

Fort Lee 1856

**Fort Lee and Fort Pickering
Conditions Assessment, Cultural Resources Survey, and
Maintenance and Restoration Plan**

City of Salem

Massachusetts Historic Commission

2003

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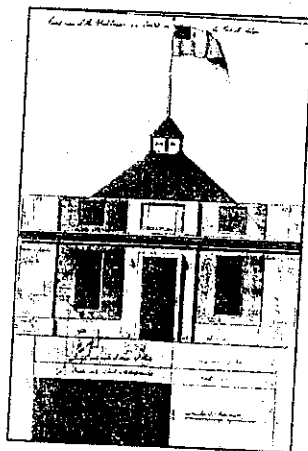


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I. EXECUTIVE SUMMARY

This study was commissioned by the City of Salem and the Massachusetts Historical Commission to develop a Maintenance and Restoration Plan for Fort Lee and Fort Pickering and their historic landscape settings. Fort Lee and Fort Pickering are important examples of Salem's early coastal military fortifications and are both listed on the National Register of Historic Places and in the Inventory of Historic and Archaeological Assets of the Commonwealth.

This Maintenance and Restoration Plan is a guide for management, planning, and design decisions. The Plan was developed through a team of architects, archaeologist, planners and designers with the guidance of the City of Salem Department of Planning and Community Development, the Massachusetts Historic Commission, the Salem Historic Commission, the Winter Island staff and local residents and historians.

The Plan aims to inform and assist in the mobilization of broader public support to facilitate its implementation in the upcoming years. With constructive public participation, efforts to revitalize the forts will succeed. A concerted effort to raise public understanding of the forts and their value is central to the implementation strategy.

The forts and their landscape settings are historic remnants of the past. They are "landscapes of history" through which one can come to understand the evolution, changes and uses of this land and how historic events have shaped its use. Through study of the fortifications and the surrounding landscape one is reminded of the pre-history and

history of the land and of the American evolution from settlement to nationhood.

STUDY PRESENTATION

The study is assembled into two separate documents. This document presents project objectives, a summary of the historic overview, existing conditions, recommendations for restoration, maintenance and management, designs for public access, interpretation, implementation recommendations and budget estimates for restoration. The companion document, prepared by Pamela Crane and Peter Morrison of Crane and Morrison Archaeology, Leslie Shaw Native American specialist and Anne Wilder archaeologist assistant, presents the full historical overview, the detailed results of the archaeological investigations, maps depicting known and probable historic and prehistoric archaeological resources, archaeological sensitivity maps and recommendations for additional research in high sensitivity areas that have not yet been tested.

This document first presents the study background, listing the objectives and discussing the research and methodology for the cultural and archaeological resources survey and the maintenance and restoration plan. Secondly, a summary of the historic overview of Salem Neck and Winter Island is presented, highlighting significant historic facts revealed through the Crane and Morrison Archaeology research. The Restoration Master Plans are then presented. These plans are developed by using the survey of the cultural and archaeological resources, maps of historically sensitive areas and the design teams' site analysis. The Master Plans are presented in study section four and are based on six guiding principles recommended by the study team and summarized below:

- The forts be restored, maintained and interpreted together and as part of the Salem Neck and Winter Island landscape for enhanced public access.

IMPORTANCE OF PRESERVING THE FORTS

The forts are historically and culturally important. This study confirms the historical and cultural sensitivity of both sites. They should be preserved for the following reasons:

- They are significant as examples of developments in military seacoast fortification engineering from before the Revolutionary War to the Second World War.
- They have associative links with major events in our Nations history.
- They are located in areas of land that are visited by thousands of tourists and Salem residents each year.
- Fort Lee is one of a few remaining earth fortifications in the North East.
- The sites were used as a military fortification, for over two centuries.
- The visible remains of both forts and related archaeological resources are substantial and have great potential for historic and architectural interpretation.
- The settings have natural beauty and restoration of the forts would enhance these settings.

RECOMMENDATIONS

A number of restoration recommendations are presented in the study and include treatments specific to each fort site. They address the sites landscape and masonry remains and present immediate and long term restoration work. Additionally, options for visitor access and interpretation are presented, suggesting locations for parking, walks, wheelchair access, viewing areas, seating and interpretive signage. Methods of comfortably combining the other site uses found on Winter Island and Salem Neck with these historic sites is addressed. Suggestions for Fort Lee include the

removal of Memorial Drive that now bisects the Fort site from O'Keefe Field and the extension of walks and period lighting from the Salem Willows Park to a new parking lot off Fort Avenue and a possible visitor center. At Fort Pickering the reorientation of the access drive to create an entry plaza and parking are suggested to create a transition area before entering the immediate fort site. Accurate restoration of part of the Fort Pickering rifle gallery and Fort Lee's ramparts are recommended for effective interpretation. To accomplish these recommendations the study team suggests the following management implementation strategy.

- *Establish a Friend's of Salem Forts Society.* This society would be composed of citizens in the community with an interest in Salem's historic sites to assist in the forts preservation planning and to raise funds for the restoration efforts.
- *Create a Preservation Zone.* It is recommended that both sites be placed within a *preservation zone*, with defined boundaries so these historic resources can be managed and used for public enjoyment, understanding, and appreciation of their historic values. This would also ensure that their site environments and remaining structures are protected from influences and uses that could cause deterioration.
- *Implement this study's short-term recommendations and maintenance tasks.* This study recommends vegetation clearing and temporary repairs in the short-term to allow full understanding of all conditions.
- *Increase maintenance budget.* A proportional increase in maintenance budgets must be allocated and is as important as capital spending in creating a healthy and beautiful historic and recreational setting.
- *Appoint a Forts manager.* Appoint a Forts manager or superintendent to head a dedicated maintenance crew, to be accessible and accountable to Fort users, and to organize the efforts of staff, and

volunteers.

- *Complete a final maintenance work plan and schedule.* Following the restoration of each fort complete a final maintenance work plan and schedule that addresses all maintenance needs.

II. PROJECT OBJECTIVES AND METHODOLOGY

BACKGROUND OF STUDY

In 1998 the City of Salem, with the assistance of the Massachusetts Historic Commission, took the initial steps toward developing a restoration plan for Fort Lee and Fort Pickering. The "Salem Historic Preservation Maintenance Plan", completed in 1998, and funded through a grant from the

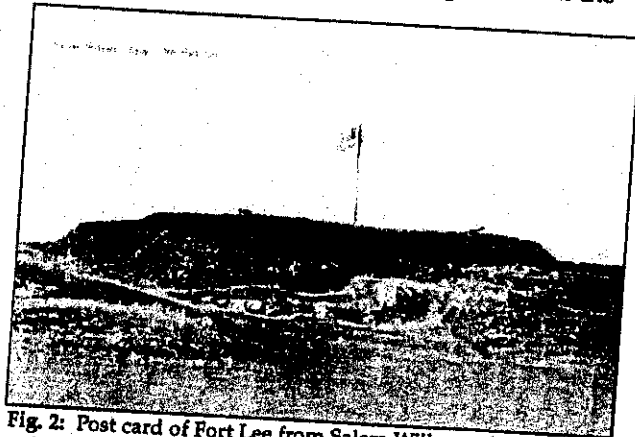


Fig. 2: Post card of Fort Lee from Salem Willows, date unknown. The Hugh C. Leighton Co., Portland, ME.

Massachusetts Historic Commission Survey and Planning Grant Program, provided a preliminary assessment of Fort Pickering and the Lighthouse. As stated in the request for proposal for the current study:

"This grant, intended for all city-owned historic properties, provided only a preliminary set of recommendations and guidelines for Fort Pickering. Although the report was significant in determining future objectives for the project, it was not able to provide the depth of information needed to document and preserve the existing archaeological and cultural resources for the fort. This project is intended to build on our existing information and produce maintenance and construction plans that will lead to the successful restoration and rehabilitation of both Fort Lee and Fort Pickering. This study is essential due to extensive erosion and landscape overgrowth that are threatening the stability of the existing structures and resources at both forts. With this project, the City can plan for the nec-

essary improvements for stabilization and preservation, landscape conservation, landscape rehabilitation, pedestrian circulation, and the provision of public information."

PROJECT OBJECTIVES

This study is intended to identify and document prehistoric and historic sites; if possible to determine the boundaries and integrity of those sites, to determine their significance in terms of National Register criteria, to establish methods of historic preservation, community interest, budgetary issues, long-term maintenance, conservation and management.

Archaeological Report

Research, Historic Documentation and Archaeological Objectives

The companion document prepared by Crane and Morrison Archaeology addresses the following objectives:

1. To develop an historical overview.
2. To conduct archaeological investigations (including a professional archaeological intensive survey report)
3. To identify known and potential prehistoric and historic period archaeological resources within the boundaries of each fort.
4. To place known and potential resources and features within the context of the history and evolution of each site to the present, with particular emphasis on the context of the history and evolution of each fort.
5. To determine whether there are significant contributing features of each National Register listed fort and/or the Winter Island Historic and Archaeological District when possible.

6. To develop a series of maps:

a. Map depictions of known and probable historic and prehistoric archaeological resources associated with each fort.

b. Prehistoric and historic archaeological sensitivity map for each fort.

7. To provide recommendations for additional research in high sensitivity areas that have not yet been tested.

Methodology

Literature Review

The Crane and Morrison Archaeology research began with a literature review seeking to find and confirm written factual descriptions and accounts of Salem Neck, Winter Island and the Forts. Local histories, articles, pamphlets and archaeological reports were identified and reviewed. In addition, interviews were conducted with local historians, members of the Salem Planning Department, the National Park Service, Winter Island staff and the Historic Salem Incorporated. The geology and environmental setting of the area was researched to understand the opportunities and limitations these areas had for use and development. The area's prehistory, history and the history of the Forts was examined, gathering all known information about prehistoric sites, tracing the development of this area from eight thousand years ago, to 1626 when the area was first settled by Europeans, and into the twenty first century.

These initial studies sought to find the answers to questions such as; what is known about the prehistory of the landforms where the historic forts are located, what was the nature of the historic development of the town, when were the forts built and how do these structures fit in the evolution of fort systems in the United States, what was the role of the community in the construction and outfitting of the forts, in what ways did the town benefit from their construction, how did they con-

tribute to the growth of the town of Salem, are there any non-military historic sites on the properties, such as farmsteads, wharves, or shoreline wrecks, where is the greatest potential for prehistoric and historic archaeological remains, how do they contribute to the history of the forts and what specific activities are represented at these sites.

Field Investigation

Following the literature investigation, field investigations were conducted by the archeological team, the landscape and architectural preservation consultants documented existing conditions and established recommendations for archaeological testing. For two months archaeological tests were conducted in the field at both fort sites uncovering historic artifacts and establishing archaeological sensitivity maps to guide management and restoration plans. This work focused on identifying what structures and/or prehistoric and historical features are visible and assessing their condition, identifying areas of deterioration and documenting, through photographs and earlier research, their locations and uses.

Maintenance and Restoration Plan

Management, Maintenance and Restoration Objectives

This study document addresses the following objectives:

1. To survey the existing conditions of all historic structures and landscape features.
2. To provide a guidance document that outlines appropriate steps to be followed by contractors or grantees for the City of Salem in the event that unexpected historic or archaeological discoveries are made.
3. To provide opportunities for public comment and participation in the development of the restoration plans.

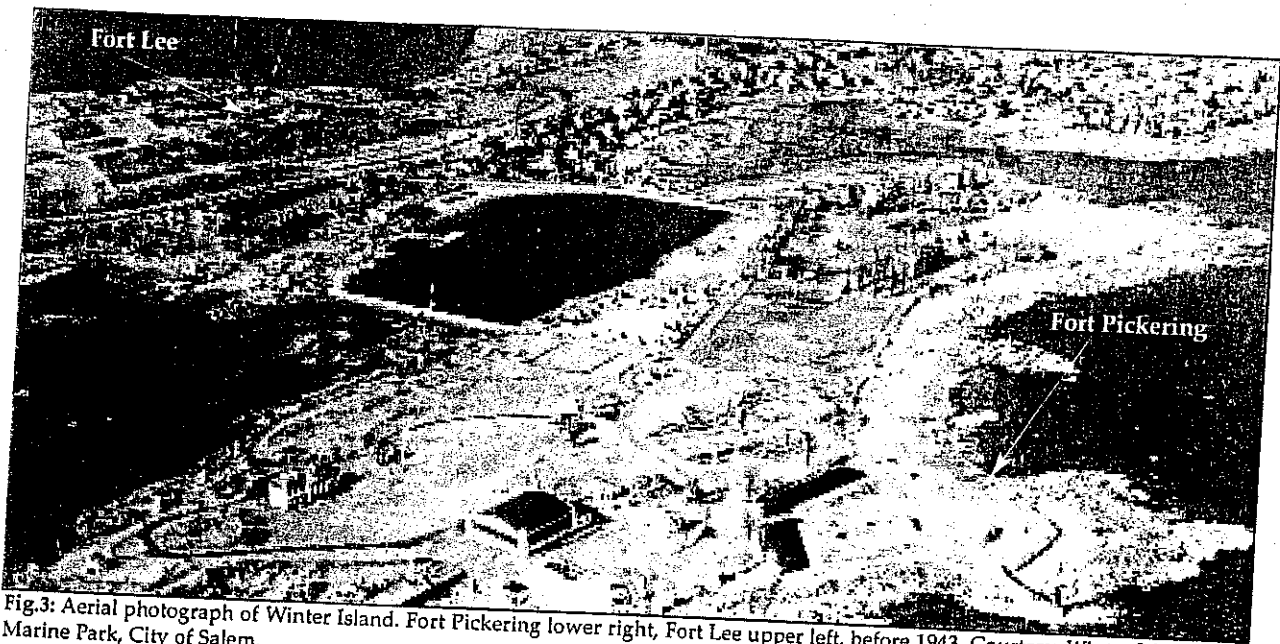


Fig.3: Aerial photograph of Winter Island. Fort Pickering lower right, Fort Lee upper left, before 1943. Courtesy, Winter Island Marine Park, City of Salem.

4. To develop comprehensive restoration plans that can be completed in phases
5. To produce schematic plans and specifications for rehabilitation and restoration.

6. To develop management recommendations for the protection of identified resources and sensitive areas.

Implementation Objectives

This study provides information for maintenance and implementation and attempts to address the following management goals:

1. To develop an implementation program that can be accomplished with current city personnel.
2. To develop recommendations to assist the city personnel in the necessary and appropriate maintenance of these sites.

Methodology

Maintenance and Restoration Plans

To successfully create a maintenance and restoration plan, it was believed that Restoration Master Plans should first be developed and that then these plans could be used as guides for the overall forts restoration. In developing these master plans, the adjacent land uses were analyzed. Questions such as; what are the exact boundaries of the forts, how should the other adjacent land uses relate to these sites, what locations are appropriate for visitor parking, pedestrian approaches and access through and around the sites, given the remaining features what is the potential for interpretation, how should the remaining features be protected, what existing structures or restored structures could allow better interpretation, would a visitor center be necessary and integral the plans, and how do the short, mid and long term maintenance needs affect creation of these plans?

Integration of Archaeological Research

The archaeological team provided maps and pho-

tographs illustrating the various stages of the fort development, the location of remaining historic features and the remaining landscape and architectural structures. Through their research, possible sites used by the Native Americans were discovered at the forts. Also confirmed were the locations of three other defensive sites on Salem Neck, that one of the defensive functions of Fort Lee was to protect the rear of the coastal fortifications thus illustrating the defensive relationship between all of these fortifications. The research also revealed the evolution of both forts, their initial designs, their siting and their construction. This documentation formed the framework for conceptualizing and developing the Restoration Master Plans.

Assessment of Remaining Features and Recommendations

The remaining visible and significant fort features that require stabilization, repair or restoration were evaluated in the context of the Restoration Master Plan. Their existing conditions were documented through field investigations and photographs. Recommended treatment was identified addressing preservation concerns as well as interpretation. These recommendations were organized into short, mid and long-term restoration. To establish levels of funding, estimated costs for each treatment were developed.

III. SUMMARY HISTORIC OVERVIEW

PREHISTORIC AND HISTORIC CONTEXT

Archaeological and historical evidence indicate that Native Americans camped and may have fished and gathered shellfish on Salem Neck and Winter Island from approximately 8,000 years B.P. (Before Present) through to the arrival of European settlers in 1626. The high density of prehistoric sites on the Neck and Island had a lot to do with the ecological diversity found along the north coast of Massachusetts. Tidal flats, protected coves



Fig. 4: Plan of Salem U.S. Geological Survey 1893, reprinted 1940

and open ocean were all rich sources of fish and shellfish. Evidence from known sites indicates that by 4500 B.P. this part of the coast was a desirable place for occupation, even if only seasonally.

NATURAL LANDSCAPE, EARLY SETTLEMENTS AND USES

Salem Neck and Winter Island form a peninsula of approximately three hundred acres with close to 4.6 miles of coastline that features natural beaches, elevated promontories, open fields and woodlands. In the early seventeenth century European settlers built fish stages on the island to the east of Salem Neck and constructed a causeway connect-

ing this land to the Neck. Winter Island, as it became known, allowed sea access when the waters further up the harbor froze over and it was the center of Salem's fishing trade until the mid eighteenth century.

FORTIFICATIONS

Salem Neck and Winter Island provided land for boat building, farming, fisherman's cottages, wharves and fish drying. In addition, because of its undulating shoreline and proximity to the mouths of both the North and South Rivers, it offered sites for the defense of these waterways, protecting the inner harbors and the settlements beyond. Over time, five fortified sites were created on the peninsula. Three were on points of land at the north of Salem Neck known today as the Salem Willows Park and a residential neighborhood called Juniper Point.

