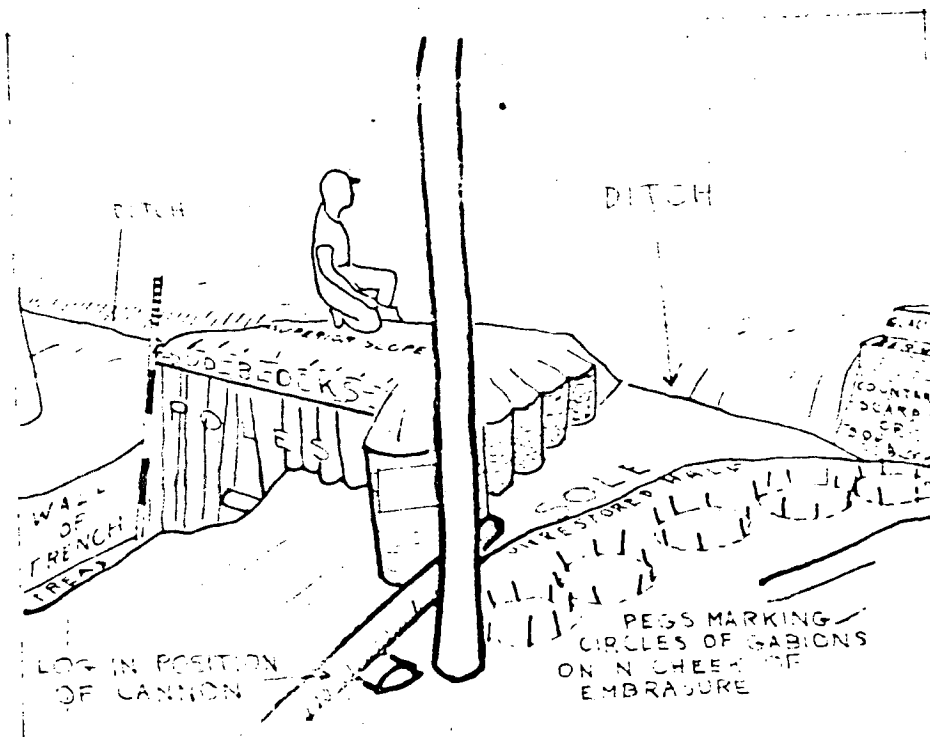


DIAGRAM OF PLATE XIX
RESTORED GUN EMBRASURE AND BREAST-HEIGHT

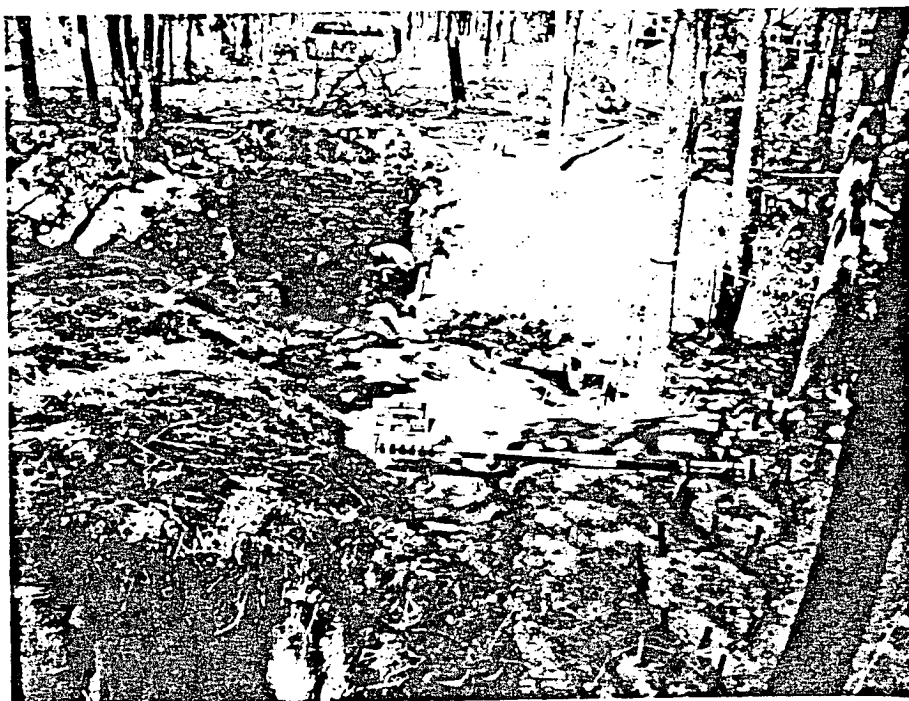


PLATE XX

27 JULY 1961 11:25 F.P. 5, Ex. 8

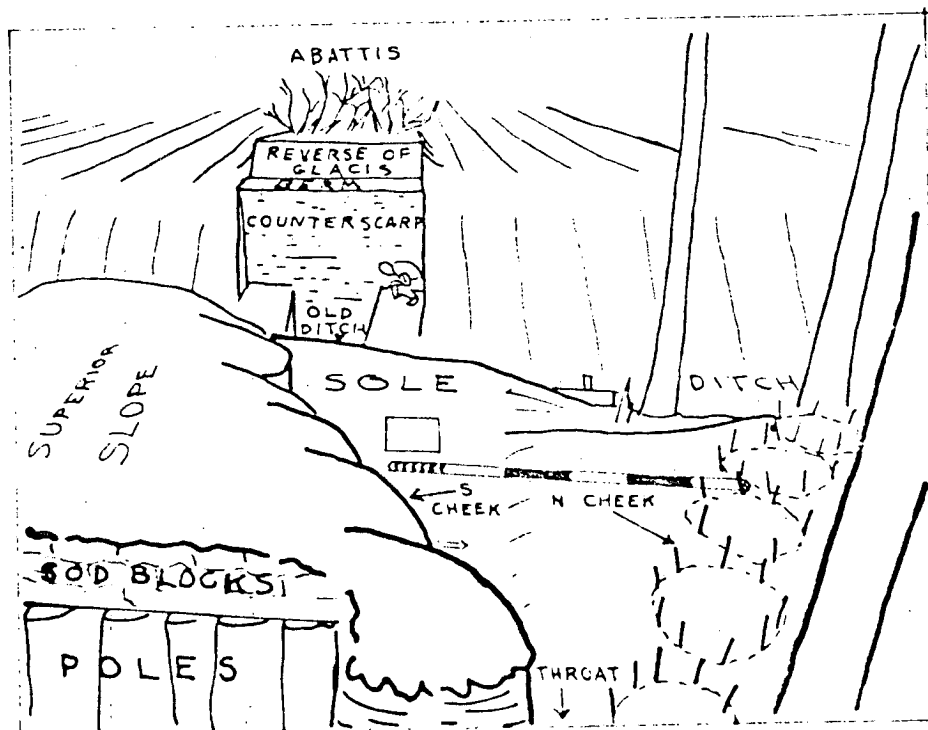


DIAGRAM OF PLATE XX

RESTORED SECTION, FROM ABOVE GUN EMBRASURE
LOOKING OUT OF FORT

IV - CONCLUSIONS

A Summary of Structures and Findings:

Filling Room: The inside dimensions of the interior timber structure were 6 ft. wide, 6 ft. 6 in. high, and 25 ft. long. The entryway was 12 ft. long, and only 4 ft. wide. The walls were planks nailed to heavy timbers as shown in the plan. The timber framework was surrounded by an open space, for the circulation of air to dry and preserve both wood and gun powder. A rough wooden shell completely surrounded this. Its outside dimensions were 13 ft. wide, about 9 ft. high, and 3 ft. longer than the combined interior of the Filling Room and its entry. Thus it was 40 ft. long, which is the size of the hole originally excavated in the earth. The entire wooden work was then covered with dirt. The exterior slope of the earth mound was 42° , the superior 17° , and the reverse 30° . From terreplein in front of the Filling Room to terreplein in back of it was 38 ft., and from end to end (N wall of the bastion to door of the Filling Room) was 45 ft. Its maximum height above the terreplein was 12 ft. at the superior crest, which gave 7 ft. 6 in. of dirt cover vertically over the outer timber structure.

Powder Magazine: This was constructed in the same way as the Filling Room. The inside dimensions of the wooden room were 10 ft. wide, 6 ft. 6 in. high, and 50 ft. long. The inside dimensions of the hole in the earth (hence the outside dimensions of the rough timber shell which allowed an air space around the inner structure) were 22 ft. wide, about 10 ft. high, and probably 60 ft. long. It should be understood that all these dimensions are not only approximate, but varied. For instance, the earth floor sloped down to make a drain along the center, and the roof was peaked. Thus if it was 10 ft. in the middle it was probably only 7 ft. or 8 ft. high at the edges. Also it was slightly wider at the bottom than at the top.

The entry way to the Magazine was 4 ft. 6 in. wide. It ran 4 ft. 6 in. in the same direction as the axis of the Magazine (NE), and then turned a right angle and ran 21 ft. to the SE and the surface. The angles of the various slopes of the earth cover of the magazine were as follows: exterior 32° , superior 14° , breast-height 68° , and reverse 46° . From the terreplein in front to terreplein in back (which was 1 ft. 6 in. lower) was 44 ft. The top of

the inside of the inner room was on a level with the rear terre-plein. The superior crest was 12 ft. above this, or 10 ft. above the timber shell.