FORT LEE

In the center of Salem Neck, on a high outcrop some fifty-five feet above sea level, a fourth fort was sited. With good visibility to the sea and coastline it was an excellent defensive site. This

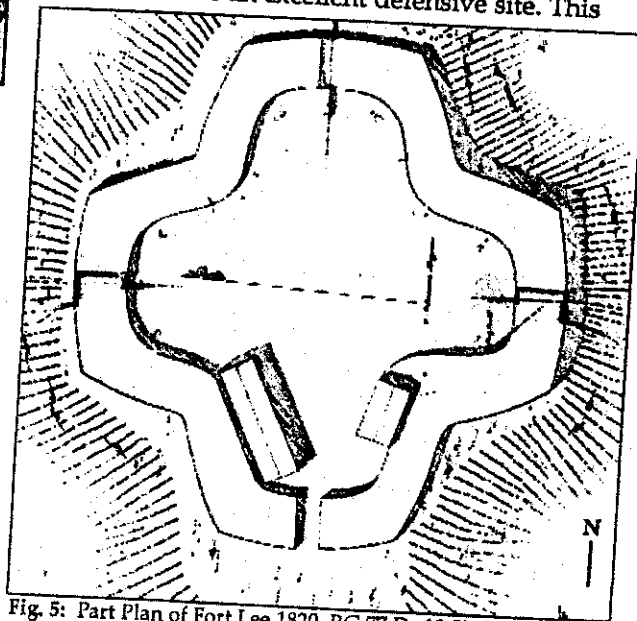


Fig. 5: Part Plan of Fort Lee 1820. RG 77 Dr 18 Sh 12. National Archives and Records Administration.

fort would command the high ground and secured the rear of the coastal fortifications. The heights might have been fortified as early as 1690, but no confirming evidence exists until 1776.

FORT PICKERING

Fort Pickering, the fifth fortification, was sited on Winter Island on the southeast, at a natural headland. The island was isolated from the mainland but was situated into Salem Harbor and was the best location to defend Salem's inner harbor where Salem's trading vessels, wharves, storage houses and residential settlements were located. It is believed that this site was first fortified in 1643 and the Fort was known as Fort Ann. In 1794 it was ceded to the United States Government and rebuilt under the design of Lt. Colonel Stephen Rochefontaine of the United State Corps of

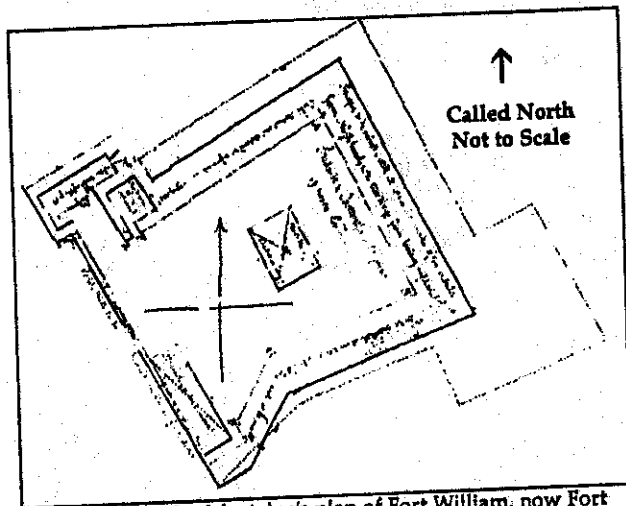


Fig. 6: Stephen Rochfontaine's plan of Fort William, now Fort Pickering, dated 1794. Courtesy Peabody Essex Museum, Salem, MA.

Artillerists and Engineers. In 1863, in the midst of the American Civil War, the United State Department of War redesigned and enlarged the Fort creating, among other features, a wood framed rifle gallery on the land side and a wet ditch. The final construction before the turn of the century was the lighthouse built to the south ca. 1890.

TWENTIETH CENTURY USES

These sites were used as defensive military sites through the Civil War but within a few years, because of advances in weaponry and re-evaluation of coastal defensive strategies, they became obsolete and were left to decay. In about thirty

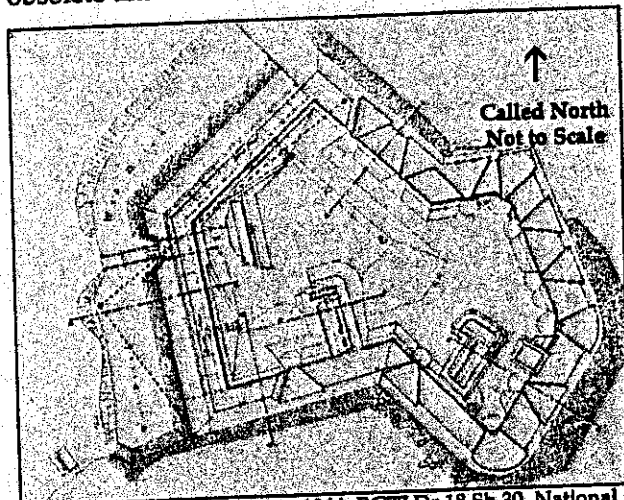


Fig. 7: Plan of Fort Pickering 1864. RG77 Dr 18 Sh 30. National Archives and Records Administration.

years Fort Pickering's rifle gallery had collapsed. The U.S. Coast Guard established an Air Station on Winter Island in 1934 and used the fort area for munitions and vehicle storage until the station was de-commissioned in 1969. The fort was then used as a recreational historic site for leisure enjoyment. Fort Lee melded into the park like setting of Salem Willows Park and was used as a wonderful viewing and picnicking area.

RECENT HISTORY

In 1976, The Salem Bicentennial Commission completed a restoration project on the forts. This included installing interpretive plaques and clearing away overgrown vegetation. The restoration also called for the removal of fill that separates the north and west arms of the Fort Pickering wet ditch to restore it to the original design. This restoration, however, was never completed.

IV. RESTORATION MASTER PLANS

INTRODUCTION

Major study goals were to "develop comprehensive restoration plans that can be completed in phases" and "produce schematic plans and specifications for rehabilitation and restoration." The study team recommends that the restoration and maintenance of the forts be guided by a master plan that address site design, vehicular and pedestrian access and increased visitor use, as well as rehabilitation and maintenance. As part of that plan, design considerations such as parking locations, walks, signage and interpretation must also be considered. Within a comprehensive plan, treatment of the individual fort features can then be addressed. This section presents a proposed Restoration Master Plan, the planning principles, plans, restoration goals, standards for historic treatment and the archaeological site sensitivity of the sites.

PLANNING PRINCIPLES

The Restoration Plans are based on the following planning principals that were developed from the teams site analysis and the Crane Morrison research:

1. That the interpretation of both forts be considered together and as part of the Salem Neck and Winter Island landscape to appropriately integrate the various land uses of this area of Salem.
2. That complete and thorough interpretation of the fortifications will require further archaeological investigation.
3. That restoration of parts of Fort Pickering and Fort Lee be considered, to achieve convincing interpretation.
4. That a visitor information center be considered at either fort for the display of artifacts, visual presentations of the Salem Neck and Winter Island landscape history, settlement history and fort's history and as an orientation site for visitors.

5. That the remaining landscape settings of each fort, if visible and reshaped, would enhance the fort's interpretation.

6. That a complete interpretation of the Fort Pickering historic fortifications and the Winter Island site history would include the remaining features and buildings of the World War II era.

The proposed Restoration Plans are shown in Figures 11 and 13 at the end of this section. These are presented to illustrate an approach to restoration, interpretation and site access and they represent a response to the planning principles and the restoration goals presented below. These plans are used to guide the detailed treatment recommendation in sections five and six.

RESTORATION GOALS

Each fort contains a unique setting and different design challenges. For example, Fort Lee is isolated and surrounded by roads. It is barely noticeable from those visiting Salem Neck. Fort Pickering is really part of the Winter Island recreation area and has both active and passive recreational uses. Eight restoration goals common to both forts were established by the study team.

1. Develop a comprehensive program for the stabilization and maintenance of the forts.
2. Develop a plan to make the fort features more visible.
3. Create a plan that facilitates a visitors understanding of the stages of fort construction and design.
4. Develop ways to encourage visitors to experience the forts.
5. Enhance the passive recreational features of the fort.
6. Better integrate the historic fort site uses with there surrounding site uses.

7. Encourage civic participation in the management and protection of Fort Lee.

8. Create unobtrusive vehicular and pedestrian access to and within the fort sites.

THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION

The underlying basis for treatment of these properties is the The Secretary of the Interior's Standards for Rehabilitation. There are ten basic principles created to help preserve the distinctive character of a historic building and its site, while allowing for reasonable change to meet new needs.

The Standards (36 CFR Part 67) apply to historic buildings of all periods, styles, types, materials, and sizes. They apply to both the exterior and the interior of historic buildings. The Standards also encompass related landscape features and the building's site and environment as well as attached, adjacent, or related new construction.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.

2. The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.

3. Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.

4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.

5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.

6. Deteriorated historic features shall be repaired rather than

replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.

7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.

8. Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.

9. New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.

10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

TREATMENT LEVELS

These standards set forth appropriate treatment for historic buildings and structures. As a general guideline for treatment, the standards limit treatment in order to retain original historic fabric, character-defining features, and integrity. Architectural treatment, whether interim stabilization, preservation, or full repair and restoration, is dependent on what treatment is appropriate for a particular period in order to express original construction and use. Other factors affecting treatment include funding and interpretation. The general treatment levels available and that allow flexibility in planning, funding, and interpretation and that have been used in this study are as follows:

Stabilization: Control deterioration in order to retain historic configurations and materials. Stabilization may involve using temporary, intrusive, non-historic means that are reversible.

Preservation: Control and arrest deterioration in order to retain historic configurations and materials using appropriate means. Preservation seeks to maintain existing historic materials with only limited replacement of missing or deteriorated materials.

Restoration: Control and arrest deterioration while replacing missing or deteriorated materials using historically appropriate materials and means. Although restoration can be specific to a period, it may also include modifications that occurred in later historical periods. Restoration seeks to replace missing elements and to renew or replace severely deteriorated elements. Some modern materials and methods may be required due to the severity of the conditions encountered.

Reconstruction: The historically accurate rebuilding of part of the site or structures.

Other recommended activities consistent with a restoration program and used in this study are the following:

Interpretation: Identification of, and treatment recommendations for, structures and site features that should be preserved for interpretation.

Research and Testing: The required documentation prior to implementing and treatment.

Coordination: Activity that requires consultation with archaeologists and/ or consultants.

Maintenance: Work that can be accomplished without research and testing such as, remove trash and debris from the site, trim back vegetation from contact with concrete and masonry materials and remove from the site. Remove dead wood and trees with harmful root growth, remove soil wash from surface drainage paths. Establish adequate surface drainage away from structures, increase site monitoring by appropriate means.

ARCHAEOLOGICAL SENSITIVITY

The preservation and management of the forts must be guided by the the archeological documentation. Sensitivity maps were created identifying high, medium and low areas of potential for finding both ancient Native American and historic archaeological resources. These maps should be consulted prior to any ground disturbance. Preservation issues are also addressed in the Crane and Morrison Archaeology study.

Salem Neck and Winter Island contain prehistoric archaeological resources that can yield valuable information about plants and animals that once existed in the area. The Forts also contain historic archaeological resources. All of these archaeological resources are important to protect as they can be used to more fully understand the development of the area.

All prehistoric, and historic archaeological resources should be identified, surveyed, documented, and protected in compliance with the National Historic Preservation Act, The Native American Graves Protection and Repatriation Act, The Archaeological Resource Protection Act, and The American Indian Religious Freedom Act.

FORTS LOCATION PLAN

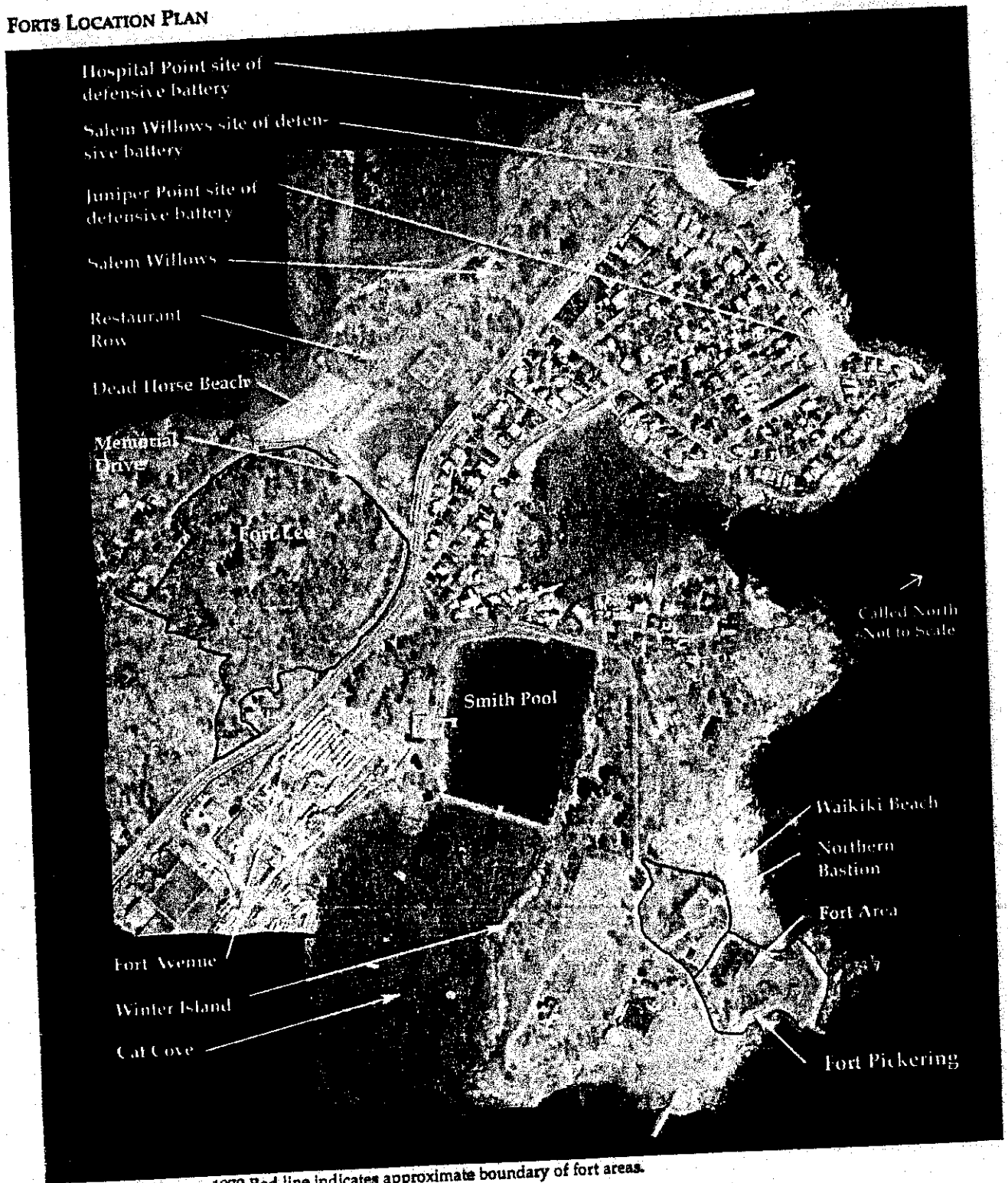


Fig. 8: Aerial Photo c. 1970 Red line indicates approximate boundary of fort areas.

FORT LEE EXISTING BOUNDARY PLAN



Fig. 9: Aerial Photo c. 1970 Red line indicates approximate boundary of Fort Lee site.

Fort Lee and Fort Pickering Conditions Assessment, Cultural Resources Survey, and Maintenance and Restoration Plan

FORT LEE AND SALEM WILLOWS EXISTING SITE PLAN

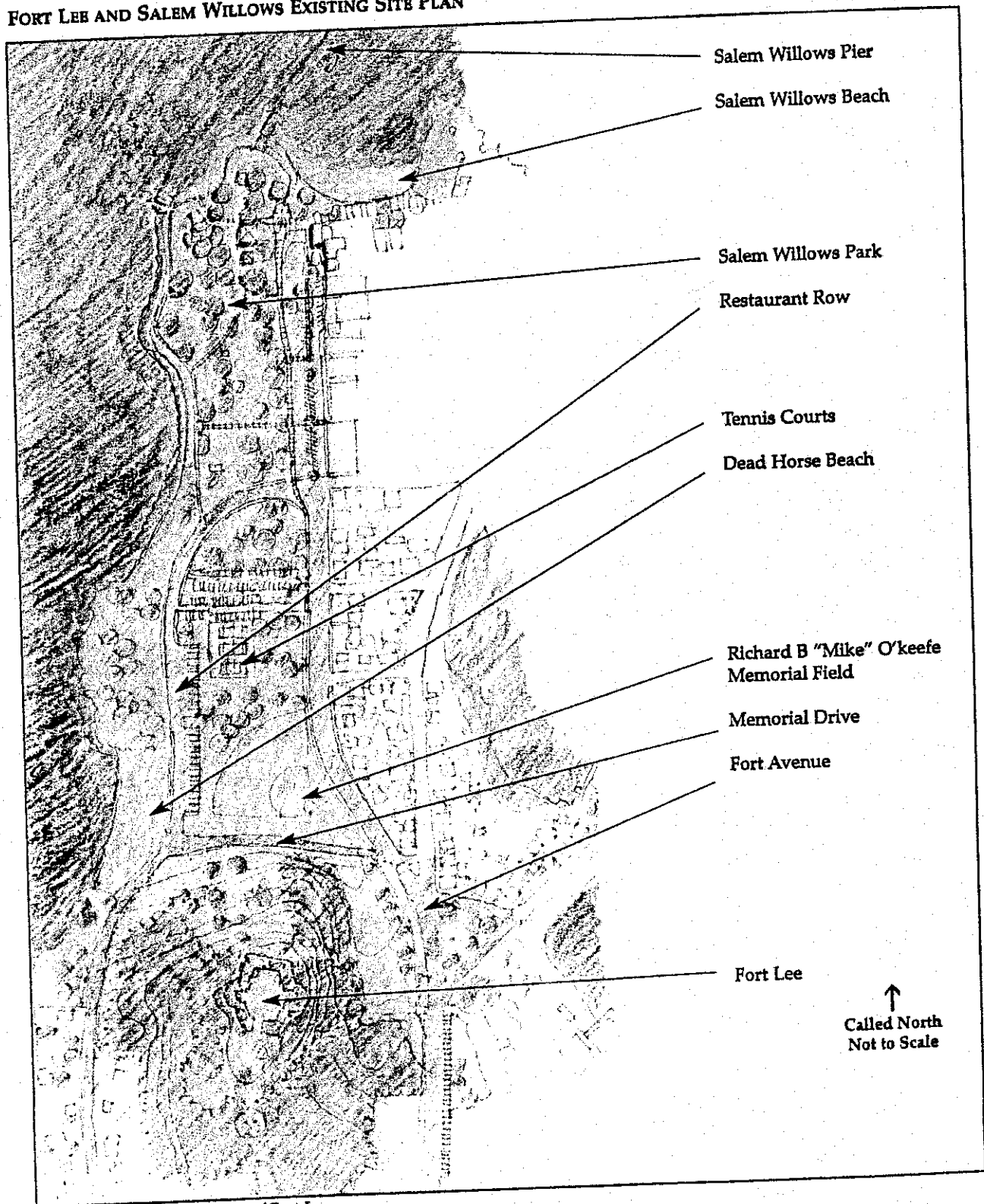


Fig. 10: Existing Site context of Fort Lee.

Fort Lee and Fort Pickering Conditions Assessment, Cultural Resources Survey, and Maintenance and Restoration Plan

FORT LEE MASTER PLAN

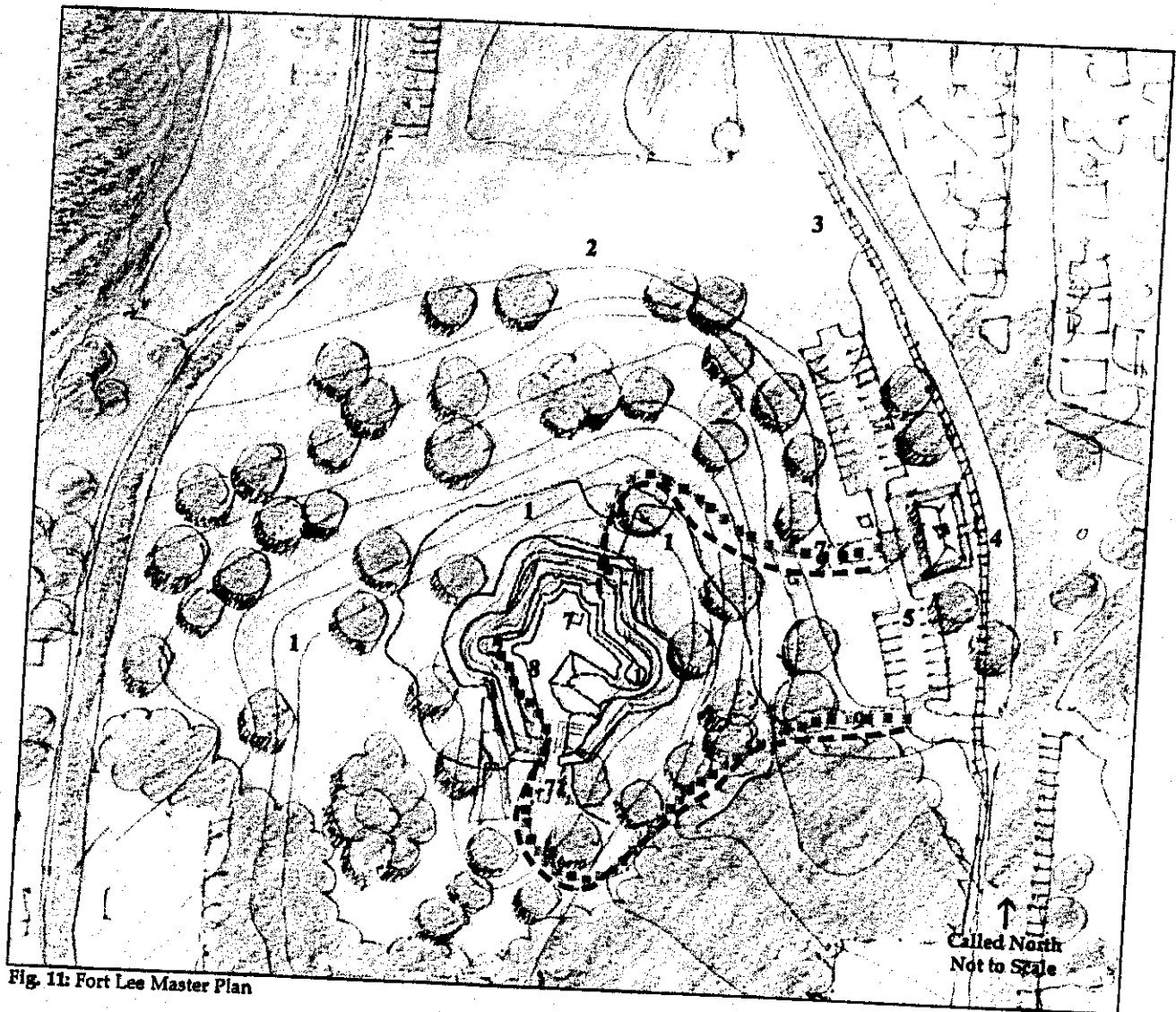


Fig. 11: Fort Lee Master Plan

Plan Key

1. Remove most of the vegetation that has overgrown the fort, restore earth wall shape and seed to stabilize.
2. Remove part of Memorial Drive that separates Fort Lee from the Salem Willow Park.
3. Extend new concrete walks from Salem Willows to Fort Lee with period lighting.
4. Construct a new Forts Visitors Center at the east open area visible from Fort Ave. This Center should house some of the appropriate artifacts of the forts area and displays should be developed to convey an understanding of the geology, prehistory and history of the Forts and their importance to Salem.
5. Create a visitors parking area with accessible parking.
6. Install new interactive interpretive kiosks at main entry to fort.
7. Install new plaque type interpretive signs at specific locations in existing stones.
8. Create earth ramp to top of the ramparts to allow wheelchair access.
9. Create formal walks from parking to fort.

FORT PICKERING EXISTING SITE PLAN

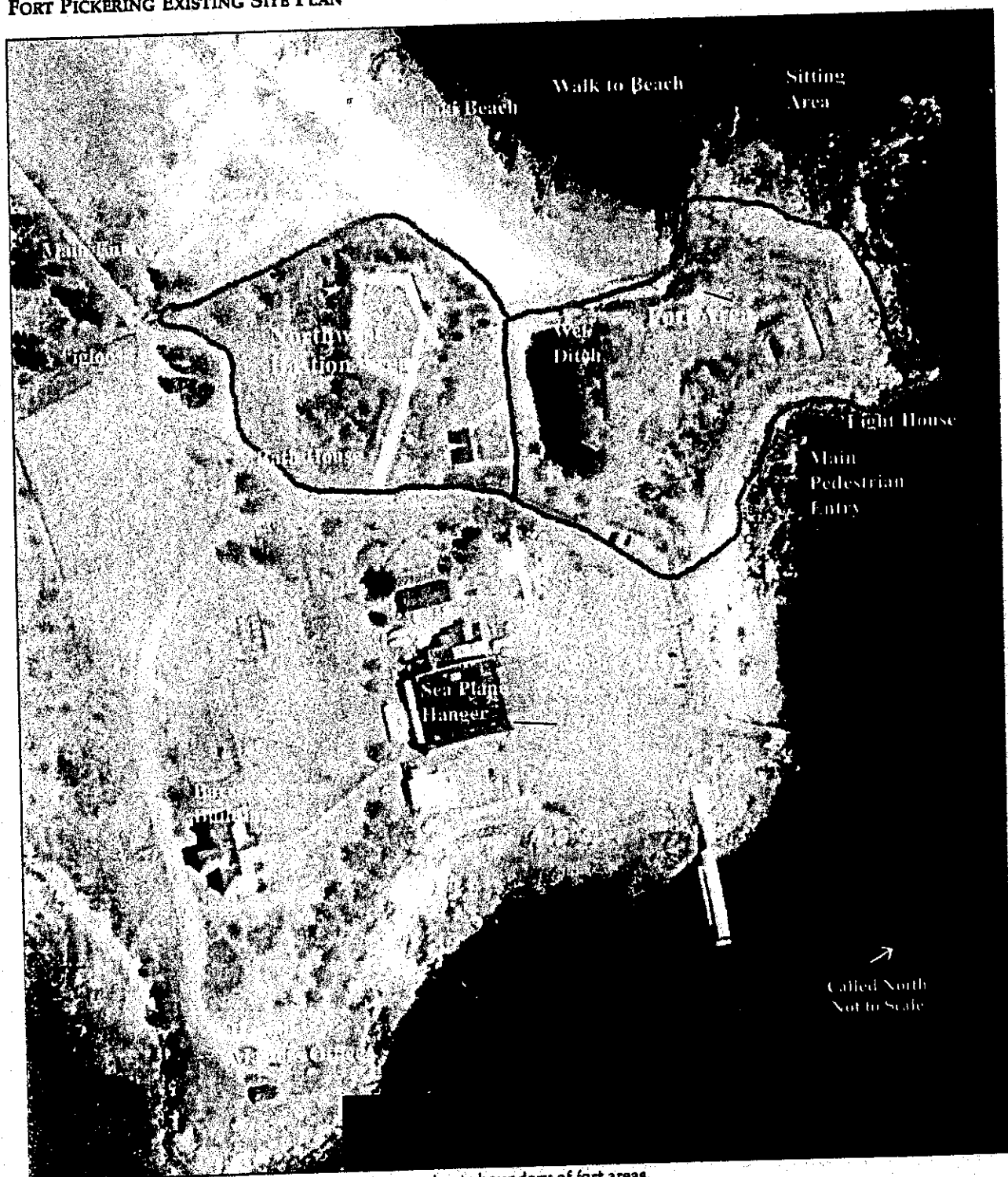


Fig. 12: Aerial Photo c. 1970 Red line indicates approximate boundary of fort areas.

FORT PICKERING MASTER PLAN

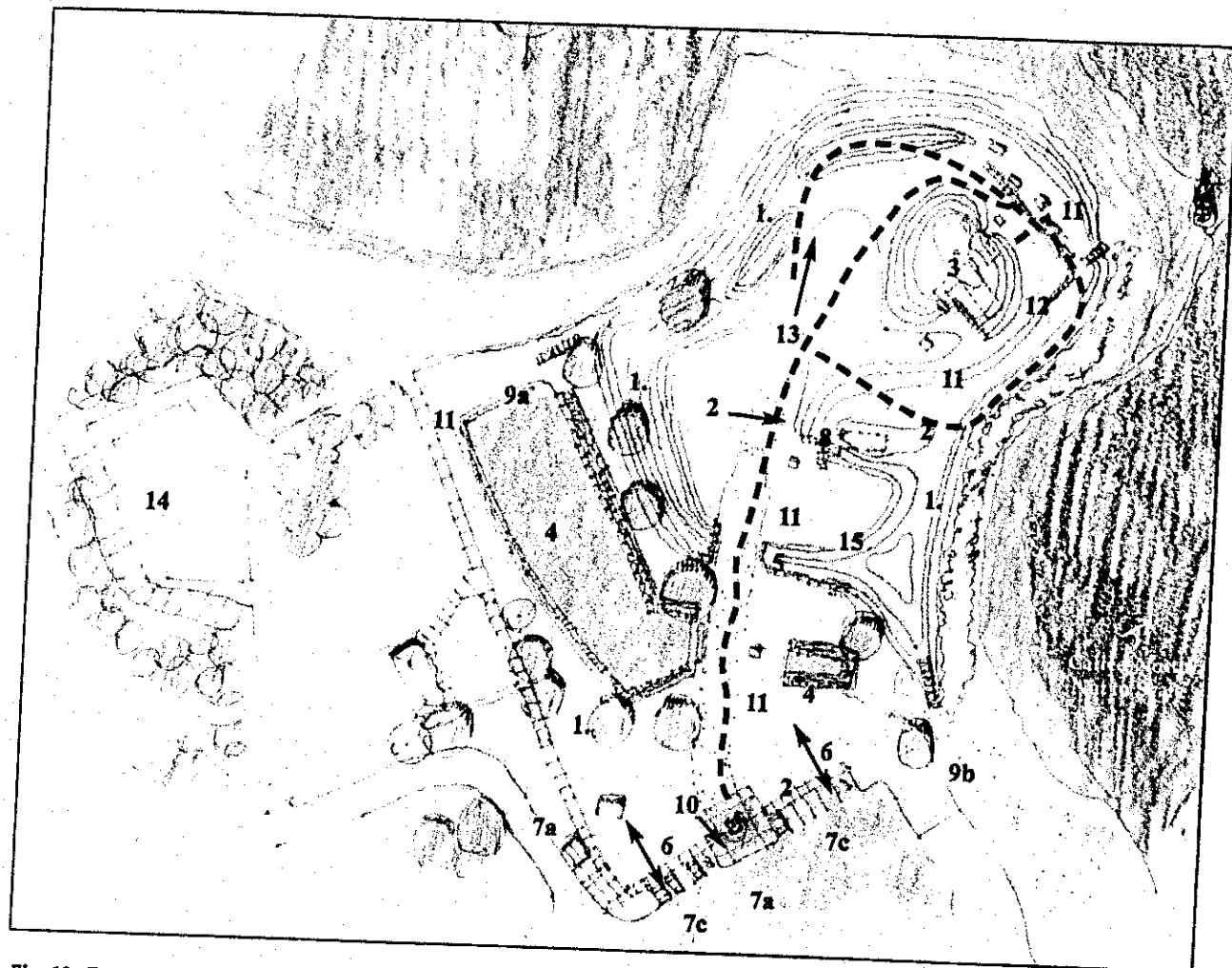


Fig. 13: Fort Pickering Master Plan

Plan Key

1. Remove most of the vegetation that is over growing the fort.
2. Create new formal paths from parking to viewing areas.
3. Create a viewing platform and stair access to top of Bomb Proof Magazine A and C.
4. Clean and repair the wet ditch.
5. Restore the earth fort at one section to allow full understanding of the fort construction.
6. Enlarge the grass entry area by removing the entry drive and creating Fort Pickering accessible and designated parking.
7. Create a main entry plaza with informational kiosk(7a) Redirect entry drive (7b) Create new accessible parking(7c).
8. Restore all earth ramparts at bunkers.
9. Restore stone and earth to prevent pedestrian access at the Waikiki Beach entry (9a) and at the Winter Island Beach side entry (9b) and eliminate pedestrian access.
10. Provide new interactive interpretive kiosks at main entry to fort.
11. Provide new plaque type interpretive signs at specific locations.
12. Remove existing wooden telephone pole and abandoned conduits.
13. Modify grades to create wheelchair access to top of rampart.
14. Restore igloos.
15. Remove fill between bunkers.

V. FORT LEE

CONDITIONS AND RECOMMENDATIONS

EXISTING SITE CONDITIONS

Fort Lee is located on "Salem Neck", a peninsula of land bounded by Collins Cove and Beverly Harbor to the north and South River and Salem Harbor to the south. The fort was built on an area of the "neck" that is approximately 55 feet above high water mark. The fort is heavily overgrown with vegetation that obscures its current configuration. One experiences the fort by walking up one of several paths that were installed during the bicentennial in 1976.

Overall, Fort Lee is an irregular six-sided polygon with two semi-circular extensions on the north and south angles of the ramparts. The landward rampart is the location of the sloping entry ramp on the southwest; its opposite rampart is nearly square. The remaining pair of ramparts to the northwest and southeast are semi-circular. Parapets, constructed of earth excavated from ditches located around the circumference, protect

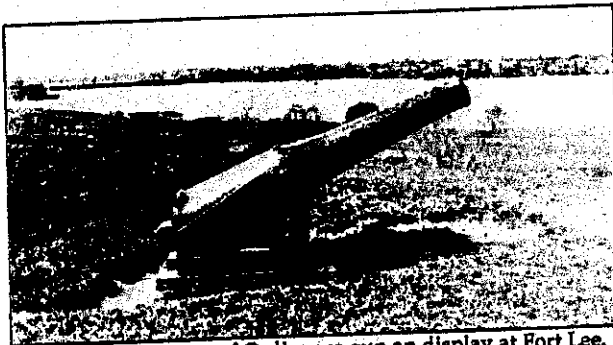


Fig. 14: 32lb. Bureau of Ordnance gun on display at Fort Lee, date unknown. Courtesy, Peabody Essex Museum, Salem, MA.

the inner parade grounds. The ditches around the ramparts are not continuous because of an outcropping of rock ledge. There is a bomb proof magazine located underground.