Parapet and Ditch: The slopes of the surfaces were: banquette slope 27° , breast-height 80° , superior slope 12° , exterior slope or scarp 45° , counter scarp 52° , reverse of glacis 42° , and glacis slope 15° . The horizontal distances from terreplein inside the fort were: 3 ft. to the crest of the banquette slope, a level banquette tread 4 ft. wide, and the superior crest 1 ft. further (total, 8 ft.). The exterior crest was 19 ft. 6 in. from terreplein. It was 14 ft. 6 in. (total now 34 ft.) to the foot of the exterior slope or scarp, at the floor of the ditch. The ditch was 11 ft. 6 in. wide. At 7 ft. further (a total of 52 ft. 6 in.) was the crest of the counter scarp. There was an 18 in. level berm, and 18 in. further was the crest of the glacis slope. The foot of the abattis was 6 ft. 6 in. out on the glacis slope, or 62 ft. from terreplein inside the fort. The slope might extend as far as the ground permitted.

Since terreplein rose to different levels at different parts of the fort, I have taken the superior crest as a datum to indicate relative heights of the features of the parapet and ditch in a typical profile. The dimensions of the wall profile remained constant, and the superior crest was only gently graded up toward the salient angles, regardless of the variations in terreplein.

The banquette tread behind the superior crest was 4 ft. 3 in. lower. This was the breast-height. It was from 1 ft. 6 in. to 4 ft. down to terreplein behind that, a total of from 5 ft. 9 in. to 8 ft. 3 in. below the crest. In front of the superior crest the superior slope fell 2 ft. to the exterior crest. The floor of the ditch was 19 ft. below the superior crest. The berm at the top of the counter scarp was 8 ft. 6 in. above the floor of the ditch, and 10 ft. 6 in. below the superior crest. The crest of the glacis slope was 18 in. higher.

Gun Embrasures and Platforms: The throat of the average gun embrasure was 18 in. wide. The width of the mouth varied from 10 ft. to 18 ft., (20 ft. at salient angles) depending on the splay of the embrasure and the thickness of the wall. This also affected the length of the sole. The angle of the sole was sometimes parallel to that of the superior slope and sometimes sloped down more steeply. It was 3 ft. below the superior slope for a Siege Carriage emplacement. Each cheek was held up by a row of six gabions. Thus the sole of a Siege Carriage embrasure was 3 ft. 6 in. above the platform

at the throat of the embrasure. For a Field Carriage embrasure the height of this same "genouillère" was only 2 ft. 8 in., as the entire sole of the embrasure was 8 in. lower to accomodate the lower field carriage.

The platform itself was a raised ramp of earth, slightly rising to the rear, to check the recoil of the gun. The usual dimensions of this were 20 ft. long and 18 ft. wide. A heavy decking of planks or timbers 6 in. thick, of random width, was spiked onto seven or eight sleepers to make the wooden platform on which the gun rested. This was 22 ft. long and 14 ft. wide. Actually it was 2 ft. shorter than the earth ramp at the rear, and projected 6 ft. further forward, to the foot of the breast-height.

B. Archaeological Conclusions

The general location of all main features of the bastion was apparent from surface contours before excavation. However, a century of erosion had erased all distinct structural shapes. The three test trenches and the line of auger borings enabled us to determine the exact location of the earth structures covering the Filling Room, the Powder Magazine, and the different surfaces of the Parapet and Ditch. A number of secondary features were found, such as the S side of the gun platform, the exact plan of one gun embrasure, the stairway outside of the Filling Room, the possible palisade closing the gorge of the bastion, and the buried ditch of the old fort.

It was not possible to find the location of the two earth-covered timber structures within an accuracy of closer than 1 ft., because they were set inside large spaces in the earth structures. These spaces were clearly defined, however, and we can safely assume that the timber rooms were more or less centered in them.

The methods of construction and destruction, and the particular features of the earth were made apparent in our excavations. The fort was built in the approved manner of excavating by strata. Each level of construction fill was probably screened to break it up and remove large stones, and then tamped. Structures were built up in level layers, and then the surface was cut to the desired slope and

8 The Ordnance Manual for the Use of the Officers of the United States Army, 2nd. ed. (Washington, D. C., Gideon & Co., Printers, 1850) 475 pp., pp. 55-56 "Dimensions and Weights"
Brig. Gen. John Gibbon, U. S. Vols., The Artillerists Manual, compiled from various sources and adapted to the Service of the United States (New York; D. Van Nostrand, 1863), p. 396

covered with sod. The layers ranged from 4 in. to 15 in. thick. ⁹

Artifacts were not very significant, except for the samples of Gabion wire, and a few 30d. cut spikes. The latter were probably used to fasten the sill to the breast height, and to hold the outer shell of the buried timber structures in place. We did find a number of samples of coal tar which had been spread on the roofs of the timber structures. This was evidently applied in layers 1/2 in. to 3/4 in. thick with small gravel spread between them. It may have been as many as three tar layers thick. The logs (or half logs) it coated were probably about 6 in. across. This outer timber structure held back the earth cover, and allowed air to circulate around the inner beam-and-plank structure of the Powder Magazine and Filling Room. The heavy beams of the inner structure, in turn, supported the outer timber shell and the full weight of the earth which covered that. The tar and gravel layers were spread on top of the outer shell before it was covered with earth.

The wood work of the fort was dismantled, and the earthworks were repeated evidence of earth having been dug up and thrown to one side so that timbers could be removed. This was particularly clear in the profiles of the two bomb proof structures, where the earth once covering them had been thrown to the rear. During the war all forest, orchards, or other cover had been felled to provide clear fields of fire for two miles in front of the line of fortifications. Other wood had been used as fire wood, or for abattis. It is indicative of the dearth of wood in 1866 that it was worth considerable effort to dig up these deeply buried timbers.

The archaeological evidence confirmed what we might expect from the historical records. There was absolutely no evidence of fire, and none of gradually collapsing structures. A clean removal was made of all usable material while the fort was still in good

⁹Dennis Hart Mahan, A Treatise on Field Fortifications (New York; John Wiley, 1862) This handbook, especially in its earlier (c. 1850) edition, was used, with modifications, during the construction of the forts around Washington.

condition--in fact, within a few months of its completion. After this disturbance of the construction layers, the dirt gradually eroded to its present condition, with little subsequent activity, at least in the Northwest Bastion.

The remaining item of archaeological interest is a function of the Fairfax Soil. The terreplein of the fort was above a layer of water-resistant fragipan, but the ditch around the fort was dug into a well-drained subsoil. We do not know much about the drainage system of the fort, except for the location of one drain in front of the Filling Room. However, we presume the drains emptied into the ditch outside the walls. Under these soil conditions the original fort was doubtless well drained, and the restored Northwest Bastion can be kept dry in the same way.

The structure of this soil is not entirely advantageous. The hardpan layer was exposed about half way up the main parapet. The result of this was that the soft subsoil of scarp below it tended to crumble and fall away, while the hardpan held together. This undercut the hardpan, and resulted in a weaker wall than one made of a uniform material. This weakness, however, only took effect when the sod cover of the slope was not maintained, so it should not affect restoration.

C. Military Engineering

Fort Ward, in its last stage of development, is typical of the latest improvements in military engineering at the end of the Civil War. It could be described as a well flanked structure of strong tracé and profile. Despite some discrepancies between the plans drawn up by the army in 1865 and the actual contours as indicated by our digging, it was clear that great care was taken in planning and building the fort.

The angles of the various slopes were calculated to give maximum protection to the men behind them or the structures beneath them, in case a shot hit them directly enough to penetrate. Their surface would

10 The timber in Fort War was sold on 30 November 1865 to E. C. Morrison (abattis and revetment) and to Bodfish, Mills, & Co. (Timber and lumber inside of parapet). This item is included in a report dated 6 December 1865 from Brig. Gen. B. S. Alexander to Brig. Gen. R. Delafield, titled "Account of Auction sales of property of Def. of Wash. for week ending Dec. 2, 1865." found in Letter Book of HQ, Defenses of Washington including that year, at the U. S. National Archives.

deflect most fire because it would come at an oblique angle and glance off. The crests of interior structures were several feet higher than the superior crests of the wall, to protect men inside the fort and at the top of the rear wall from gently arcing shots which might just clear the front wall.

The gun embrasures were each designed for the specific field of fire required at that point. For example, the embrasure we excavated was the central one of three on the W or main front of the Northwest Bastion. It was designed for a $4\frac{1}{2}$ in. Ordnance Gun on Siege Carriage. This would be one of the main guns firing at an attacking party approaching from the most likely route. For this reason it was symmetrical, its central axis being at a right angle to the long axis of the wall. It had a splay of 48° , which was the maximum allowable without weakening the cheeks and making the embrasure inadequate to protect the gun and crew.

On the other hand the embrasure farthest to the NE was designed for a small 6 Pounder Gun on Field Carriage, which was lighter than a Siege Carriage. Thus a gun was mounted particularly to cover the NW face of the North Bastion, and the ditch in front of it. It would be used only at very short ranges if an attacking party actually reached this part of the fort. Then it would rake the wall and ditch toward the N salient angle with grape shot.

Because it was a secondary gun emplaced to do the specific job of covering part of the North Bastion, which was itself a supporting element of the fort, the 6 Pounder Embrasure was only 31° wide, and very lopsided to the left. Thus this gun could turn only through the field of fire necessary to perform its job. To have made the embrasure wider or symmetrical would have weakened it to no purpose.

Another refinement of military planning was the placing of breast-height revetments along the top of the Filling Room and the Powder Magazine. Vertical poles, incidentally, were superior to long horizontal beams, since they localized the damage of any solid shot which might penetrate the parapet. The additional length of breast-height increased the yardage from which infantry could fire on an approaching enemy, although they would have to be careful since they would fire just over the heads of the men of the main wall in front of them. The main purpose, however, was to provide a second line of defense. The two structures nearly closed the throat of the Northwest Bastion, and there was some evidence (Historic Drawing No. 140-134, and the westernmost disturbance along the auger line) of a stockade closing the gap between them. If an attacking party should have succeeded in entering the bastion, it could be fired on from these structures, and prevented from gaining entry to the rest of the fort. The long "Bomb Proofs" or personnel shelters in the middle of the fort also had breast-heights for musketry, and could be a third defense line. Discussing this arrangement, Barnard says:

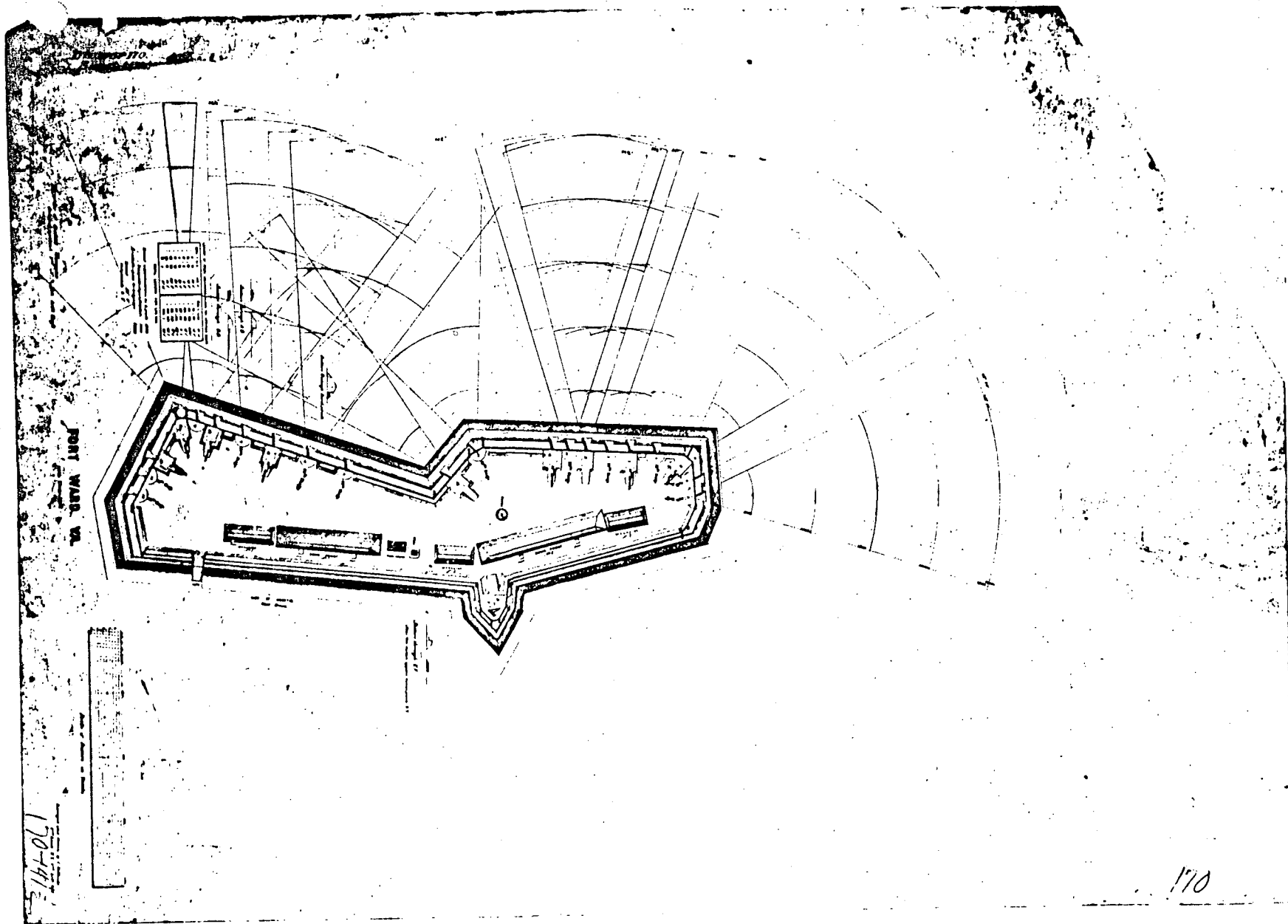
"...the location of magazines and implement or filling rooms was such as to make them subserve the purpose of traverses; each of these structures was also provided with banquettes and breast-height, so as to command by musketry fire the three principal bastions, which, by this arrangement, were comparatively isolated from the main work, and thus made additionally secure against assault." ¹¹

The door of the Magazine opened to the rear, to lessen the chance of an enemy shell hitting it. The entry way turned an angle, as additional protection against explosion. Only one keg of powder was to be removed at a time, to be put in the Filling Room. Here the shot and shell would be loaded. Then a limited amount of ammunition was taken up for each gun. Thus there was a minimum exposure of powder to enemy fire, and the effect of an accidental explosion in any part of the fort would be well contained.

The construction of Fort War is typical of one particular feature of this military planning. It used materials that were available on or near this site. In an area of scrub forest it used poles for revetment, and beams and planks for the buried structures. North of the Potomac, in heavier woods, the buried structures were solid log buildings. At Petersburg, in heavy thicket growth, gabions and fascines were used to revet, instead of unobtainable poles. Elsewhere sod was used extensively for the same purpose. This school of fortification made the best use of its environment, as well as of its location.

It can be seen that Fort Ward was a very sophisticated example of Civil War military engineering. The structures preserved or to be restored in the Northwest Bastion illustrate these well planned features. The carefully developed theory and application represented are worthy of our study and respect today and of restoration and preservation.

¹¹ Barnard, Report on Defenses (1871), p.38.