There are no buildings visible at the fort. There is however, evidence of what may be a small house foundation or covered retreat, in the form of depressions in the ground, to the north of the fort. There is also a large depression on the terrace overlooking the ball field, northeast of the fort that

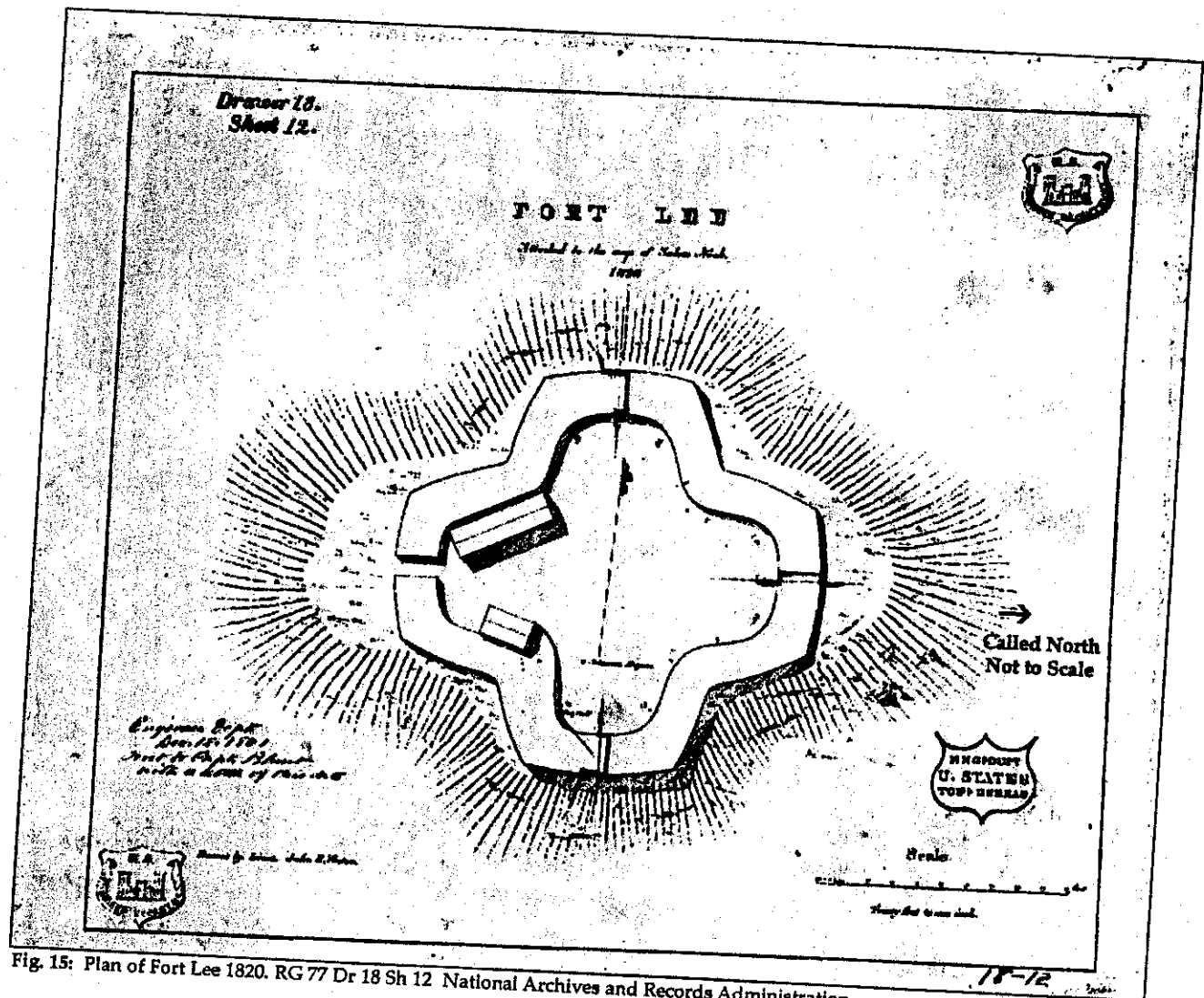
may be evidence of a cellar hole or barn foundation. To the east of the fort is a gravel parking area. The site has one identifying plaque that was placed there during the 1976 bicentennial clean up of Fort Lee.

Fort Lee is heavily overgrown with Staghorn sumac (*Rhus typhina*), Multiflora rose (*Rosa multiflora*), Asiatic bittersweet (*Celastrus orbiculata*), Bush honeysuckle (*Lonicera* sp.) and there is some Japanese knotweed (*Fallopia japonica*) or "bamboo", an introduced species that is often difficult to eradicate once it takes hold.

Evolution of Fort Lee's Design

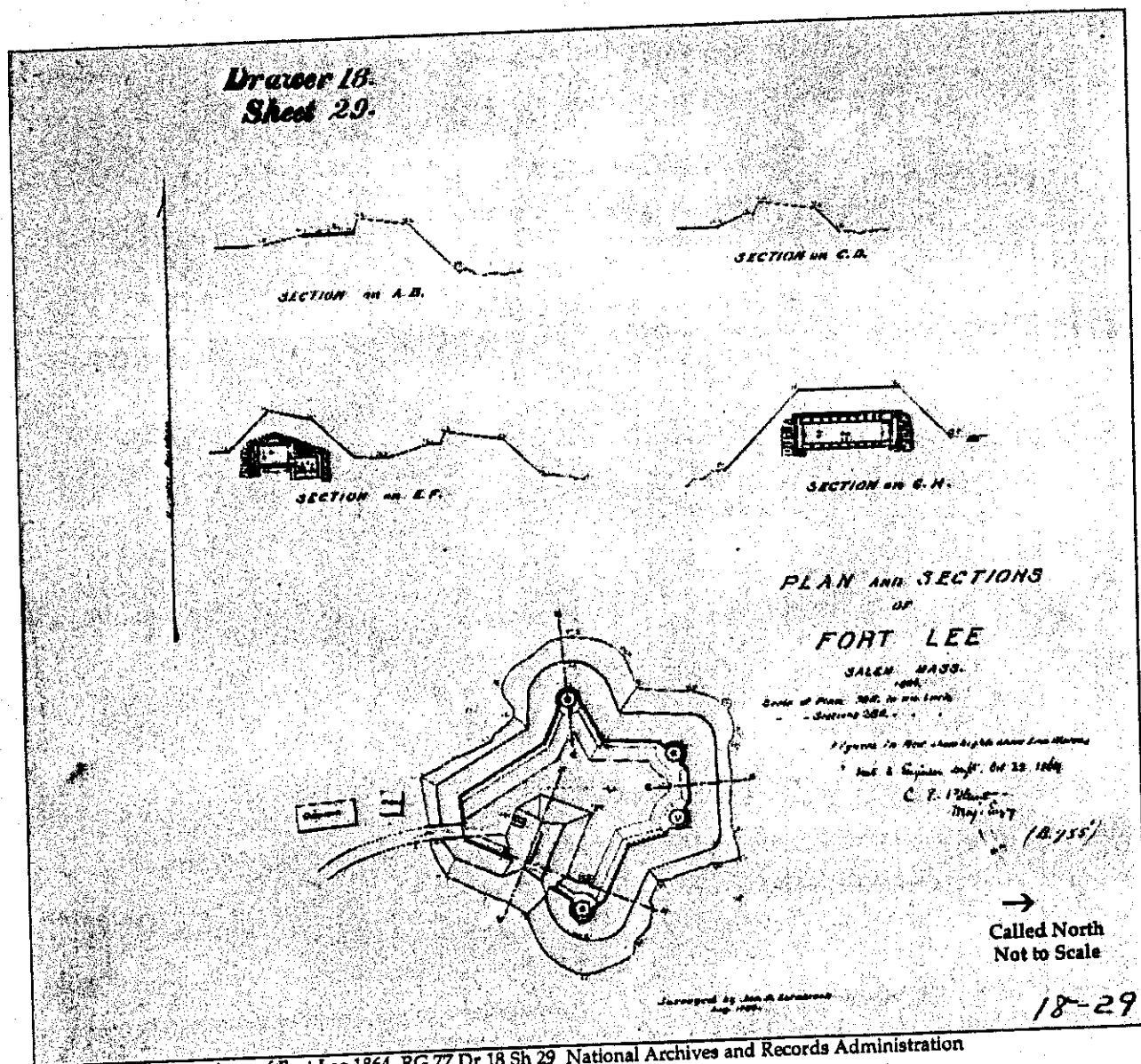
When Salem Neck and Winter Island were surveyed in 1820, a plan was made of Fort Lee, along with that of Fort Pickering. This plan, made by Lieutenant John R. Vinton of the U. S. Engineering Department, is our first graphic representation of the fort, and shows it as it existed after the repairs of 1814 (Figure 15). The plan shows two magazines. The first is a small subterranean chamber buried in the ramparts. The second is a larger free standing structure on the surface but protected by earth on two sides. The two parts of the magazine were connected by a passage. Possibly, the buried part of the magazine was for powder, while the free standing portion was for ammunition and other less dangerous stores. The date of these structures is not known. Reverend Bentley stated that the magazine was being repaired so one or both of the structures must have predated 1814. Possibly they dated to the probable original construction of the fort in 1776.

The U. S. Army turned its attention to Fort Lee at the same time as Fort Pickering, when the Civil War was well under way. Proposed changes to the fort were completed by the end of June, 1863 (Figure 17). Fort Lee was to be modified to mount four heavy cannons. The two facing east towards the entrance of Beverly Harbor would be mounted on wooden front pintle carriages firing through embrasure in the parapet. The two located on the



lobes of the fort facing north towards Beverly Harbor and south towards Winter Island would be mounted on center pintle carriages raised high enough to fire en barbette. The trace of the fort was to remain essentially unchanged, but the ramparts were to be made much thicker and slightly higher. A new magazine was to be added to replace the old free standing magazine, but the old subterranean magazine under the ramparts was also to remain. The plan is particularly useful in that it showed both proposed changes and the existing condition of the fort.

An updated plan was submitted to the War Department one year later (Figure 16). It was broadly similar to the 1863 plan, but had some important changes. First, it showed the position of a small guard house and larger barracks outside of the fort west of the gate. Inside the fort, it showed that all four heavy cannons were mounted on center pintle carriages en barbette. Drainage of the parade surface was to be achieved by a buried stone culvert that exited the fort under the gate discharged into the ditch south of the fort. Both the 1863 and 1864 plans showed the "old magazine" under the south rampart, just as it had



been recorded in 1820. They also showed a new magazine, replacing the freestanding magazine that had existed in 1820. The 1864 plan greatly adds to our knowledge of these structures by showing cross sections through them.

The old magazine, possibly dating from as early as 1776, was 5 feet long by perhaps 4 feet wide and 7 feet high. It had stone walls and a stone roof.

Apparently the interior of the stone work was reinforced by some kind of timber work, or possibly brick work. The floor of the old magazine was five feet lower than the floor of the new magazine, and the passage into it entered high in the wall; possibly it was little more than a crawlspace. The whole structure was inside of the newly heightened ramparts under more than 4 meters of earth.

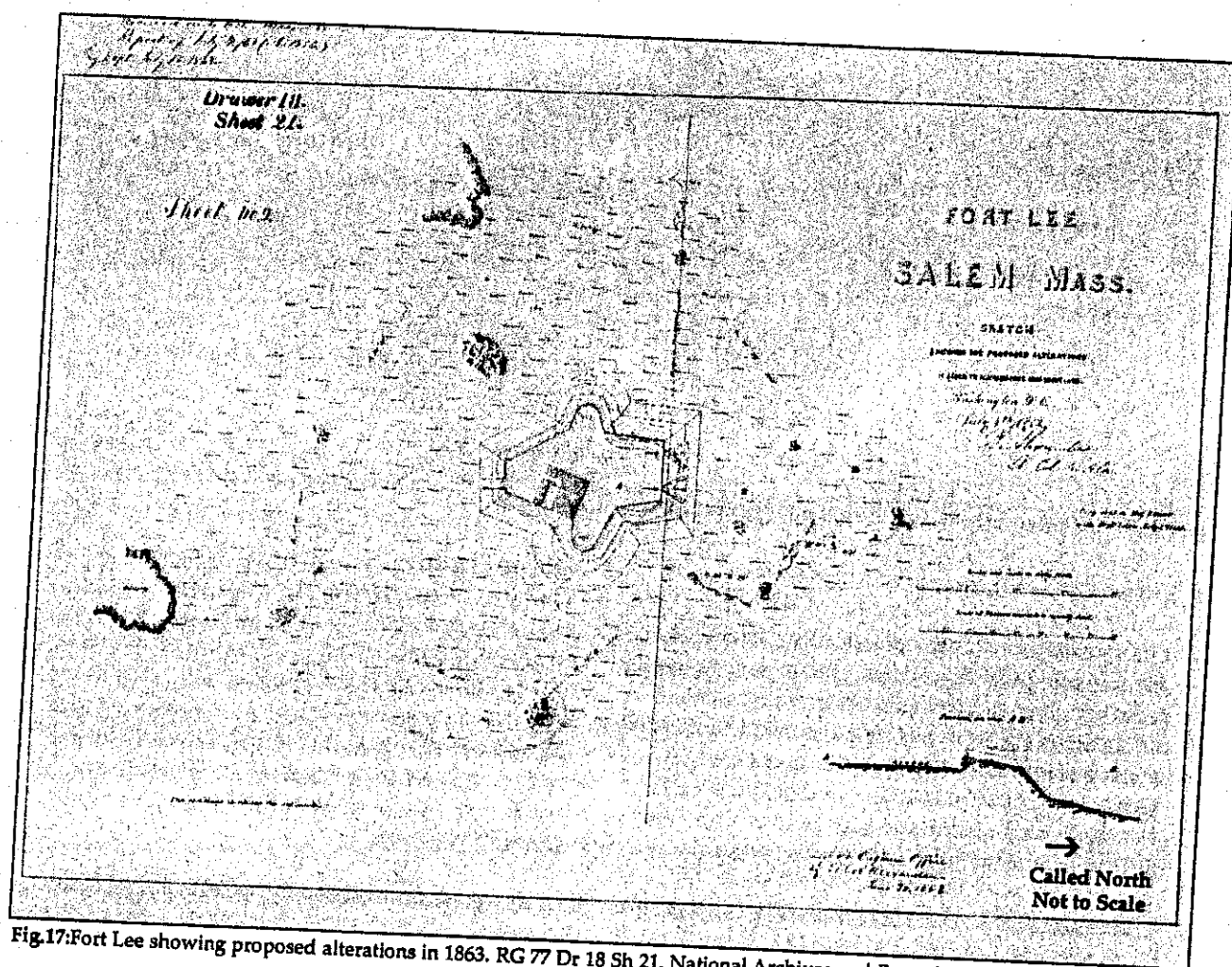


Fig.17:Fort Lee showing proposed alterations in 1863. RG 77 Dr 18 Sh 21. National Archives and Records Administration.

The new magazine was a 10 foot by 30 foot structure, nearly 7 feet high inside. Like the old magazine, it had stone walls. Interior to the stone work, the structure was supported by a thick timber framework. The roof was also timber, and unlike the old magazine, did not have a stone roof. The structure's floor was at roughly the same grade as the parade outside. The new magazine was covered by over 3.5 meters of earth, so that its earthen bombproofing stood well above the height of the adjacent ramparts at the time it was built.

Photographic evidence indicates that actual construction closely followed what was depicted in the 1864 plans (Figure 16).

Remaining Visible Features

The remaining visible and historically significant features that have been documented by the archaeological consultants are:

1. The parade
2. The ramparts
3. Two Bomb-proof magazines
4. Ditch
5. Depression outside of the fort and north of the gate
6. Platform for display gun
7. Two U.S.G.S. bronze survey benchmarks
8. Concrete and steel flagpole base

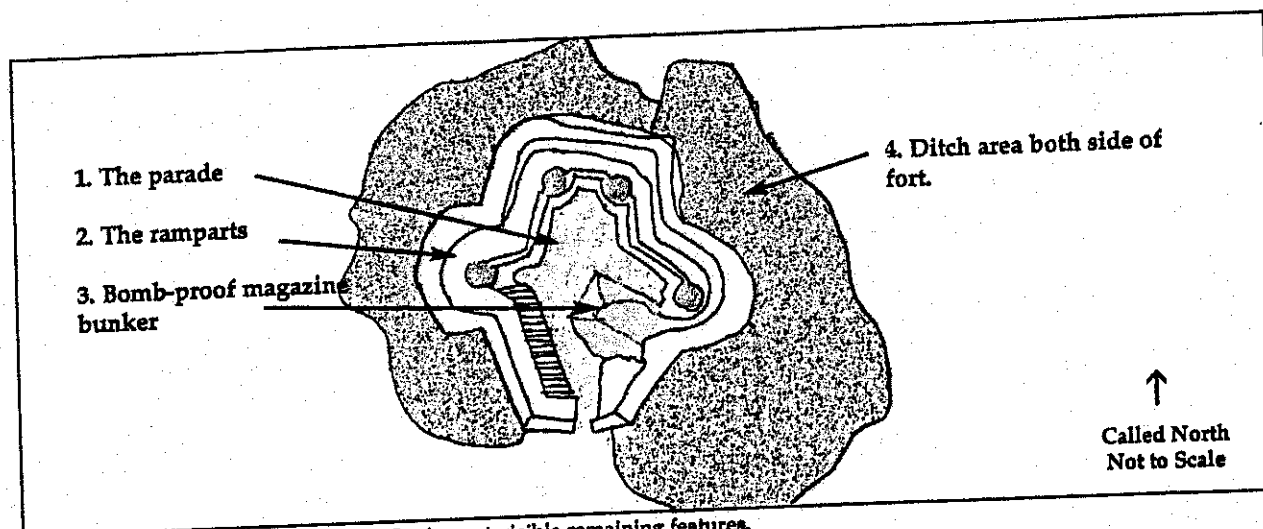


Fig. 18: Plan showing location of Fort Lee's most visible remaining features.

9. Road that begins at gate

1. The parade. The parade is simply the enclosed ground inside of the ramparts. It is not particularly fragile, and may be cleared. No excavations should take place in it, as there are buried features under the surface. For instance, a granite drain dating from 1864 probably lies under the parade and there may be archaeological evidence of other buildings and features not otherwise documented.

2. The ramparts. The ramparts are the most visible and recognizable feature of Fort Lee, and are essentially intact. However, erosion has "softened" what were once crisp angles, and have made the terreplein all but indistinguishable from the parade. In several places, erosion from foot and bicycle traffic and from surface runoff has cut deep channels. The ramparts are overgrown with trees varying from sapling staghorn sumac to fully mature apple, oak, cherry, and maple.

3. Two bomb proof magazines under an earthen covering. The earthen covering rises up inside the fort to the right of the gate upon entering. The state of the underlying magazines is not known for certain. The earlier (ca. 1776?) smaller vault might be intact, as it is stone. The later (ca. 1864) larger vault is believed collapsed, but probably has excellent archaeological preservation.

4. Ditch. The ditch is the largest feature of Fort Lee, as it wraps nearly entirely around the fort and is very broad, up to 20 m in places, and two to three meters deep. Even so, the ditch is only readily recognizable as a defensive feature on the north-west side of the fort, and even then, only to somebody that actually ventures into the thick woods that have overgrown it. With clearing, the ditch and ramparts would together be recognizable, and impressive.

5. A depression outside of the fort and north of the gate. This might be a visible feature of the 1864 guard house, or might be a shallow extension of the ditch. Numerous artifacts that might be related to the guard house are exposed on the adjacent eroded path. This structure, if confirmed, and any associated archaeological material, would contribute to the significance of Fort Lee.

6. Platform for display gun. Two granite blocks are visible on the top of the ramparts at the east side of the fort. These were initially noted as possibly related to a gun platform. In fact, they appear in the 20th-century photograph of the 32 pounder, and were simply the base for it. They do not contribute to the significance of the fort, as they are not related to any serviceable gun platform dating from the Civil War or earlier. They should be left in place, but need no special atten-

tion.

7. Two U.S.G.S. bronze survey benchmarks (no feature numbers) located on the ramparts should be left in place. They do not contribute to the significance of the fort, but should none the less be protected. One, on the rampart north of the gate, is adjacent to an eroding path and should have soil filled in around it.