8. Historic Drawing No. 170-141. Plan of Old Fort (early stage: possibly Spring 1862) N is to Upper R

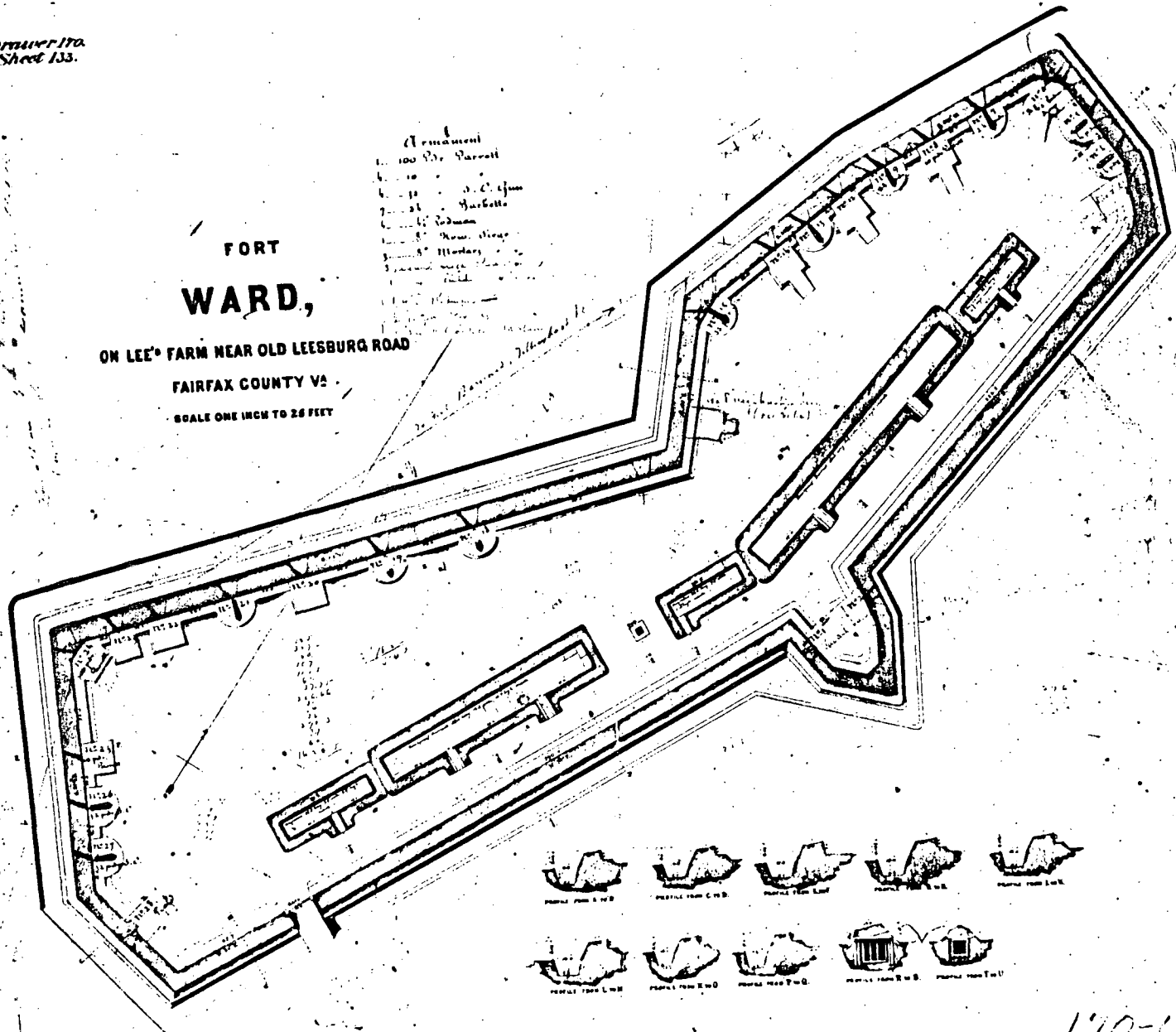
FORT WARD,

ON LEE'S FARM NEAR OLD LEESBURG ROAD

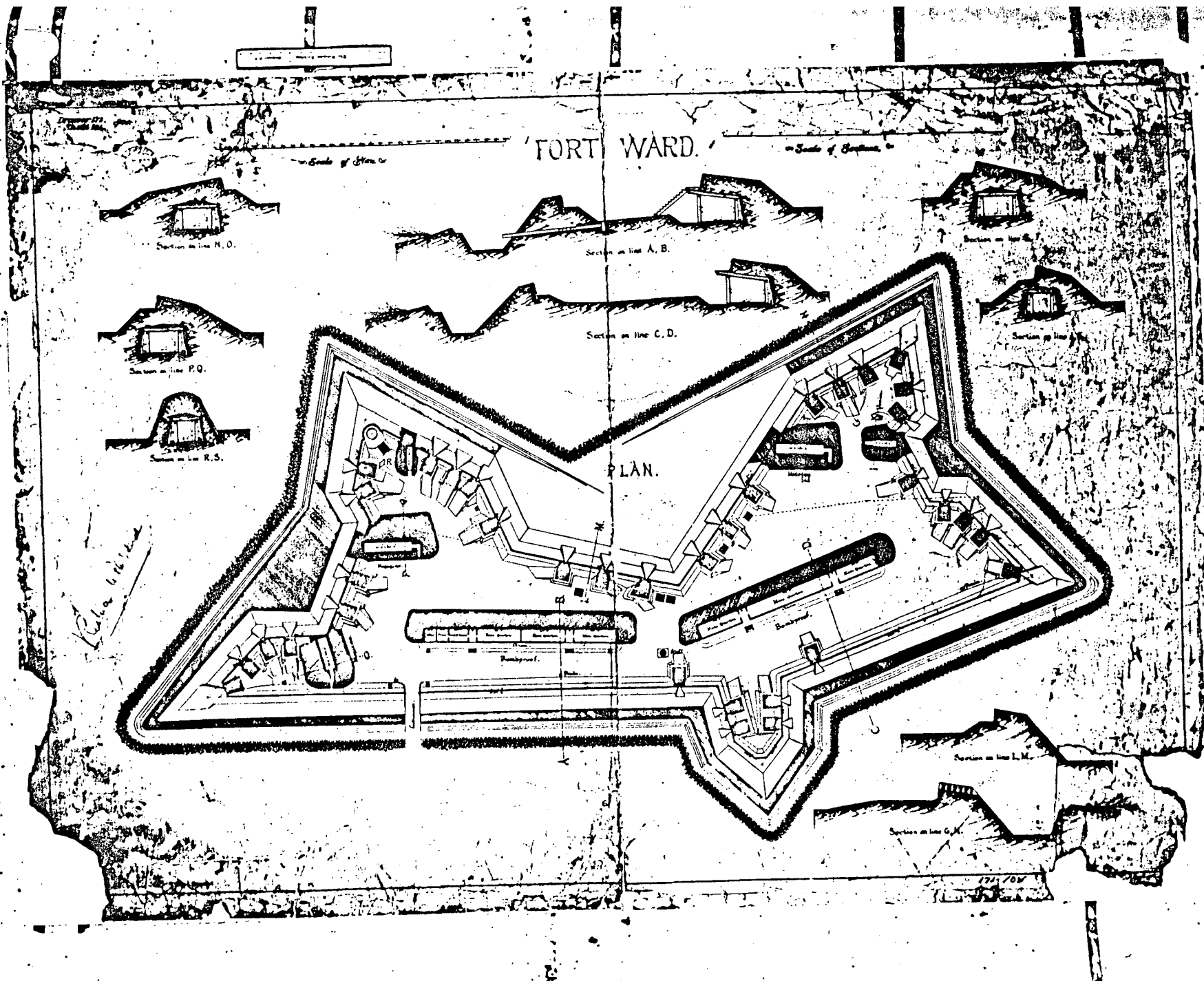
FAIRFAX COUNTY VA.

SCALE ONE INCH TO 25 FEET

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170-133



10. Historic Drawing No. 171-104 Plan of New Fort (Finished: 1865) N is to Upper Right

D. Historical Conclusions

The development of Fort Ward, from the first field trenches dug in 1861 to the final fort of 1865, shows the sequence of events and the effects of practical experience on the theory of military construction during the Civil War. The first fort was, as Barnard says:

"...thrown up very hastily. A part only of the site was clear; the right half of it and the slopes to the front, to the right towards Leesburg road, and to the rear, were covered with a second growth of young trees and bushes. The portion on the cleared ground was paced off and commenced while the clearing of the rest of the site and its surrounding was going on; hence the very defective tracé." ¹²

Inspections were critical of this, and a number of improvements were made, including the addition of more gun platforms. However, this was inadequate, and in 1864 the fort was completely rebuilt and enlarged.

As rebuilt, a number of new features were included. For example, the ditch around the old fort (a section of which we uncovered) was too narrow and the walls were too steep, leading to complaints about falling scarps. In the old fort there was no berm between scarp and exterior slope, but there was a break and the scarp ran down at a steeper angle. In the new fort the line of the exterior slope-scarp was continuous, from exterior crest down to the ditch. It was also less steep than the old scarp. This was admittedly a military defect, but it represented a necessary adjustment to the soil conditions and weather of the site.

The profile of the earth fill over the buried structures in the new fort showed a decided improvement over similar work in the old fort. There was much more earth, particularly where it mattered, above the exposed front angle of the buried structure. This was where a falling enemy shot was likely to strike. The thicker cover also helped to protect against the increased use of explosive shells. The sloping angles of the earth in the new fort were better calculated to deflect fire, and the additional interior breast-heights for musketry provided an extra margin of defense.

¹² Barnard, Report on Defenses, (1871) p. 38, f.n.

It was only because the defense system of Washington was maintained and developed over four years that this sort of growth can be observed on one site. Furthermore, the large congressional appropriations made for defense of the national capitol made possible the complete application of the lessons which had been learned in military and practical engineering. The elaborate system of defenses around Washington was unusual in its extent, strength, and perfection. Fort Ward is even more unusual because it is one part of these defenses in which we can see at once the whole process, from first hasty fort, to improvements, complete rebuilding, perfection, and final dismantling. We are very fortunate that Fort Ward and the system surrounding it are so well preserved, and that the City of Alexandria has acquired them, and has afforded this opportunity for their study.

APPENDIX I

Descriptive Terminology

The following drawing will give the technical names for parts of a fort of the Civil War period. Most of the terms are of French deviation. Some of the features which cannot well be illustrated are given in the glossary.

Glossary

Major Military Structures:

FORT: A relatively large (more than 100 Yards perimeter) completely enclosed defensive work, capable of being defended from an attack on any part of it, as a self-sustaining entity.

BASTION: A projecting part of a fort, designed to provide flanking fire along some other surface of the fort, or to place some guns so as to make their forward fire most effective.

BATTERY: A relatively small position with defensive earthworks in front but open to the rear. This may be as well armed as a bastion or even a small fort, but it cannot be defended if the enemy should attack it from the flanks or the rear. Batteries along a defensive line should be placed to support one another.

Parts of Structures:

EMPLACEMENT: The constructed setting for a cannon. This always consisted of a raised earth gun platform surmounted by a smaller platform of heavy wooden planks, or, in the case of guns as big or bigger than a Parrot 100 lber, cement.

There were two major types of emplacements--"en barbette" and in embrasure. Those in barbette were mounted on high naval gun carriages. These had small wheels, and the trail often turned in a semicircle of track so that the gun could swivel. Barbette guns were above the parapet and fired over it.

Guns in embrasure were mounted on either earth field or siege carriages. These were similar in appearance except that the wheels for instance of the siege carriage were of 60 in. diameter, those

of the field carriage only 57 in. In general the siege carriage was a slightly heavier, stronger version of the field carriage. Somewhat larger guns were mounted on siege carriages, and they were higher above the ground.

The embrasure itself was a gap out in the top of the parapet. Inside the wall it was only slightly wider and deeper than the muzzle of the gun which projected into it. It sloped down and flared out, so that the gun had a maximum freedom of traverse commensurate with the strength of the wall. The sides were called cheeks, and the floor was called the sole.

BREAST HEIGHT: A nearly vertical wall on the rear of some earth cover. From tread to top could be no more than 4 ft. 3 in. or 4 ft. 6 in. Infantry men leaned against this wall when firing over the top of the earth structure, leaving only their head and shoulders exposed.

GORGE: The narrow entrance to a structure, such as an open emplacement or a bastion.

TERREPLEIN: The level floor inside the fort, far enough below the crest of the parapet to be sheltered from enemy fire. It might rise toward the foot of the banquette slope, as it did in the Northwest Bastion of Fort Ward.

Materials:

GABION: A tube of basket-work, 2 ft. across and about 3 ft. long. This was filled with dirt or turf and used to hold up steep walls of dirt.

FASCINE: A solid roll of twigs and branches bound together. It might be 8 in. across, and up to 15 ft. long, also used to revet.

A SOD or A TURF: A block 12 in. square and 4 in. thick. Some blocks were cut 18 in. long, to be laid as headers. We cut our blocks about 9 or 10 in. across.

Locations or Characteristics:

PROFILE: The height of the parapet above the ground, its thickness, the depth of the ditch, and the steepness of the slopes. In effect, the "cross-sectional military strength".

TRACE: The outline of a fort in plan, with the lengths of the various flanks related to the number of guns sweeping the faces of those flanks and the space for infantry men to fire from. The strength of Trace also considers the overlapping arcs of cannon fire along the exposed front, and the mutual support afforded by the bastions of the fort. This is the "out-line military strength."

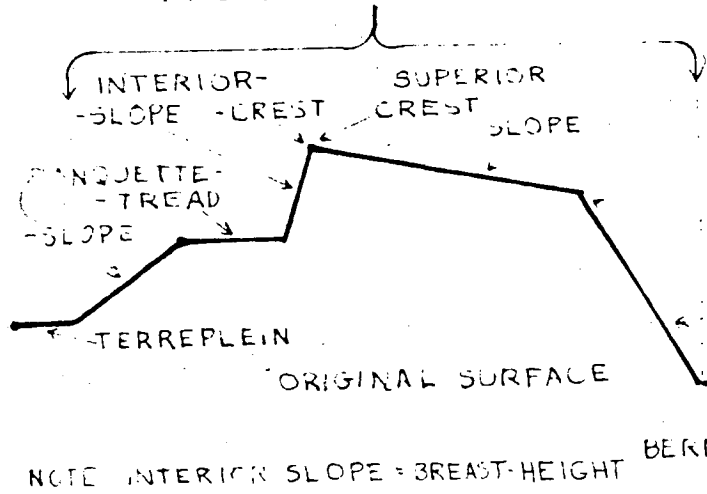
FRONT and BACK: Front is the side facing the enemy, and back faces away. Throughout this discussion of the Northwest Bastion the front faces almost due W.