8. A concrete and steel flagpole base on the crest of the ditch east of the fort is a 20th century feature. It does not contribute to the significance of the fort, and does not need protection.

9. The road that begins at the gate, wraps around to the south within the ditch line, ending at the old parking lot at the bottom of the hill, appears to be the historic access road to the fort. It should be retained, though it could be modified to meet modern requirements, if done sensitively.

Recommended Treatment of Remaining Features

The ramparts, magazine covering, and ditch are massive features that need no flagging. No digging should be done into them, so roots of cut trees should be allowed to decay on their own. Closely related to this, any stones or timbers found on or imbedded in the ground surface should be left in place until a qualified archaeologist can consider their possible significance. Bare soils should be immediately seeded or sodded for long term erosion control. Water diversions might also be necessary. Straw should be put down as temporary erosion control. Clean fill should be added in deeply eroded gullies.

Remnants of the 1864 guard house can be managed in conjunction with the 1864 barracks (see item 3 below). They were both located near each other west of the gate. While the depression north of the gate might be related to the guard house, the archaeologists did not confirm features related to either. The general area is eroded from bicycle and foot traffic, and is littered with artifacts. Clearing may take place here, but the same caveats

noted above apply: no excavation without consulting with the MHC; bare soil should be seeded or sodded, and temporary erosion controls applied. Here, it may be desirable to add fill over the eroding surface to place a buffer between feet and any archaeological remains.

Buried features

The archaeological research uncovered through historic maps and some testing the following buried features:

1. ca. 1776 building (barracks?), and associated archaeological remains. Evidence of this structure was found during excavations, and included buried features and artifacts. While such a building would have been necessary, it was not otherwise documented and its location was not known.

2. The 1814 barracks and associated archaeological remains, in approximately same location as ca. 1776 structure, above. The nature and location of this building was documented historically, and has been also partially confirmed archaeologically.

3. 1864 barracks and associated archaeological remains outside of gate. In testing, no features were found related to this building. However, numerous artifacts that might be related to this structure are exposed on the eroded path surface outside of the gate.

Recommended Treatment of Buried Features

Remnants of the ca 1776 and 1814 buildings are deeply buried in the parade, left of the gate as you enter. They are safe from any damage incidental to normal maintenance, such as mowing or tree clearing. Again, no excavations should be made near them, or indeed, in the parade at all, without first considering alternatives in consultation with the MHC, and a qualified archaeologist. Remnants of the 1864 barracks can be managed in conjunction with the 1864 guard house (item 5 above).

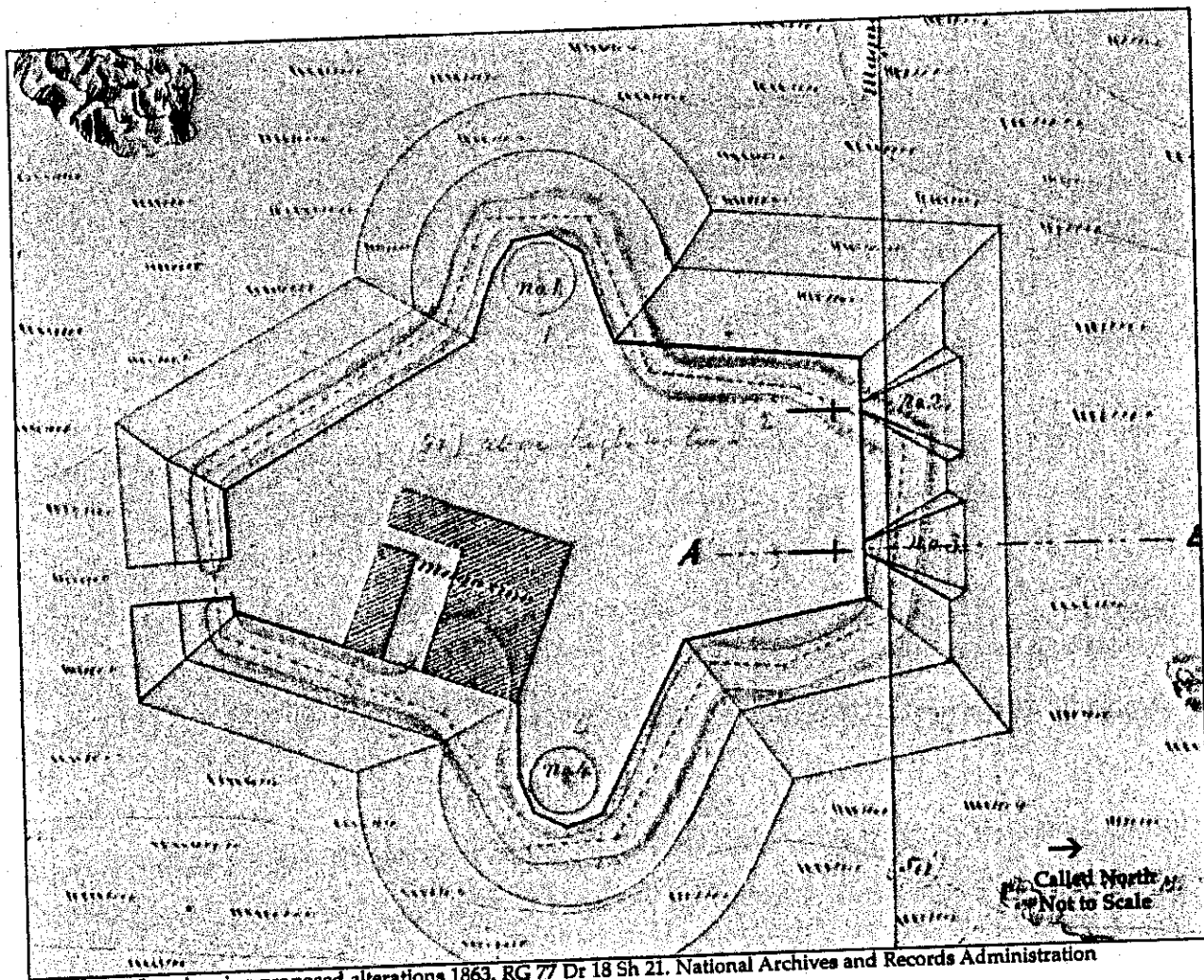


Fig.19 :Fort Lee showing proposed alterations 1863. RG 77 Dr 18 Sh 21. National Archives and Records Administration

Historically documented features, not visible, and not found in the field

1. The gun platforms 1,2,3 & 4, as numbered on 1863 and 1864 and shown in the enlarged plan (Figure 19) no definite remains have been identified of any of them. As the platforms were wood, any remains are likely to be archaeological, if they survived at all. These features, if they survived, contribute to the significance of the fort.
2. Buried drain, dating from 1864. Historical plans indicate that a granite drain was placed from the parade to the ditch outside the gate to the south. This feature probably survives under the parade, and represents a simple but important

part of the fort's engineering. This feature, assuming it survives, contributes to the significance of the fort. These features need no special protection beyond what has already been noted for the parade above.

Coordination Recommendations for all Restoration

1. Non-intrusive maintenance such as lawn mowing, tree and brush removal can be done without further consultation.
2. Plans for construction and grading should be done in consultation with a qualified archaeolo-

gist.

3. Consultation should be initiated with the Massachusetts Historical Commission.

4. Before grading or excavations are carried out, further archaeological investigations should be completed to determine what specific archaeological resources will be affected, to assess their significance to Fort Lee, to make recommendations as to further investigations, if necessary, and to discuss further adjustments to plans that might limit damage to the historic resources.

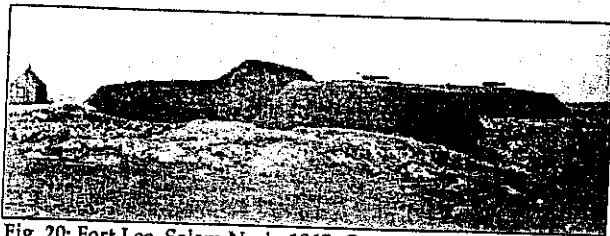


Fig. 20: Fort Lee, Salem Neck, 1865. Courtesy, Peabody Essex Museum, Salem, MA.

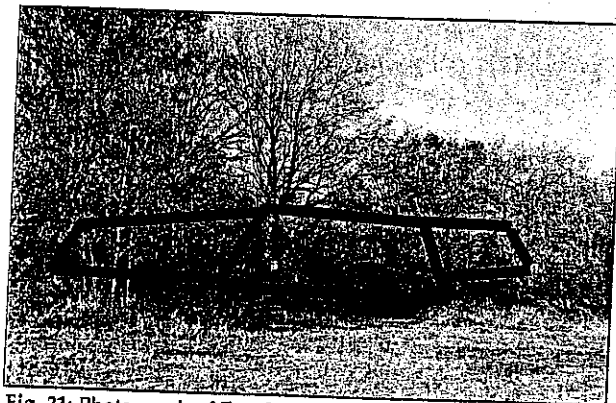


Fig. 21: Photograph of Fort Lee from Fort Ave. 2003. Black line shows the approximate location of the fort rampart walls.

5. When in doubt, consultation should be made with archaeologist from the Massachusetts Historical Commission.

6. Coordinate all earthwork with archaeologist.

General Recommendations

Short Term - Stabilization

1. Add selected fill material to eroding areas, seed and compact by hand.

2. Add approved ground cover to bare areas and maintain.

3. Monitor erosion and replace soil wash.

4. Identify and protect existing stone monuments.

Mid Term - Preservation

1. Selectively remove vegetation to allow site survey to be completed and contract for complete site survey.

2. With complete survey, prepare final Restoration Plan with phased development if required.

3. Prepare plans and technical specification for proposed restorations.

Long Term - Preservation

1. Fund and implement maintenance program.

VEGETATION AND LANDFORMS RECOMMENDATIONS

The site has been severely overgrown over the past thirty years. Original earthen berms as shown in figure 20 have suffered isolated erosion and settlement. The flat-topped formations that contrast with natural terrain have been obscured and eroded. Larger trees have intruded on the ramparts and surrounding defensive ditch as well as the landscape that forms the setting for the fort to the surrounding streets view of the fort and from the fort are blocked.

Short Term - Inspection and Testing

Archaeologists have determined that the interior of Fort Lee, the ramparts, and the surrounding hill top contains archaeological deposits that might be sensitive to damage from maintenance and

restoration activities. These include the possibility of Native American deposits, historical period sites unrelated to the defensive works, and sites directly related to construction and use of the fort, buildings such as a three successive quarters and a guard house, and visible and hidden engineering features of the fortifications, such as the ditch, ramparts, drain, two magazines, and possibly, remnants of wooden gun platforms.

Portions of the maintenance plan can be carried out without impact to archaeological deposits. Surface vegetation can and should be cleared and trees cut flush to the ground. However, roots should not be grubbed out, excavated, chipped, or otherwise removed below the existing ground surface. Any soil that is bared should be stabilized to avoid erosion.

Beyond such routine non-invasive maintenance, specific grading and construction plans for the fort should be developed in consultation with archaeologist so as to minimize potential impacts to archaeological deposits. If construction plans ultimately call for disturbances to the existing ground surface, additional archaeological testing should be carried out. This should be aimed at determining what specific archaeological resources will be affected, towards assessing their significance to Fort Lee as a historic and cultural resource, and to making recommendations as to further investigations, if necessary, and to consult on further alterations to plans that might limit damage to the resource.

Long Term - Restoration

1. Clear vegetation to allow original fort form to be recognizable and to create viewing areas from the ramparts. Large trees in specific areas may remain, however, the final recommendations must be made after a complete topographic survey is compiled.

2. Where ramparts have been damaged by erosion, or soil instability, corrective action is required. Depending on the level of treatment prescribed,

earthwork may involve work ranging from interim stabilization to full restoration of a section to be used as an interpretive guide.

3. Perform excavation and soil stabilization as required.

4. Backfill with original earthen materials and compact soils in six-inch lifts.

5. Hand grade sections of the topsoil to achieve original lines and grades.

6. Install vegetative materials.

ACCESS AND VIEWING AREAS RECOMMENDATIONS

Random paths have been developed that are not appropriate for the site. Some existing paths for access are still visible. There exists a formal, unpaved parking area off Fort Avenue.

Short Term - Inspection and Testing

The hill top, both within and outside of the fort, has been identified as a place where remains associated with the Revolutionary War, War of 1812, and Civil War era construction and garrisons might be located. Each of these could contribute to our understanding of Fort Lee. Any construction that will entail ground disturbance should be preceded by intensive archaeological investigations. This will identify the nature of archaeological materials that will be disturbed and may provide guidance as to how designs can be made to minimize disturbance. The area where the proposed visitor's parking is sited off Fort Ave. is not archaeologically sensitive, and would not require additional archaeological consideration.

Long Term - Restoration

Some structured paths exist from earlier restorations. These include the granite steps near the top of the fort and a cleared path from the Fort Avenue parking area to the rear fort entry. These paths are appropriate ways of approaching the



Fig.22: Plan of existing paths shown in red.

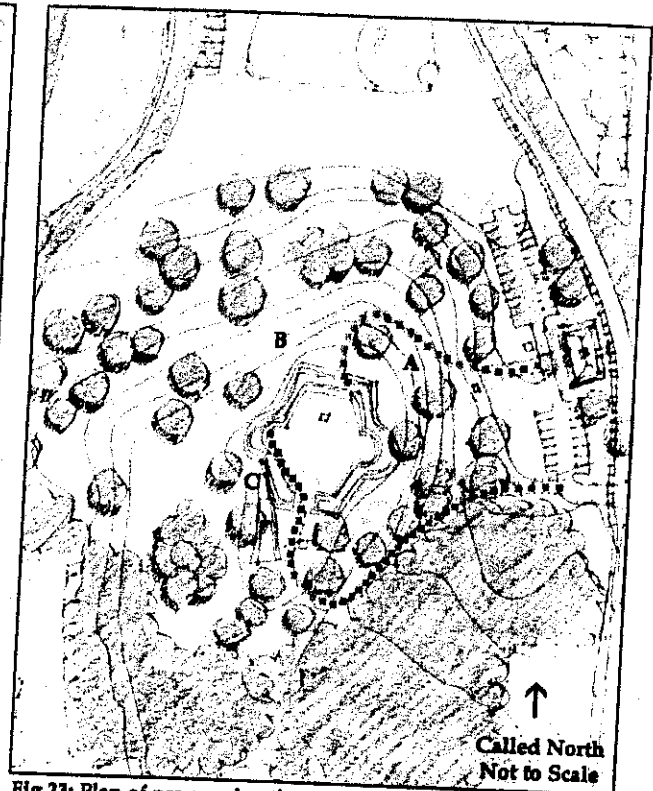


Fig.23: Plan of proposed paths. A. Existing entry to granite steps construct path. B. Rebuild rampart walls for viewing areas. C. Regrade and create wheelchair access to rampart. D. Abandon other paths.

fort. Other paths have been created through wooded areas. It is recommended that these be abandoned and that with the clearing of the vegetation these paths be seeded over. It is also recommended that wheelchair access to the top of the ramparts should be created by constructing an earth ramp within the fort with a slope of 5%. Handrail should not be installed. A visitor parking area can be created in the level area off Fort Avenue as recommended above. These paths and would lead to the fort enclosure and to the ramparts for viewing. View corridors should be sited from these viewing areas and the vegetation cleared. This work should only commence once the final restoration plan is developed following more archeological investigation.

1. Hand grade topsoil to achieve original lines and grades.

2. Install vegetative materials to inappropriate social paths to discourage their use.

3. Install compacted gravel on formal walks.

4. Build earth ramp for wheelchair access to top of ramparts.

5. Build parking area off of Fort Avenue.

INTERPRETATION RECOMMENDATIONS

In 1976 Fort Lee was partially restored. Interpretive plaques were installed, however most of these have been removed or vandalized. These were placed on stones and some of the stones still exist. In the early twentieth century the fort area was visible and a flag pole and artillery were pres-

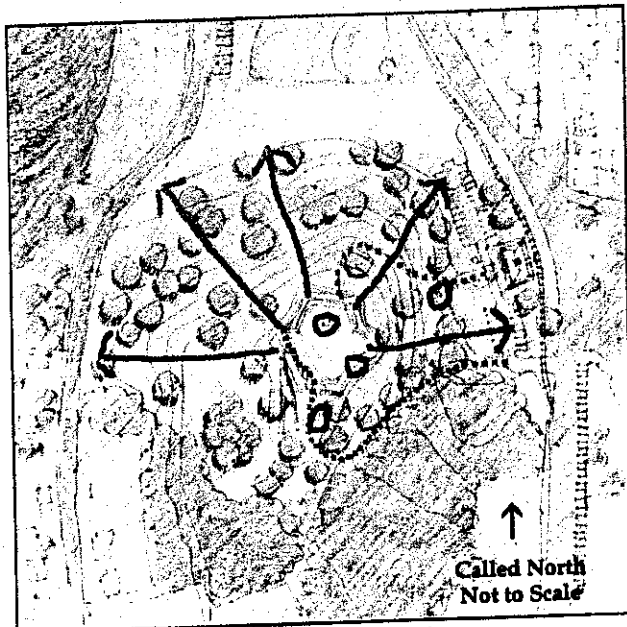


Fig. 24: Plan of existing paths shown in red.

ent on the ramparts. What remains, although hidden by vegetation, is the form of the fort, the Parade, the Ramparts, a Bomb-proof Magazine Bunker, the defensive Ditch, and the Terreplein.