CREST and FOOT: The highest point of a slope is its crest, and the lowest is its foot. Thus when two slopes are contiguous the foot of the upper slope will be the crest of the lower.

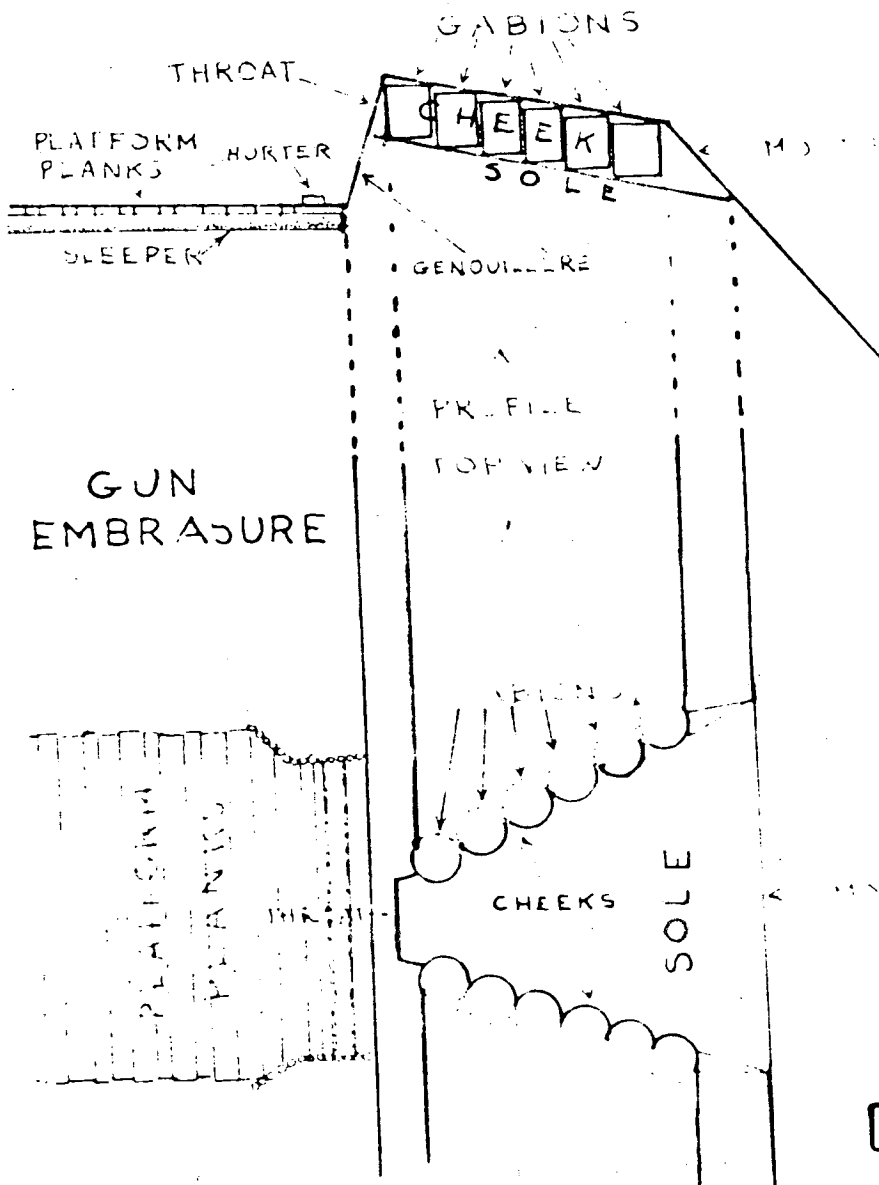
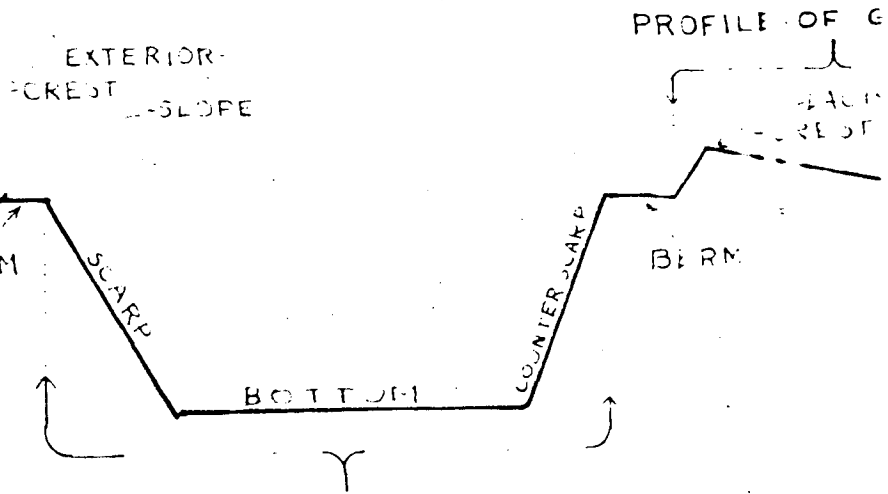
TO FLANK: To project bastions from a fort to cover its surfaces with fire--to improve its Trace.

TO REVET: To hold up any steep dirt wall with some supporting material--long beams or vertical poles of wood, sod blocks, gabions, fascines, or even masonry.

PROFILE OF PARAPET



MAIN WALL PROFILE AS SPECIFIED BY MAHAN (ca. 1850)

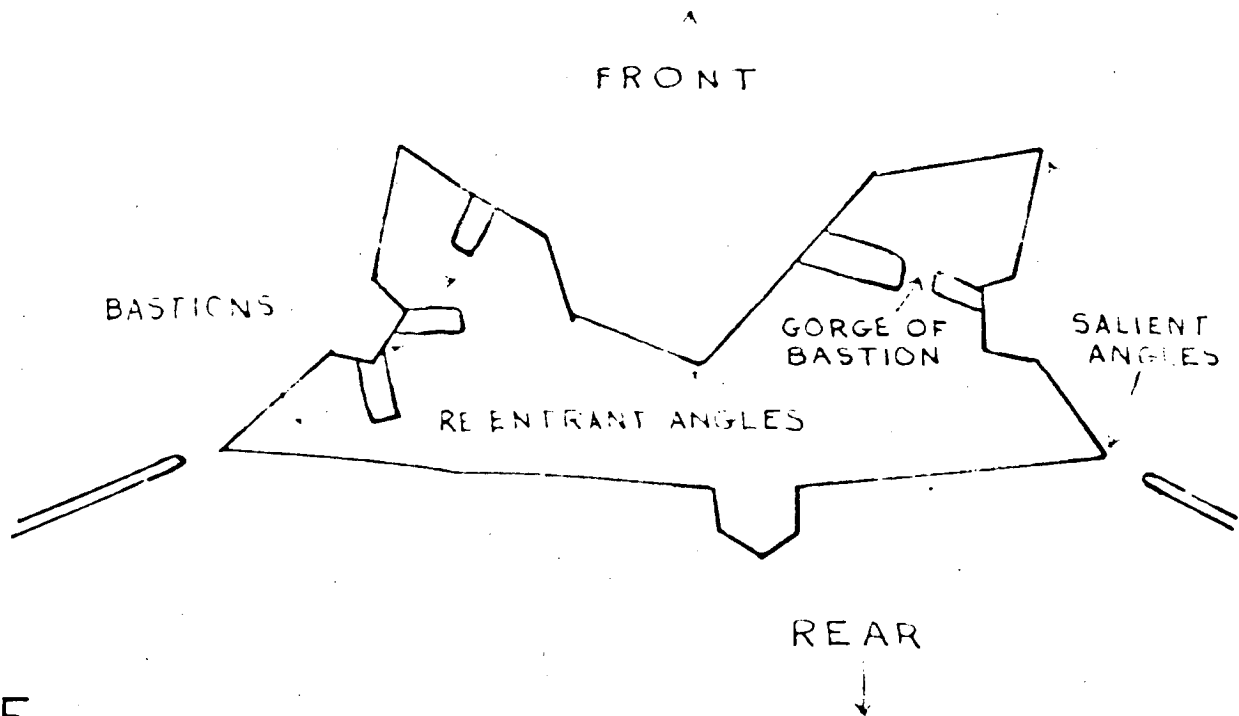
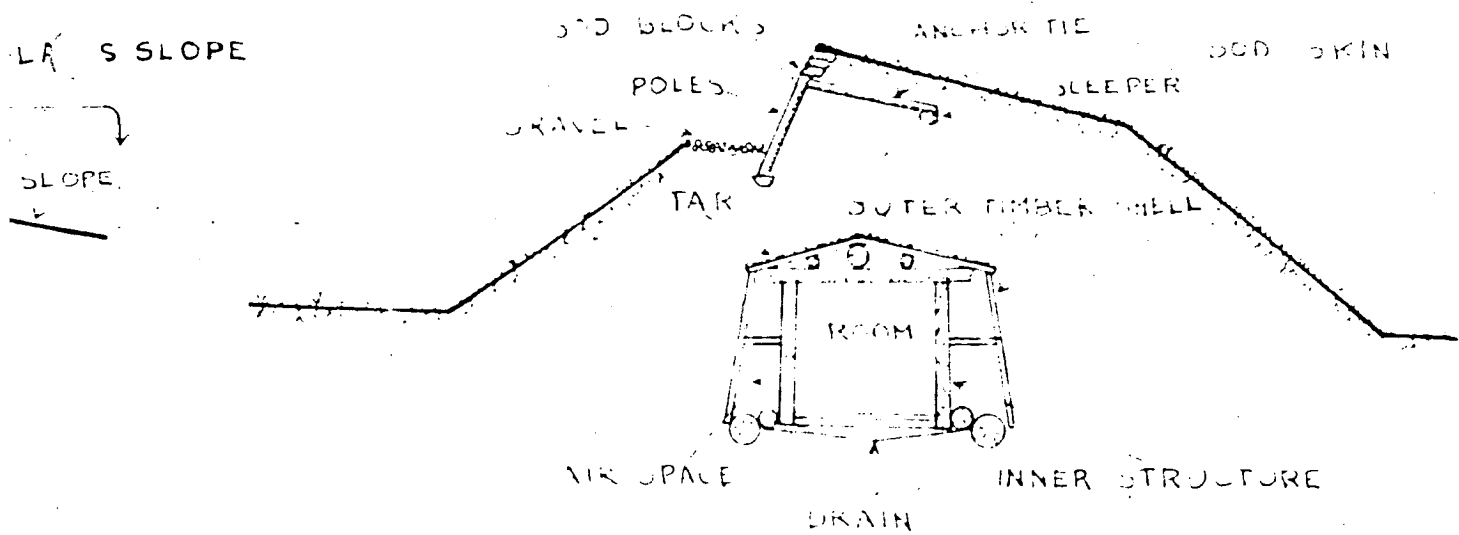


PROFILE OF DITCH

PROFILE AS MODIFIED DURING WAR (FT WARD - 1865)

DRAWING TO ILLUSTRATE
TERMINOLOGY OF
WAR MILITARY ENG

PROFILE OF BURIED ROOM AND CONSTRUCTION OF REVETMENT



STRATE
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NEERING

DRAWING NO. 11

APPENDIX II

Historic Plans

We know of twelve drawings pertaining to Fort Ward in the National Archives. All are in Records Group 77. They are Numbers 110-15, 170-133 through 170-141 $\frac{1}{2}$, and 171-104. A description of them follows.

110-15 "PLAN SHOWING QUARTERMASTER PROPERTY Size unknown
 AT FORT WARD"
Scale unknown

"Defences of Washington, South of Potomac. General plan--Fort Ward

Note: Building here is constructed like those of a similar purpose at forts North of Potomac.

Defences South of Potomac. October 12th, 1865"

This drawing shows only the outline of the new fort along the interior crest. It is concerned with the three barracks (each 90'6" x 18'2"), the five officers quarters (each 11'5" x 15'3") and office (24'6" x 16'6"), and the mess hall (44'5" x 100'6"), with three back wings). These buildings, and a few smaller ones, stand behind (E of) the S part of the fort. They were arranged to form two sides of a street which approached the rear gate. The nearest building was less than 70 ft. from the fort. The property where these buildings stood is not at present part of Fort Ward Park.

170-133 "FORT WARD" 24" x 19"
25 ft to the inch (See Drawing 9)
 (1/300)

"Fort Ward, on Lee's Farm near old Leesburg Road, Fairfax County, Va. Scale One Inch to 25 feet."

Old Fort. Complete Plan, tinted. Eight profiles of Parapet and Ditch, and two of magazines are shown. In these old profiles there is a break between the exterior slope and the steeper scarp, but there is no berm. Profile L-M, nearest our section of the old ditch, gives a bottom width of 13 ft., and a depth of 7 ft. 3 in. The cover over the magazines is clearly inadequate.

There are twenty-eight gun platforms shown, indicating type of gun and carriage. There was already (at whatever date this represents) a 100 lber. Parrot mounted at the SW corner of the fort. Apparently a number of improvements had been made by this time, as compared with the situation shown in drawing 141 $\frac{1}{2}$.

There is some pencil sketching and figuring, including one small projected bastion at the NW corner.

170-134

"FORT WARD"

46 $\frac{1}{2}$ " x 27"

1/8 in. to 1 ft.
(1/96 (1/300))

New Fort, Interior only. Probably one of several drawings made to prepare the final illustration for the book. Numerous spot elevations of Terreplein are indicated, as "99.5" etc. Presumably the digit "2" should come before each number, to give the elevation (ca. 300 ft.) in feet as measured during the Civil War.

Profiles of all rooms are finished drawings, longitudinal as well as sectional. Longitudinal profiles were not used in the final drawing, so this is the only source for them. The interior plan of the fort is shown in outline only.

Most profiles have more dimensioning than in the final drawing that appeared in the book. The longitudinal profiles of the Powder Magazine and Filling Room of the Northwest Bastion clearly show a palisade with loopholes closing the gap between them. This may have been only proposed, as there is no evidence of it in the plan, nor in the final drawing (171-104). There was disturbance in the soil in this area, however, as if a palisade might have been removed there.

The type of gun platform at each embrasure is indicated in pencil, as is the type of gun mounted there. This is the source for our recommendation of which guns to mount where in the Northwest Bastion.

170-135

"FORT WARD"

47" x 27"

1/100

1/300

New Fort, Interior only. Most profiles shown, but not finished. Interior not finished, features sketched in pencil. Probably an abandoned version of the finished drawing.

170-136

no title

34" x 28"

attached sheets

25 ft. to the inch

17 $\frac{1}{2}$ " x 6"

(1/300)

10 $\frac{1}{2}$ " x 5"

New Fort, complete line plan. No profiles. No labelling at all. Several continuous survey lines run across fort, with elevations of all floors, slopes, and crests given--ranging from 290.0 to 313.8 ft. Very faint sketches of profiles as line crosses some earth-covered rooms. Profiles were drawn up from these figures.

This is probably the finished plan which was traced for the drawing that appears in Barnard. The profiles then were probably taken from drawing 170-134.

170-137

"FORT WARD"

22" x 12 $\frac{1}{2}$ "

50 ft. to the inch

(1/600)

Old Fort. Grid of 50 ft. squares shown around fort with elevations measured at each line intersection. Some elevations shown inside the fort, and distances from point to point inside it. Tentative plans for bastions and improvements sketched on this.

170-138

"FORT WARD"

31" x 27"

50 ft. to the inch

(1/600)

Old Fort and surroundings. Same 50 ft. grid as in 137, but showing a wider area. Intervals of 2 $\frac{1}{2}$ ft. are shown in contour lines. An area from 600 ft. in front

of the fort to 400 ft. at each end of it is shown. Rifle trenches running N and S from the fort are shown, and the outlying battery NW of the fort, connected by rifle pit. No details at all are shown inside the fort, but proposed bastions (smaller than those actually built) are sketched, to take advantage of high ground.

170-139 "FORT WARD" 31" x 27"

50 ft. to the inch (See Drawing 2)
(1/600)

Old Fort. Same grid, plan, and contours as in 138, but slightly more finished drawing. Again, no details inside fort, but somewhat different proposals for an improved trace shown, with larger bastions. Some distances given inside the old fort.

170-140 "SECTIONS OF BOMBPROOFS AND MAGAZINES. 24" x 24"
AT FORT WARD--MARCH 1864"

1 ft. to the inch
(1/12)
4 ft. to the inch
(1/48)
10 ft. to the inch
(1/120)

"Transferred from the Office of Chf. Engr. Defenses of Washington, to Engr. Dept., Jan'y 1866."

Unfinished profiles, with revisions. Apparently these show the old fort just before the renovation, as there is very little dirt over the rooms, no breast height, and a flat roof on the timber covering.

170-141 no title 23 $\frac{1}{2}$ " x 16 $\frac{1}{2}$ "

1 ft. = $\frac{1}{4}$ inch
(1/48) (See Drawing 1)

Wooden Ornamental Gate, at rear of fort. Front, rear, and side elevations, top view, and two horizontal sections, with complete details of construction. Excellent drawing.

170-141½

"FORT WARD, VA."

33" x 23"

48 ft. to the inch (See Drawing 8)
(1/576)

"by order of Gustav Waagner, Col. Commg. 2nd N.Y. Vol. Art'y,
Regt."

Surveyed and Drawn by C. Kollinsky, 2nd Lieut, N.Y. 2nd Art'y.
Regt."

Old Fort. Finished, tinted drawing of entire, with four sections, and lengths of sides for estimating perimeter capacity. Only twenty three platforms are shown (cf. 170-333, with twenty eight), and there is no 100 lber. Parrot. All guns and platforms are identified, and the arcs of fire (from 29° to 48°) are shown in different colors. The perimeter was only 580 linear yards at this unknown time.

171-104

"FORT WARD"

30" x 22"

(1/150)

(1/50)

(See Drawing 10)

Final ink drawing of New Fort, which was photographically reproduced in Barnard's report.

Stamp in corner reads: "Recd, June 17, 1870,-----s,
Corps of Engrs."

Presumably this was when the drawing came back from the New York Printers.

The drawing is somewhat more clear than the reproduction in Barnard, and much larger and more legible.

There is also a map in the United States Geological Survey files, showing the circuit of defenses around Washington, and their condition a quarter of a century after the Civil War.

ACC. No. 1299
1 of 2

Scale unknown

"Map of the District of Columbia and Vicinity--Showing the Principal Points of Interest Including the Present Condition of the Defenses of Washington."