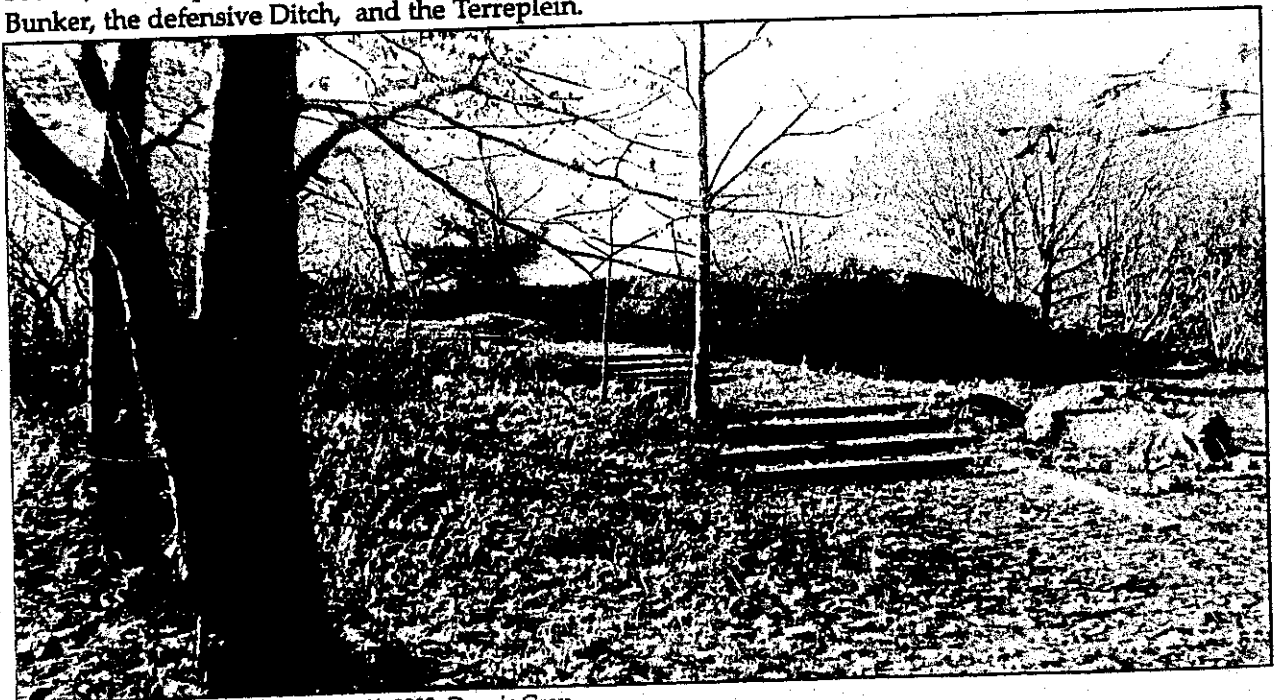


Fig. 25: Granite stairs installed in 1976. 2003, Dennis Gray

It is recommended that the remaining stones that were once used for interpretive plaques be reused with new plaques. The design, images and text must be developed to include the historic research from this study and appropriately combined with an overall interpretive plan. This plan may include a visitor's center on this site, which would be best located off Fort Ave. near the proposed parking area or at the Fort Pickering site, possibly in an existing building. The landscape setting of Fort Lee has historically been part of the Salem Willows Park. As one viewed the fort from the park, it was surrounded by grass fields. Removal of the vegetation and the portion of Memorial Drive that runs between the baseball field and Fort Lee is suggested to restore this dramatic fort setting.

Short Term - Inspection and Testing

Archaeological research can be an invaluable addition to the public interpretation of Fort Lee. Testing has already revealed that important infor-



Fig. 26: Post Card view from Fort Lee ramparts to Beverly, date unknown. The Hugh C. Leighton Co., Portland ME.

mation about the sequence of construction and usage of the fort is buried in the ground. Furthermore, observation of archaeology in progress can be an exciting way for the public to experience history, historical places, and to connect with historical peoples. Finally, the material recovered from such excavations can be used in permanent exhibits that illustrate the site's devel-

opment, usage, and historical meaning.

Long Term - Restoration

1. Construct a new Forts Visitor's Center at the east open area visible from Fort Ave. This center should house some of the appropriate artifacts of the fort area and displays should be developed to convey an understanding of the geology, prehisto-



Fig. 27: Viewing area, Fort Lee, date unknown. Courtesy, Peabody Essex Museum, Salem, MA.

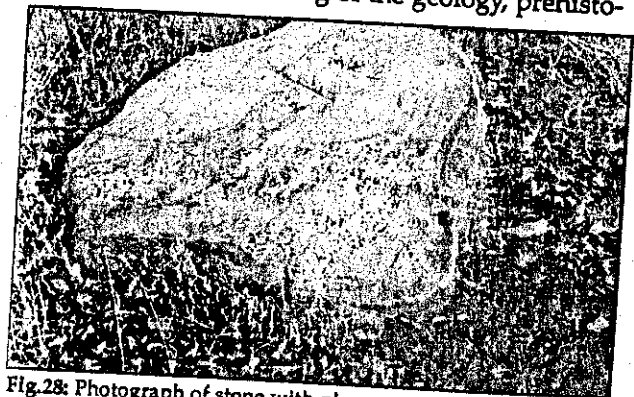


Fig. 28: Photograph of stone with plaque removed, Fort Lee. 2003, Dennis Gray.

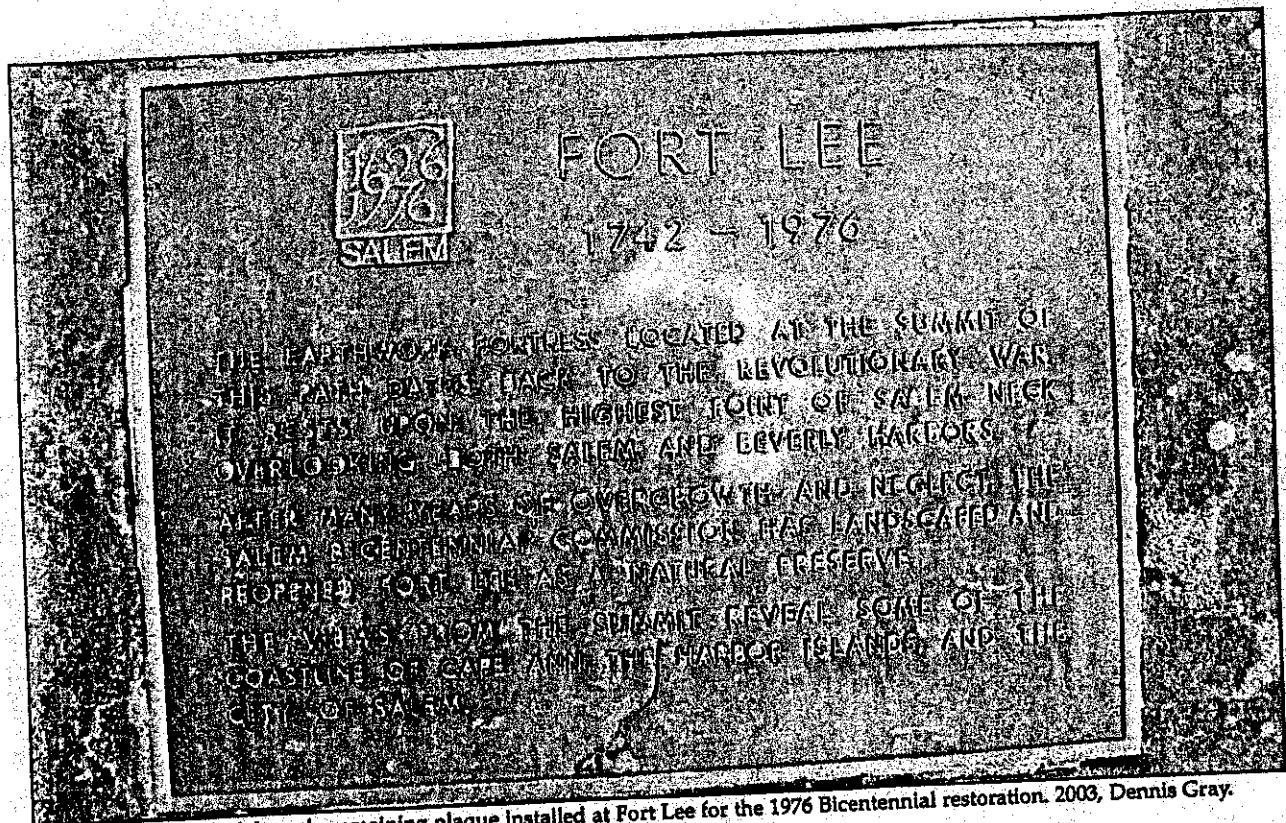


Fig.29: Photograph of the only remaining plaque installed at Fort Lee for the 1976 Bicentennial restoration. 2003, Dennis Gray.

- ry and history of the forts and their importance to Salem.
2. Provide new interactive interpretive kiosks at main entry to fort.
3. Restore sections of the rampart to the original form.
4. Provide new plaque type interpretive signs at specific locations in existing stone.
5. Remove the portion of Memorial Drive that runs between the baseball field and Fort Lee.
6. Extend new concrete walks from Salem Willows to Fort Lee with period lighting.

VI. FORT PICKERING CONDITIONS AND RECOMMENDATIONS



Fig 30: Ruins of Fort Pickering, March 31, 1942. Richard C. Kelsey photograph, on file Office of Planning and Community Development, City of Salem.

EXISTING SITE CONDITIONS

Fort Pickering is located on the eastern and southern side of Winter Island. The Fort site has two defined areas that are referred to as the "fort area" on the water and the "bastion area" the area to the west to the south of Waikiki Beach. These sites are bisected by a concrete walk leading from the parking area to Waikiki Beach. A 20th century bathhouse has been placed along the walk.

Fort Area

The most prominent features as one approaches this area are the earth ramparts and the lighthouse. The full extent of the ramparts is not discernable because of the overgrown condition of the vegetation. One experiences the fort remains by first viewing the site from the parking area, then by walking through an approximately 25'

wide area bounded on both sides by the wet ditch. As you proceed you come into an open space (the parade) that is defined by the remaining ramparts. Features such as the entries to below grade bunkers are discovered as one passes through this open area. These bunkers are locked and inaccessible to visitors. The grade rises up to the broad eastern terreplein dating to 1864. This raised area approximately covers the footprint of the smaller fort that existed prior to that date. Finally you arrives at the terreplein behind part of the parapet of a rampart. There is a break in the wall with a stone step; allowing visitors to move onto the top of the rampart where benches have been installed.

Social paths have been created on top of the remaining ramparts and at various other locations. Over time, these paths have damaged the fort grounds and in some locations are hazardous. These walks consist of compact earth and follow

the existing grades. The site has several interpretive plaques identifying various historic features on the site most likely installed during the 1976 restoration. The fort area is used by visitors for viewing Salem Harbor and for passive recreational activities. The entry setting for the fort is a grassy area screened from the entry drive with hedges and shaded with weeping willow trees to the northwest.

Bastion Area

The "bastion area" is defined by pre-cast concrete vaults installed by the U.S. Coast Guard in the 1940's. Also sections of the original earth bastion have been removed at the main entry drive and Waikiki Beach walk. These conditions make it difficult to understand the original layout of the bastion.

Adjacent Area

To the south of the fort site is a large open parking area used by visitors and boaters. The most prominent building on Winter Island is the abandoned seaplane hanger constructed in 1930's. The closest visible buildings to the fort are a small Office Building and a Ready Ammunition Building both constructed by the Coast Guard in the 1930's.

Remaining Visible Features

The remaining visible and historic features that have been confirmed by the archaeological consultants are (see Figure 31):

1. The parade area
2. Wet Ditch
3. The ramparts (red dotted line)
4. Gun embrasures
5. Three bomb-proof magazines
6. Igloos for munitions storage
7. The remains of the bastion (red dotted Line)
8. The lighthouse
9. The terreplein

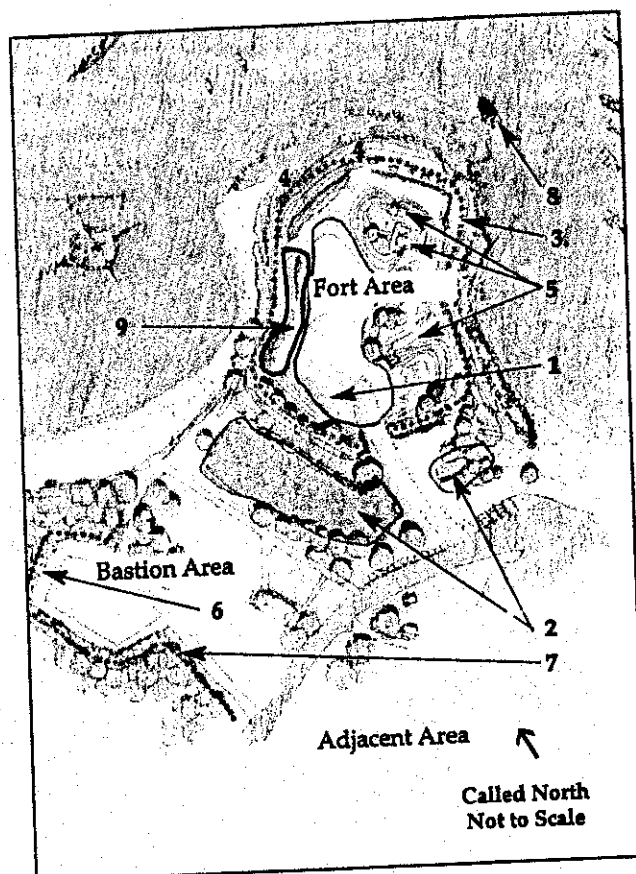


Fig. 31: Plan of existing features

Figure 31 above shows the locations of the existing features. The conditions and recommendations for the masonry features are presented in a separate section below. This section presents the landscape features conditions. The stages of fort development are shown in Fig. 32 thru 34 giving approximate locations for the 1648, 1794 and 1864 fortifications. Figure 35, the Crane & Morrison Archaeology Existing Survey Plan of Basic Topographic Features shows the present fort plan. These plans are presented as a reference for understanding the design evolution of the fort and approximate locations of remaining features.

Coordination Recommendations for all Restoration

Maintenance and restoration activities undertaken at this site must be preceded by reference to this

study and coordinated as outlined below.

1. Non-intrusive maintenance such as lawn mowing, tree and brush removal can be done without further consultation.
2. Plans for construction and grading should be done in consultation with archaeologist.
3. Consultation should be initiated with the Massachusetts Historical Commission for any intrusive activity.
4. Before grading or excavations are carried out, further archaeological investigations should be completed to determine what specific archaeological resources will be affected, to assess their significance to Fort Pickering, to make recommendations as to further investigations, if necessary, and to discuss further adjustments to plans that might limit damage to the historic resources, and that might enhance the public's understanding of Fort Pickering.
5. Coordinate all earthwork with an archaeologist.
6. An archaeologist should be on hand for any activities involving draining and cleaning of the wet ditch, other than vegetation removal.
7. An archaeologist should consult and coordinate artifact recovery from the wet ditch with a conservator experienced with waterlogged artifacts.
8. When in doubt, consultation should be made with an archaeologist from the Massachusetts Historical Commission.
9. Archaeological excavations would be essential to properly interpreting and repairing the ramparts and magazines, and would be necessary to insure that no critical information was lost. Any plans to repair or restore these features should be preceded by intensive archaeological excavations.
10. Plans for construction of viewing platforms, stairs, and grading should be done in consultation

with an archaeologist.

Wetlands Regulations

The restoration of the wet ditches and any ground disturbance within a the 100-foot buffer zone must be inspected by the Salem Conservation Commission as required under M.G.L. c. 131, § 40: Massachusetts Wetlands Protection Act; 310 CMR 10.00: Wetlands Regulations.

These Regulations apply to any wetland, including:

1. Any bank, freshwater wetland, coastal wetland, beach, dune, tidal flat, marsh or swamp bordering on the ocean, any estuary, creek, river, stream, pond, lake, or certified vernal pool;
2. Land under any of the water bodies listed;
3. Land subject to tidal action, coastal storm flowage, or flooding; and
4. Riverfront areas in the Commonwealth of Massachusetts.
5. In addition, a 100-foot buffer zone around any fresh water or coastal resource listed above is subject to jurisdiction. (see appendix for additional information)

General Recommendations

Short Term - Stabilization

1. Add selected fill material to eroding areas and compact by hand.
2. Monitor erosion and replace soil wash.
3. Add temporary barricades at selected paths to prevent further erosion.
4. Add approved ground cover to bare areas and maintain.



Fig 32: Approximate location of the Rochefontaine designed Fort William of 1794 and the outline of the earlier fort from 1648. over aerial photograph c. 1970 (not to scale)



Fig 33: Plan of Fort Pickering 1936. Engineer's Office, City of Salem.



Fig 34: Approximate outline of the Drafted Plan 1864 of Fort Pickering, ramparts in green.



Fig 35: Approximate outline of Crane & Morrison Archaeology's plan of basic topographic features.



Fig. 36: Photograph from Winter Island parking area, March 31, 1942. Richard C. Kelsey photograph, on file Office of Planning and Community Development, City of Salem.



Fig. 37: Photograph from Winter Island Parking lot 2003. Dennis Gray.

5. Monitor erosion and plant growth and replace soil wash.

Mid Term - Preservation

1. Selectively remove vegetation to allow site survey to be completed and contract for complete site survey.
2. With complete survey prepare final Restoration Plan with phased development if required.
3. Prepare plans and technical specification for proposed restorations.

VEGETATION AND LANDFORMS RECOMMENDATIONS

Vegetation has been allowed to grow without maintenance for several years and has overgrown much of the remaining fort landforms. Earthen ramparts have suffered isolated erosion and settle-

ment. The wet ditches are overgrown and have accumulated debris. The landscape setting is obscured and thus conceals the shape and design of the fort and ultimately one's understanding of this historic site.

Short Term - Inspection and Testing

The overgrown areas surrounding Fort Pickering have been found to be "sensitive" for containing significant archaeological resources. The visible ramparts are historical features in their own right, dating from the 1860's. Evidence of earlier incarnations of the fort may be buried within them, particularly at the east end of the fort. This evidence could provide insights into the nature of the fort at a time when it was much smaller. Overgrowth between Magazines A and B covers the expected location of a barracks building, later a storehouse, that stood as late as 1820, but which might have dated from the first half of the 1700's. The overgrown ramparts of the North Bastion and its ditch date from the late 1860's. In addition to containing aircraft parts, tire, and other modern debris, the wet ditches may contain significant artifacts dating from the Civil War through the Spanish American War.

Portions of the maintenance plan can be carried out without impact to archaeological deposits. Surface vegetation can and should be cleared and trees cut flush to the ground. However, roots should not be grubbed out, excavated, chipped or otherwise removed below the existing ground surface. Any soil that is bared should be stabilized to avoid erosion.