Compiled from the Latest Maps and from Original Surveys and Reconnaissances by the Engineering Platoon of the Engineer Corps D.C.N.G. F.L. Averill, C.E., First Lieut. Commr. Platoon. 1892"

APPENDIX III

Outlying Structures

Here I should mention that a good part of the defensive system contiguous to Fort Ward is also still preserved. Although this was not properly part of this study, it is significant. Fort Ward was connected to Fort Worth 1 mile to the S and Forts Garesché and Reynolds $\frac{1}{2}$ mile to the NE by continuous "rifle trench" or "covered way" which connected all the forts around Washington. This consisted of a sunken road wide enough for an artillery train, protected by a wall of ramped earth on the side facing the enemy. A ditch was dug outside this wall, and that dirt also added to it, for additional height. The road and ditch might each be 3 ft. below original surface, and the wall 4 ft. 6 in. above it, giving over 7 ft. of elevation to be surmounted by attacking enemy. This would be sufficient to prevent cavalry from breaking through between forts, and would greatly slow infantry, and force them to mass at a place where they would be exposed to highly effective cross fire.

Batteries and gun emplacements were constructed along these lines at various intervals to control the surface of the ground. These were empty, but would be armed with field cannon and manned along any stretch of the system where a serious threat developed. There was one forward battery constructed about 500 ft. NW of the NW Bastion of Fort Ward, with connecting trench. This outlying battery commanded a ravine which was hidden from the main fort.

Not only is Fort Ward remarkably well preserved, but so are the surrounding parts of the system. The outlying battery and connecting trench are both visible, although eroded. There is at least 2,000 ft. of rifle trench still running S, across the Episcopal High School Grounds on the other side of Braddock Road from Fort Ward Park, and several gun emplacements. To the NE the covered way is well preserved. It runs about 1,000 ft. through the woods to the out for the Shirley Highway. A battery is still extant on the far side of the Shirley Highway.

The covered way to NE and S are not part of Fort Ward Park, but they are in areas where they may be preserved. Every effort should be made to protect these sections of trench. The outlying battery and its connecting trench are entirely within the boundaries of the park, and should be preserved and developed. If additional area is acquired behind the fort, the general location of the barracks and officers' quarters there should be marked, as on Historic Map No 110-15.

The rifle trench to the N should be either acquired, or an agreement reached with the owners. The portion to the S across the Episcopal High School grounds can be preserved if the authorities there are made to realize its significance. Thus it will be possible for the public to see the surrounding defensive system which was so important to Fort Ward.

APPENDIX IV
Table of Artifacts

#	Item	Trench	Square	Depth	Date	Dug By	Description
1	Bottle Glass	Surface	-	-	-	EL	Green. Bottom of Bottle ca. 3"d.- Glass 3/16"-5/16" thick
2	Oyster Shell Frag.	G-H	14	30"	-	JL	2" x 2 1/2" mixed in red fill
3	Gabion Wire	G-H	14	12"	-	JL	Twisted, double- strand. Each strand 1/8"d. From S side of embrasure
4	Buried Surface Soil	I-K	3	0-30"	6-16	DM	Leafmold 3/8" thick scrap 3" long. Soil adhering on both sides. Fibrous ma- terial still dis- tinct.
5	Brick 2 frag.	I-K	3	0-30"	6-16	DM	1 corner, 1 edge, of 2 different colors & textures- hence 2 bricks. Well made, with sufficient lime.
6	Cement 2 frag.	I-K	5	0-	6-16	DR	Frag. 1" across. Similar light gray- appears fairly modern.
7	Roof Tar Tar frag.	I-K	7	0-	6-14	DG	1/2" thick-frag. 3/4" across. Coal tar?
8	Roof Tar frag.	I-K	8&9	0-36"	6-16	DG	Tar up to 1" thick. 1"d. gravel mixed with it.

9 Brick Frag.	I-K	8&9	0-35"	6-16	DG	4 1/8" x 2 1/2" x ? Well made. Could be modern.
10 Glass Frag.	I-K	8&9	0-36"	6-16	DG	Light green, 3/32" thick. Bubbles in fabric. Appears pre-1900, or older. Probably hand blown
11 Barbed Wire 2 pieces	I-K	8&9	0-36"	6-16	DG	Double strand, each 3/32" thick. Must date from 1880 or later-this seems to be a recent type (1920 on). Probably a surface find.
12 Decayed Wood 7 frags.	I-K	10	0-	6-14	JL	Appears to be pieces of poles from 1 1/2"-2"d.-sawed to a point. Soft, red wood, with large grain.
13 Gabion Wire	10'N of G-H	13	15"	7-17	JL& DM	Single strand, 1/8" d. Piece 9" long, from N cheek of Embrasure
14 Glass 2 frag.	10'N of G-H	13	15"	7-17	JL& DM	1 lt. green, 1 brown-green, frags. 1/4" or smaller across.
15 Glass Frag.	10'N of G-H	13	15"	7-17	EL	Lt. brown green, 1/2" x 5/8"
16 Tin Can Top	10'N of G-H	13	15"	7-17	EL	1/16" thick. Tin of 3"d. Tip turned 5/8"
17 Roof Tar 7 frags.	E-F	4&5	36"	6-17	JL	2" thick, layers of dirt-tar-dirt-tar-dirt. Tar layers about 1/2" thick. 1 1/2"d. gravel mixed in, & some-wood scraps.

18 Iron Wire Hanger	E-F	4&5	36"	6-17	JL	6" long. Hook 2" long on one end. 5/16"d.
19 Wood Stick	E-F	4	-	6-3	EL	5 1/4" long, 3/4" d., has knots, and is of no significance.
20 Nails 6	E-F	4	-	6-3	EL	5 30d. Cut common nails 1 10d. Cut common nail, also 1 extra head (large) Corroded, some wood adhering. No evidence of fire
21 Roof Tar 4 frags.	E-F	5	0-48"	6-23	JL	Tar only, 1/4"-1/8" thick. Coated with dirt.
22 Wood 3 frags.	E-F	5	7'-8'	6-28	DG	Decayed small posts Wood is soft, red and ugly.
23 Nail	E-F	5	7'-8'	6-28	DG	8d. Cut, common No evidence of fire.
24 Carbon-ized wood 2 frags.	E-F	5	7'-8'	6-28	DG	Very fragmentary-may be decay and not fire which has blackened them.
25 Nail	E-F	6	36"-	6-29	JE	30d. Cut, common. Some wood adhering.
26 Roof Tar 3 frags.	E-F	7	2'	6-27	DG	1/4" to 3/4". clearly coal tar
27 Nails 3	E-F	8	-	6-27	DM	2 10d. Cut, common 1 20d. (?)
28 Roof Tar 10 frags.	E-F	8	-	6-27	DM	Up to 6" long, 4" wide, 1" thick. Had rested on curved logs. Some of bark (pine?) still adhering. Diameter of logs 6" or more.

9 B f	E-F	8	-	6-24	DG	Up to 2" thick. 3/4" tar, 1/2" dirt, 3/4" tar, with small gravel
3 frags.						
0 Nails	E-F	12-13	32"-65"	6-28	LF	3 10d. Cut, common
3, & 1 frag.						
1 Gabion	G-H	14	3'	7-17	EL	Not twined. 1/8" d. From 4th Gabion in, on S side of embrasure
Wire						
2 pieces						

TRENCH (FILLING ROOM)

LINE OF AUGER BORINGS

TRENCH (POWDER MAGAZINE)

TRENCH (PARAPET & GLACIS SLOPE)

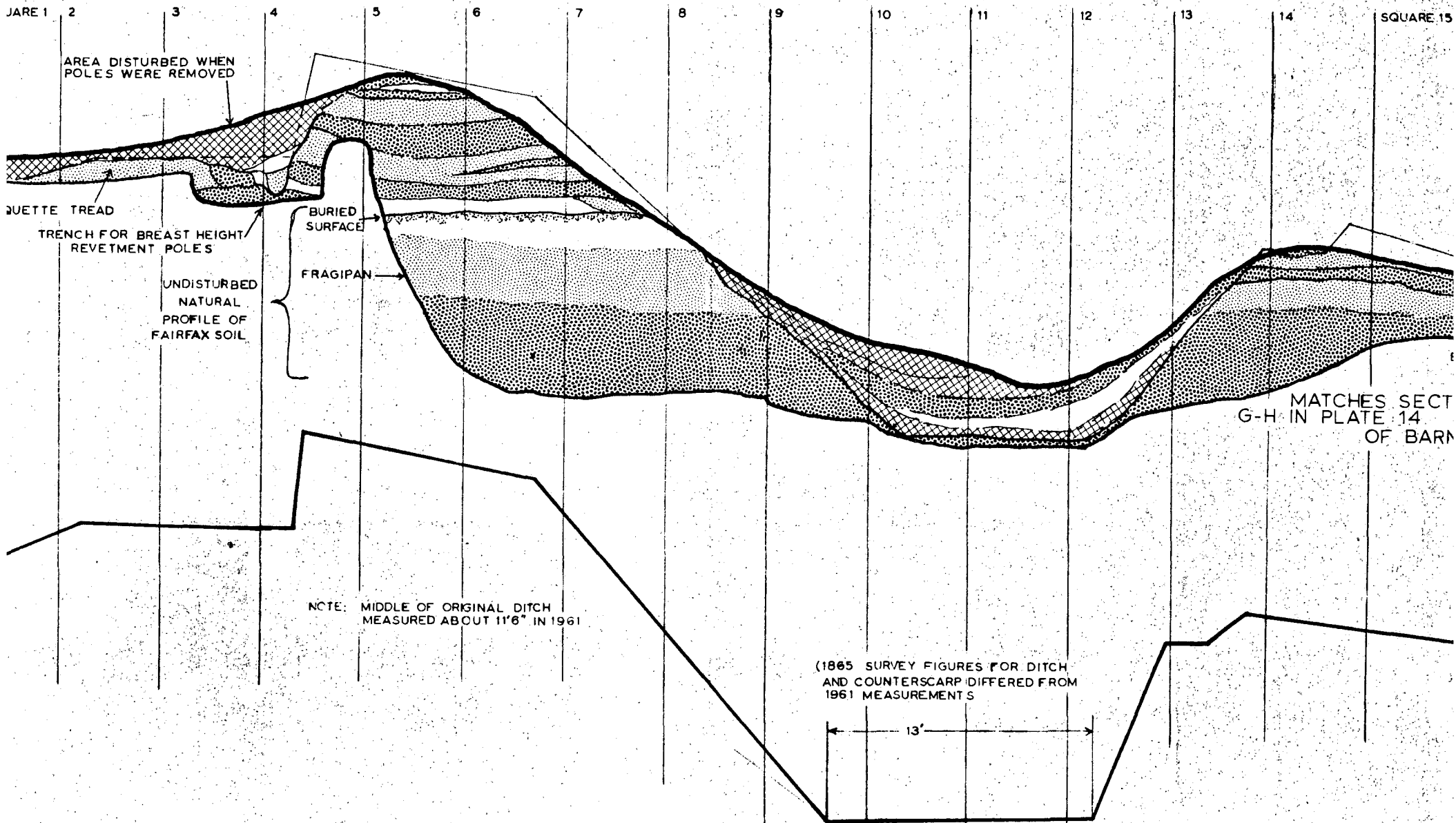







SCALE: 1" = 50'-0"