Beyond such routine non-invasive maintenance, specific grading and construction plans for the fort should be developed in consultation with archaeologists so as to minimize potential impacts to surface features and buried archaeological deposits. If construction plans ultimately call for disturbances to the existing ground surface, additional archaeological testing should be carried out. This testing should be aimed at determining what specific archaeological resources will be affected, what

their significance is to Fort Pickering as a historic and cultural resource, and to making recommendations as to further investigations, if necessary, and to consult on further alterations to plans that might limit damage to the resource.

Long Term - Restoration

1. Remove vegetation as required by the final restoration plans.
2. Regrade areas to conform with approved final restoration plan.
3. Excavate to stabilize soil materials and make repairs to structures, foundations, and waterproofing materials as required.
4. Install new drainage systems or repair existing systems.
5. Install vegetative materials for ground cover and stabilization.

ACCESS AND VIEWING AREAS RECOMMENDATIONS



Fig. 38: Photograph of parade and bunkers 2003. Dennis Gray

Walking paths have been created through visitor's use of the site. The paths do not have ground cover and are causing earth erosion. In some locations the grade has eroded because of surface runoff and the original earthen ramparts (the flat-

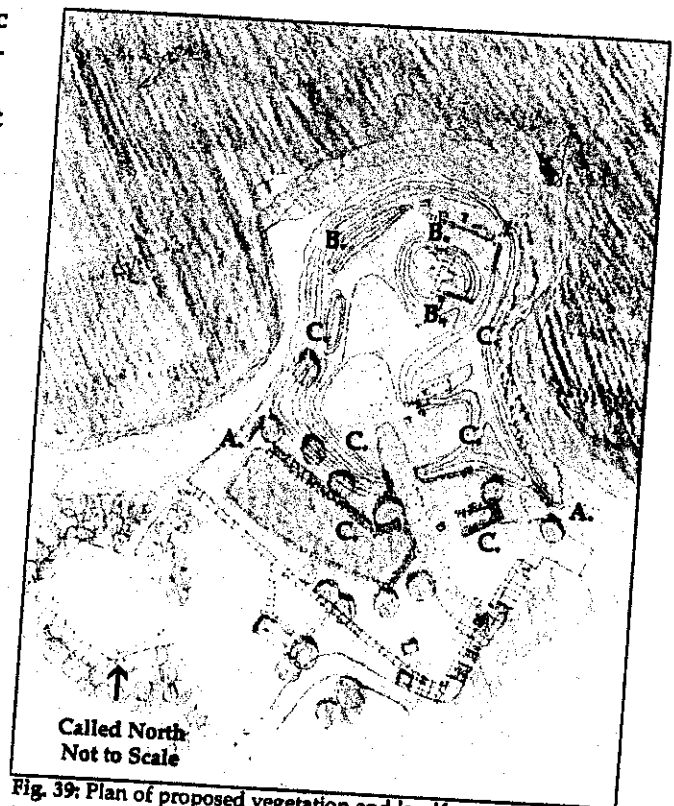


Fig. 39: Plan of proposed vegetation and landforms . A. Install temporary barriers to prevent erosion. B. Regrade area to conform with restoration plan. C. Remove vegetation to expose remaining features.

topped formations that contrast with the natural terrain) have lost their identifying shape. Treatment includes cutting, filling, grading, and reshaping existing ramparts and ultimately abandoning the existing paths and creating new more stable paths leading to the viewing areas and other accessible areas. A small viewing area exists on the Salem Harbor side with four benches. This area gives excellent views and should be maintained. Paved parking for Winter Island and Fort Pickering exists to the south of the fort although no accessible or designated parking is provided for the fort.

Short Term - Inspection and Testing

Access routes and proposed viewing areas may be located in places that archaeologists have identified as "sensitive" for containing significant



Fig. 40: Photograph at eroded path with fence guard at Waikiki Beach 2003. Dennis Gray.



Fig. 41: Photograph at wood steps to beach near lighthouse, 2003. Dennis Gray.

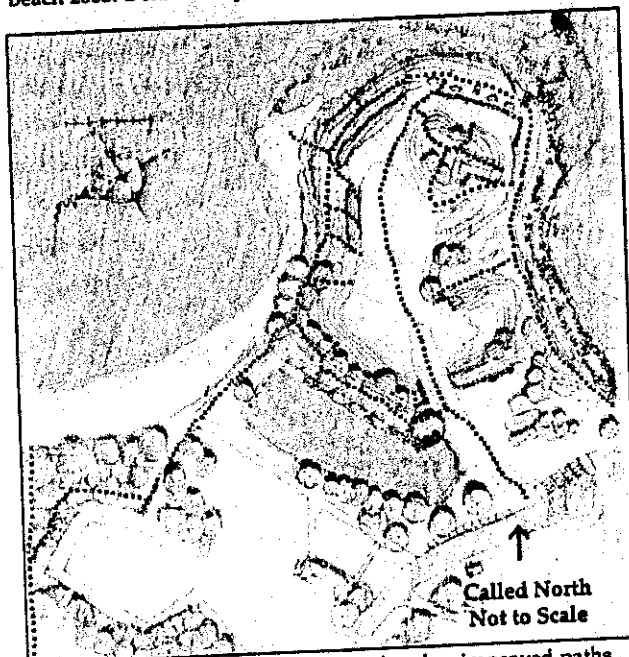


Fig. 42: Plan of existing unsanctioned and unimproved paths shown in red.

archaeological resources. In particular, important structural remnants and artifacts dating from the eighteenth and nineteenth centuries are buried in the parade ground. Additionally, the ramparts might hold evidence of a succession of construction episodes dating from as early as the seventeenth century and possibly as late as the 1890s.

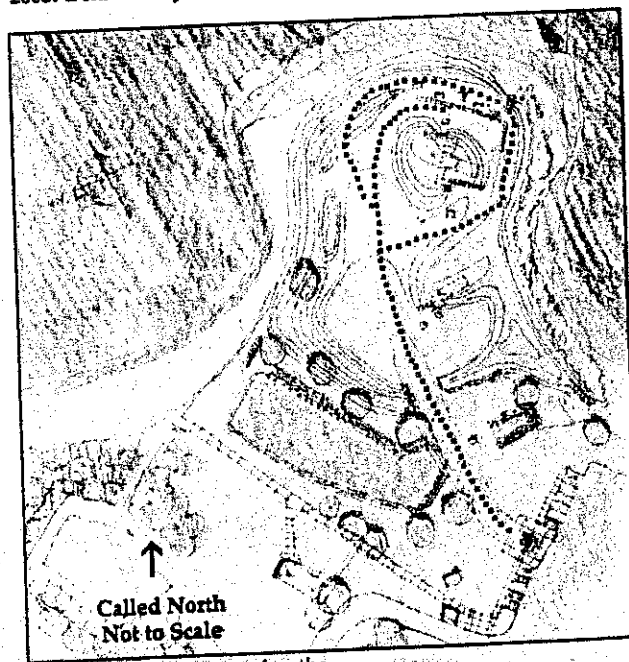


Fig. 43: Plan of proposed paths.

Outside of the fort proper, remains might be found related to fort construction activities, as well as to the military occupation of the forts. Evidence of significant non-military occupations might also be present, including Native American sites, fish processing stations, and shipyards.

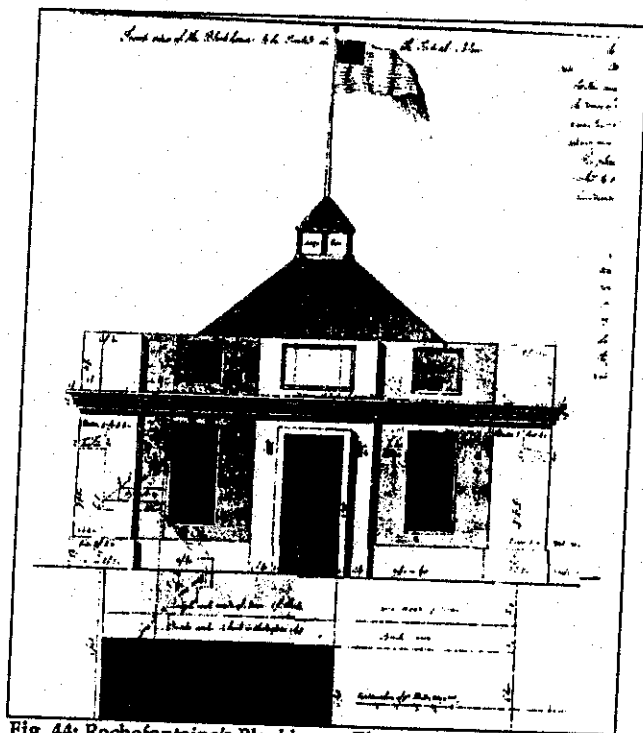


Fig. 44: Rochefontaine's Blockhouse Elevation, 1794. Courtesy of the Peabody Essex Museum Salem, MA.

Specific construction designs for paths and viewing platforms should be prepared in consultation with an archaeologist. If the ultimate construction plans call for disturbances to the existing ground surface, additional archaeological testing should be carried out. This should be aimed at determining what specific archaeological resources will be affected, towards assessing their significance to the historic fort, and to making recommendations as to further investigations, if necessary. To date, archaeological testing has been inadequate to guide planning of restoration to the ramparts. If such restoration is to be done, an intensive archaeological excavation should be carried out. Excavation results could clarify successive building episodes. That information would lend itself to providing guidance to a sensitive restoration, as well as to providing additional information for public interpretation.

Long Term - Restoration

It is recommended that formal paths be construct-

ed from the parking area through the parade and to the viewing area. Formalize the viewing area with new benches located in alignment with the rampart stone wall. Abandon other paths and restore ground cover. Reconstruct original walls at Waikiki Beach to prevent access to the ramparts near the beach. Regrade rampart at the Winter Island Beach and restricted entry.

1. Construct formal paths and reconstruct original walls and ramparts at Waikiki Beach and Winter Island Beach
2. Install wheelchair access from parade to top of ramp.
3. Install geotextile fabric reinforcement sheets at steep slopes for arability.
4. Install vegetative materials.

INTERPRETATION RECOMMENDATIONS

Fort Pickering has visible remnants from two periods of use. Of the 1794 construction, only the blockhouse cellar/ magazine survives. The 1864 rebuilding dominates the remains. The remnants are obscured by vegetation and have deteriorated over time. Like Fort Lee, interpretive plaques exist in various locations on the site.

Short Term - Inspection and Testing

Archaeological research can be an invaluable addition to the public interpretation of Fort Pickering. Testing has already revealed that important information about the sequence of construction and usage of the fort is buried in the ground. Furthermore, observation of archaeology in progress can be an exciting way for the public to experience history, historical places, and to connect with historical peoples. Finally, the material recovered from such excavations can be used in permanent exhibits that illustrate the site's development, usage, and historical meaning.

Further, the area where the information kiosk is



Fig. 45: Aerial photograph of Fort Pickering c. 1970

proposed has been identified by archaeologist as a location where buried remains associated with the Civil War era construction, Civil War era garrison, Spanish-American War era garrison, and Coast Guard, might be located. Each of these could contribute to our understanding of Fort Pickering. If construction of the kiosk entails ground disturbance, final design and construction should be preceded by intensive archaeological investigations. This will identify the nature of archaeological materials that will be disturbed and may provide guidance as to how designs can be added to minimize disturbance.

In addition to containing aircraft parts, tire, and other modern debris, the wet ditches may contain significant artifacts dating from the Civil War through the Spanish American War. Testing prior to draining and cleaning is impractical. However, an archaeologist should be on hand for these operations. Further, consultations and arrangements should be made with a conservator experienced

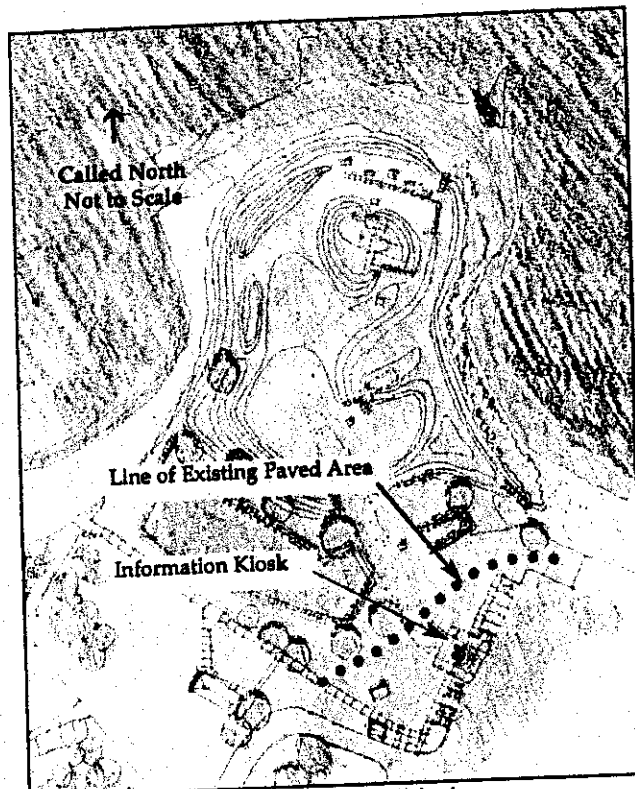


Fig. 46: Restoration Master Plan, Fort Pickering

with waterlogged artifacts in advance of these operations as to how specific material classes should be stabilized and treated for long term study and preservation.

Long Term - Restoration

An interpretive master plan for Fort Pickering should be developed in conjunction with Fort Lee. An approach to this fort's interpretation should include some level of restoration of the 1794 magazine interior and some of the 1864 features. A broad approach would include the other military buildings and features throughout Winter Island, thus exhibiting the military use of these sites from 1794 to 1969. The scope of this study however, is limited to Fort Pickering. Suggestions for interpretation of Fort Pickering, that would complement the restoration recommendations, would include; new interpretive plaques, re-creation of the wet ditch, north wall passage, wall at end of

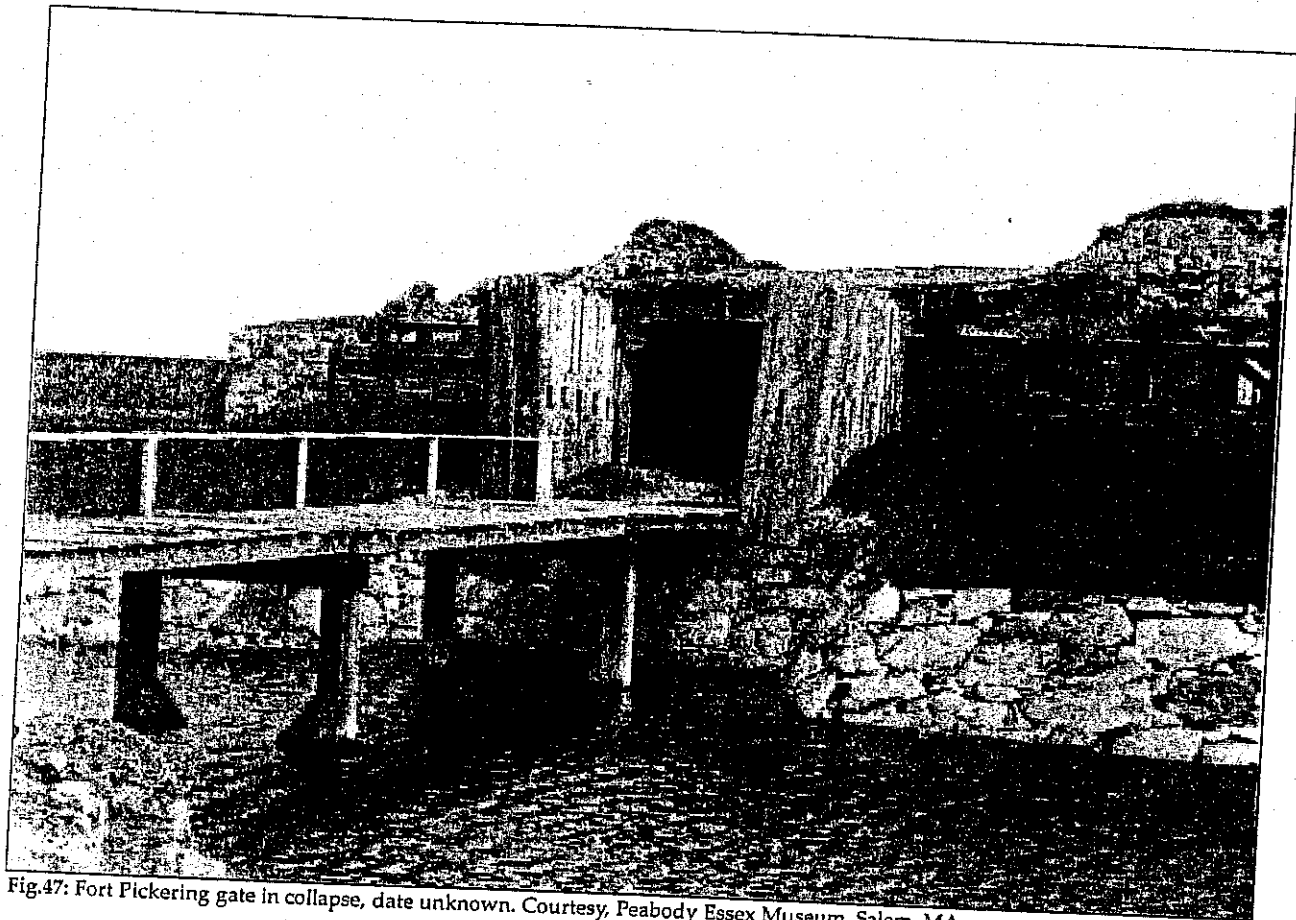


Fig.47: Fort Pickering gate in collapse, date unknown. Courtesy, Peabody Essex Museum, Salem, MA.

wet ditch and flanking wall entry. If the interpretive concepts for Fort Pickering includes signage, the design, images and text must be developed to include the historic research from this study and combined with an overall interpretive plan for both forts. This plan may include a visitor's center on this site, possibly in an existing building or as part of the restored rifle gallery.