Excavation Plan - Fort Ward

Historic Site Research, Edward McM. Larrabee, Archaeologist, Summer - 1961

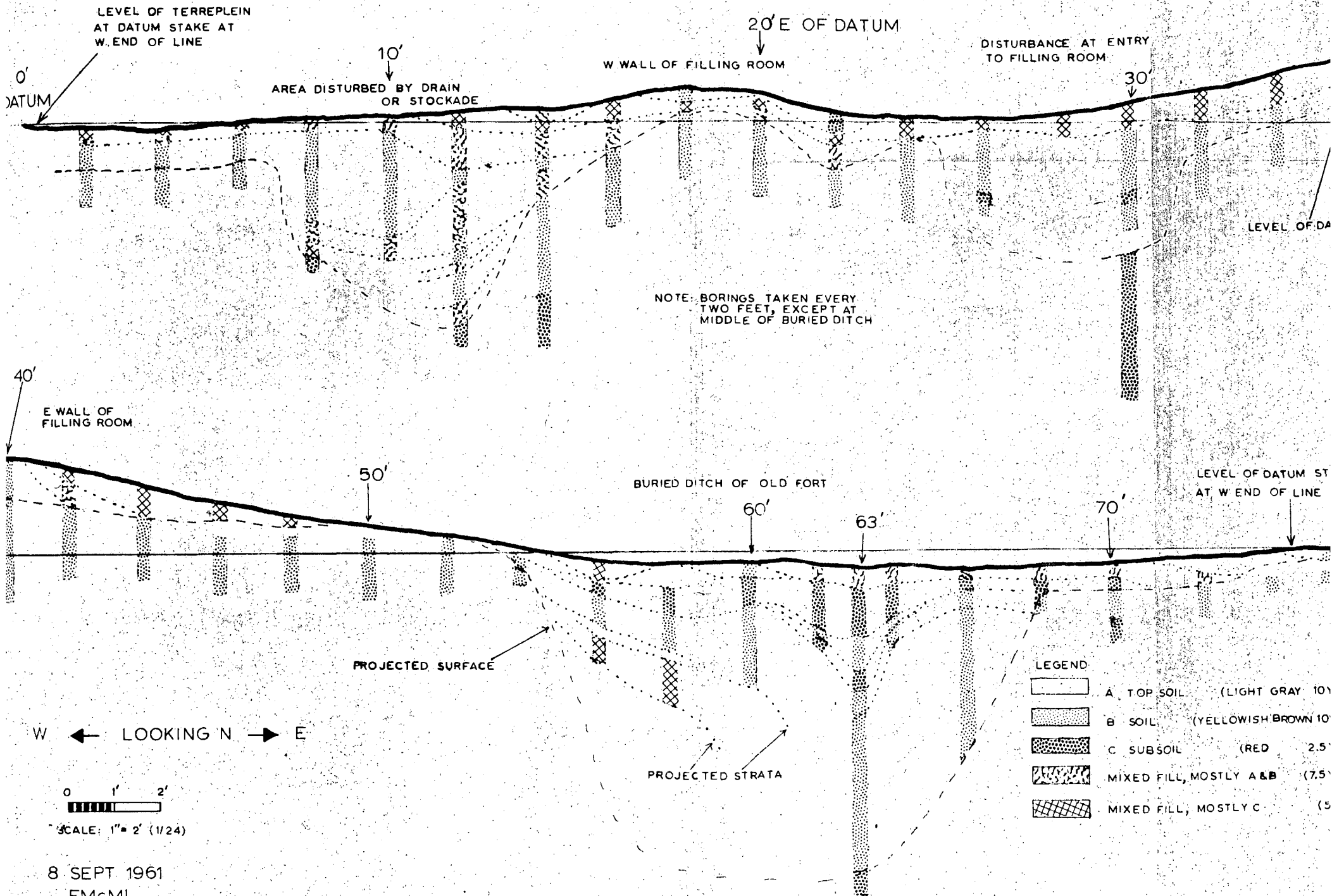
e ← PARAPET & DITCH LOOKING SOUTH → w



- LEGEND:
-  ORIGINAL SURFACE, UNDISTURBED SOIL
 -  A TOP SOIL (LIGHT GRAY) - 10 YR 7/2
 -  B SOIL (YELL OWISH BROWN) - 10 YR 5/7
 -  C SUB SOIL (RED) - 2.5 YR 4/8
 -  MIXED FILL (YELLOWISH RED) - 5 YR 4/6

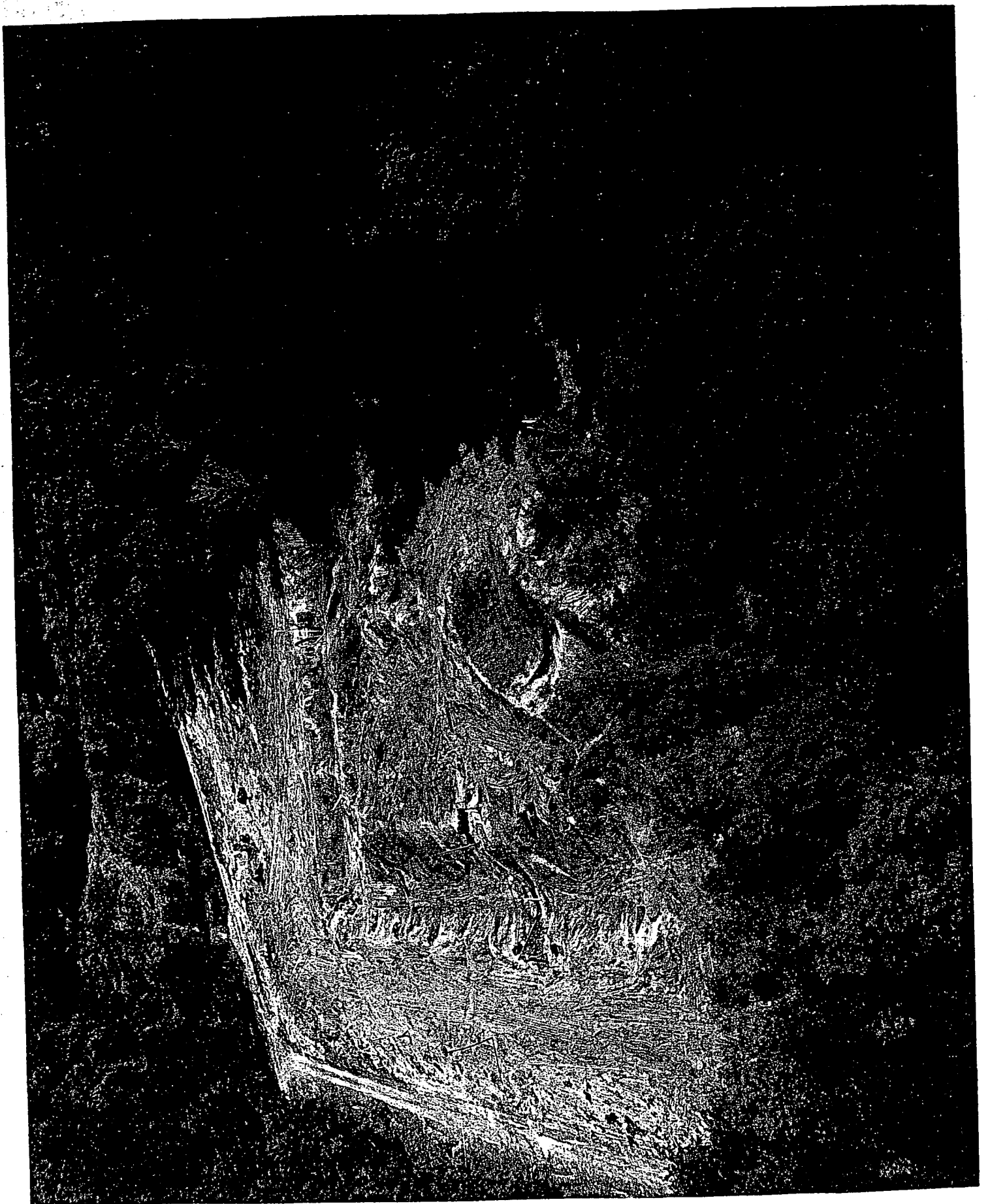
8 SEPT 1961 EMcML
SCALE: 1" = 5' (1/60)


PARAPET & DITCH
as excavated, 1961, & as
surveyed, 1865 drawing no. 5



drawing n

Northwest Bastion restoration, looking
northwest. c. 1962



Northwest Bastion, Fort Ward, c. 1964