1. Create a viewing platform and stair access to top of the Bomb Proof Magazine Bunker.
2. Re-grade earth rampart to restore original earth form.
3. Enlarge the grass entry area removing the entry drive and create Fort Pickering accessible and designated parking.

4. Create a main entry plaza with informational kiosk.

5. Provide new interactive interpretive kiosks at main entry to fort.

6. Provide new plaque type interpretive signs at specific locations.

7. Repair rampart stone walls and recreate the earth fort at one section to allow full understanding of the fort construction.

8. Drain wet ditch to remove aircraft parts and other refuse and clean and repair the moats.

9. Repair all earth ramparts at bunkers.

MASONRY CONDITIONS AND RECOMMENDATIONS

Introduction

This section presents the basic history, construction materials, current conditions, and treatment recommendations for the various extant masonry features at Fort Pickering. Fort Lee does not have any visible historic masonry features, and is therefore not discussed in this section of the Report. William Finch of Finch & Rose carried out the field examination of the masonry features and drafted this section during July, August and September of 2003. All non-historic photographs in this section were taken by William Finch in 2003. Additional historical background for the masonry features together with the overall history of the fort is provided in the Archeological Report prepared by Crane and Morrison. The Archeological Report also provides scaled floor plans of the three magazine structures in the fort. The archeological work directly relevant to the features discussed in this section was limited to visual surface reconnaissance on-site, review of historical plans and photographs, a subsurface test pit in the parade several feet in front of the entry to magazine A and another on the top of the south rampart. Other test sites within the parade were not relevant to the masonry features in this section.

This section is organized to first present the features associated with the main ramparts of Fort Pickering constructed during the late 1860s, and then reviews World War II vintage concrete masonry located within the northwest earthwork bastions that were initially constructed c. 1870. Recommended treatments are discussed in detail in the text, and then summarized as a list at the end of each sub-section. The drawing titled "Masonry Features" at the end of this section is annotated to locate the various types of masonry features, their general condition and construction type, and to show the locations of representative photographs. A thumbnail orientation drawing of Fort Pickering accompanies each sub-section with the location of the subject features indicated by shading. The masonry features are discussed in

the following order:

North Rampart and North Wet ditch

- Rip Rap on south side of wet ditch
- Entry wall on west end of rampart
- North Rampart Rifle Gallery Rear Wall
- Walls at east end of wet ditch

West Rampart and West Wet ditch

- West Wet ditch
- West Rampart and Rifle Gallery

South and East Ramparts

- South Ramparts
- East Ramparts
- Tidal Rip Rap

Magazines A, B, and C

- Magazine A
- Magazine B
- Magazine C

Northwest Bastion

- Storage Igloos and Panels
- Access Roadway

Summary of Treatment Recommendations

The treatment recommendations for the masonry features can be summarized in the following categories and general guidelines.

Woody Vegetation Clearance and Soil Stabilization

As discussed in the section on landforms, this treatment is essential to make the earthworks and related masonry features clearly visible to the public, and to prevent further deterioration by invasive root systems and soil erosion. It is also needed to enable a full topographic survey of the site and allow a more detailed examination of conditions in preparation for any rebuilding and restoration work. The goal of this treatment should be to return the fort to the general appearance documented in the 1930s-40s photos of the site with an herbaceous ground cover that can be controlled by routine mowing. The basic clearance and replanting work could be done by City of Salem staff provided they receive preparatory training from qualified professionals in the proper procedures and

standards to protect archeological and masonry features, and prevent erosion. Archeological testing is not required as long as the soil below grade will not be disturbed by the work. Essential guidelines for this work includes the following:

- Cut back undesirable woody species to just above the soil line (or as otherwise directed by training program), but do not attempt to remove roots.
- Mow existing herbaceous plant cover in a manner that allows rapid regeneration to prevent erosion.
- Reseed any bare ground immediately after clearance with appropriate herbaceous species to prevent erosion
- Do not disturb or move random stones on the soil surface as well as the stones within stone walls.
- The application of substantial amounts of fill must be documented on plans, and should also include placing non-biodegradable netting on the existing surface prior to filling as an indicator of the current grade for future archeologists.

Debris Removal

This work is limited to the removal of modern trash(bottles, cans, wrappers, etc.) from the enclosed portions of the magazines and areas of woody brush. The work can be done by City of Salem staff as part of routine maintenance with the following limitations. Archeological testing is not required as long as the soil below grade will not be disturbed by the work.

- The soil accumulation on the magazine floors should only be removed by qualified archeologists unless otherwise directed by the archeologists.
- Random stones, bricks and remnants of wood flooring should be left in place.

Stone wall chinking, stabilization, and limited rebuilding

All work in this category must be done by skilled

professional masons experienced with dry stone wall work and historic preservation standards. Essential guidelines include the following:

- Use the existing intact portion of the north rampart entry wall (figure 8) as a model of visual character for chinking and rebuilding visible stone walls, along with any relevant historic photographs.
- Fully record any sections of wall to be partially or fully taken down for rebuilding using scaled and rectified photographs and/or scaled drawings. Devise a numbering and orientation marking system and apply to stones and record on photographs prior to disassembly of wall.
- Precede any rebuilding with archeological testing, measures to limit damage to archeological resources, and/or recovery wherever the soil below grade is likely to be disturbed by the work. Archeological testing is not required as long as the soil below grade will not be disturbed by the work.

Concrete Repairs at Northwest Bastion

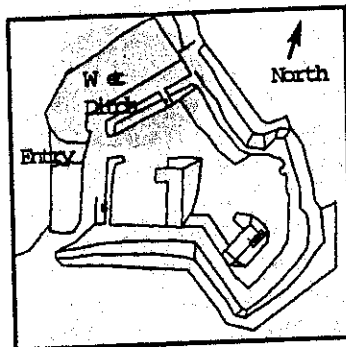
All concrete repairs must be done by skilled professional masons experienced with concrete repair, and new precast units should be fabricated only by firms that specialize in precast concrete work. Basic stabilization work to remove vegetation, remove dangerously deteriorated panels above igloos, and apply fill can be done by city of Salem staff provided they follow guidelines established by archeological testing to determine the extent of soil behind the concrete panels that can be disturbed without affecting archeological resources.

Reconstruction and restoration of masonry and earthwork features

All work in this category (primarily reconstruction of a section of the missing west rampart and associated rifle gallery, restoration of the west wet ditch, and restoration of a typical gun embrasure) requires additional document research, on-site archeological investigation, and preparatory plan-

ning by historic preservation design professionals prior to execution by professional contractors. The archeological work performed under this study did not include any on-site below grade testing at the specific locations that would be affected by the recommended restoration and reconstruction work.

North Rampart and North Wet ditch



General

The north rampart and its masonry features as visible today convey little of the appearance of the

fort as constructed in the Civil War period due to a combination of rampant vegetation and physical deterioration. The Civil War fort incorporated a wood frame rifle gallery facing the wet ditch that has now completely collapsed with its remnants likely buried under the soil between the remaining rampart and the wet ditch. The dry laid stone wall currently visible along the north edge of the rampart is actually the top of the stone wall that originally formed the rear of the rifle gallery (Fig. 49). The rest of the wall lies buried beneath the surface. This wall was never intended as a visible exterior feature of the original fort. Figures 50-53 on the following page provide a graphic explanation of the evolution of the original Civil War period construction to its current appearance.

Rip Rap on south scarp of wet ditch

Condition is sound and largely original. The current water level is several feet higher than the level in historical photographs. The portion under the causeway leading into the fort is a jumble of stone and soil fill that is a 1940's alteration that replaced the original bridge. The original rip rap bank appears to remain beneath it. The causeway

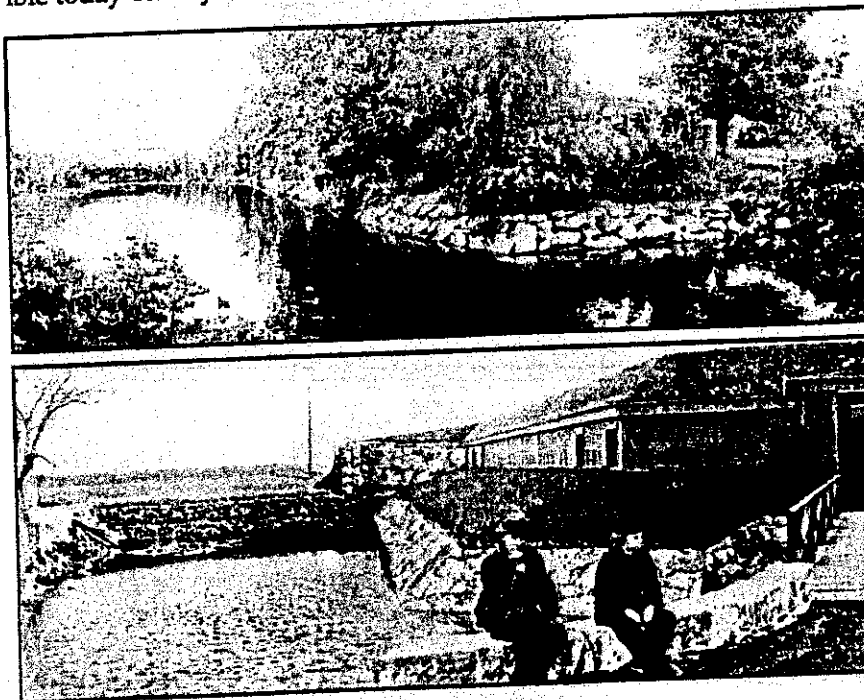


Fig. 48: Current appearance of north rampart, north moat, and entry to fort (extreme right). The dry laid stone rip rap on the edge of the moat and the stone wall visible at the end of the moat are largely intact to their original appearance and are in serviceable condition. The north rampart is completely obscured by vegetation, but has also lost all its detailing except its general mass. See Fig. 49 below for c. 1860's appearance of this view.

Fig. 49: C. 1860's photo of north rampart showing rifle gallery with bomb proof soil roof combined with c. 1900 photo of moat. Both photos courtesy of Peabody-Essex Museum (PEM).



Fig. 50: Current typical appearance of dry laid stone wall that originally served as the back of the rifle gallery. The top of the rampart lies just above and behind the stone wall. The wall is dishevelled with substantial soil erosion above and below it.

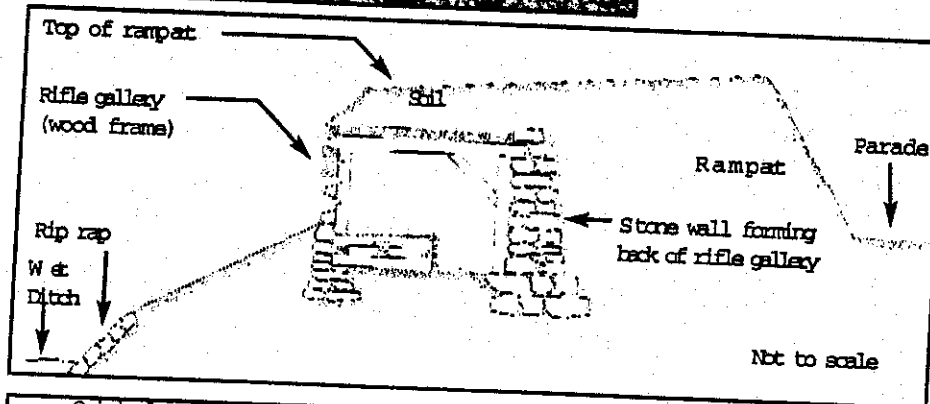


Fig.51: Conjectural section of original rampart with wood frame rifle gallery overlooking moat (based on 1830 drawing by West Point Cadet Thomas J. Lee from manuscript collection of Finch & Rose). The rifle gallery was covered with soil to make it bomb proof.

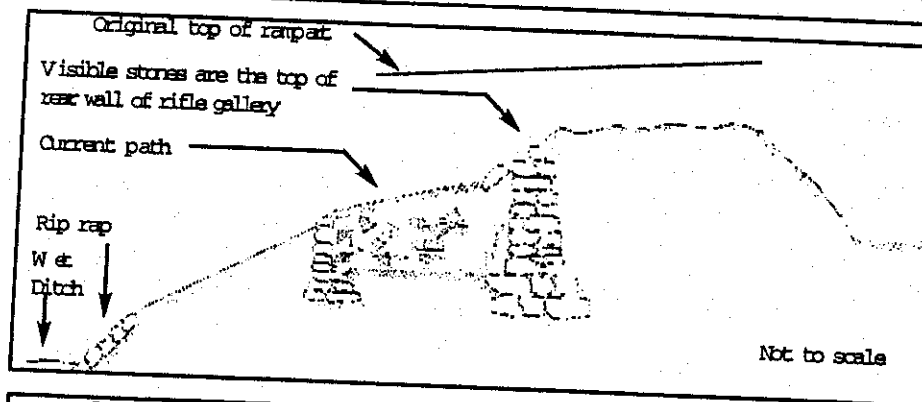


Fig. 52: Section of current condition of north rampart with remains of collapsed rifle gallery buried by the soil that was originally on its roof. Height of rampart has likely been reduced by erosion (red line indicates original height)



Fig. 53: C. 1860's photo of north rampart showing rifle gallery with bomb proof soil roof. Also note stone wall visible thru gate. This is at the base of a defensive rampart within the parade, and illustrates the original neat finish of the stone walls associated with the ramparts. Photo is a composite picture combining a c. 1900 photo on the left with the c. 1860's fort photo. Both photos courtesy of PEM.C.

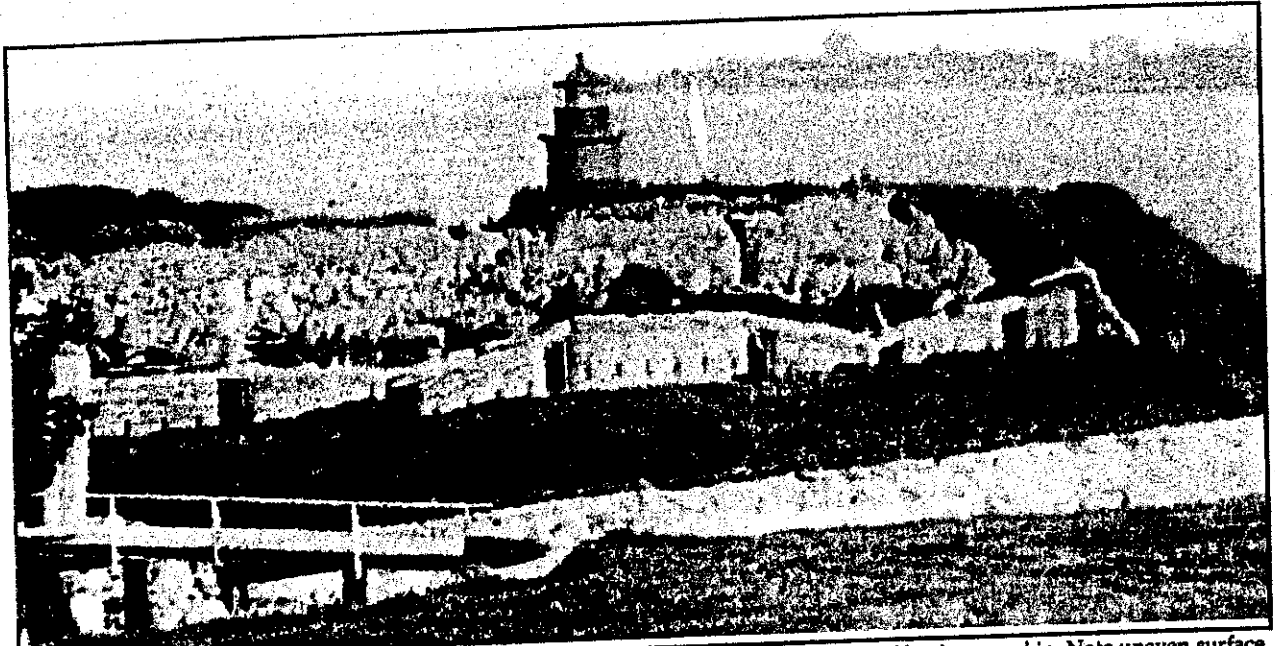


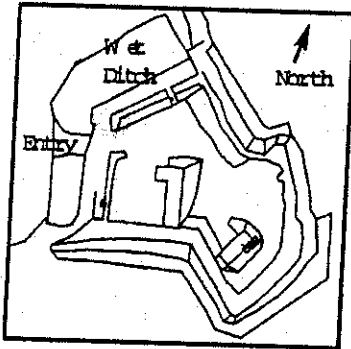
Fig. 54: C. 1900 photo of west rampart showing rifle gallery in partial collapse with the roof having caved in. Note uneven surface and erosion to top and face of remaining rampart. Photos courtesy of PEM.C.

apparently blocks the flow of water into the west moat. The causeway is functionally sound and not visually obtrusive. Restoration of the original bridge would be expensive and is not essential to understanding the fort.

Recommendations - North Wet ditch Rip Rap

Retain both rip rap and causeway masonry as is.
No substantial repairs appear needed.

Entry wall on west end of rampart



This dry laid wall of roughly dressed massive stones with tight chinking remains stable and reasonably plumb, but is missing some chinking and a few smaller stones. The right hand section of it in Figure 54 is the most intact example of the original dry stone wall construction remaining at the

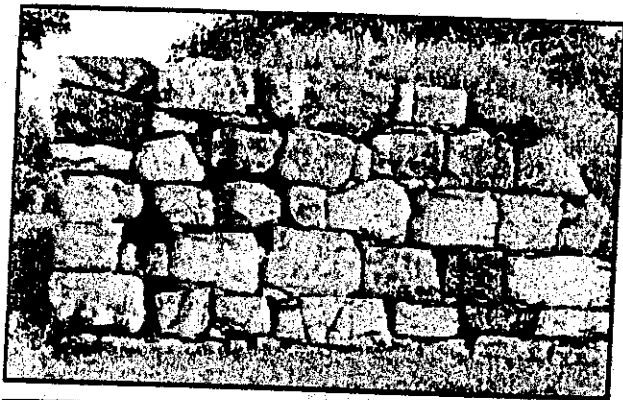


Fig. 55: Main entry wall at north Rampart (west face) showing voids to be chinked, especially on left side. The right side should be used as a model for the repair, rechinking and rebuilding of other dry stone walls.

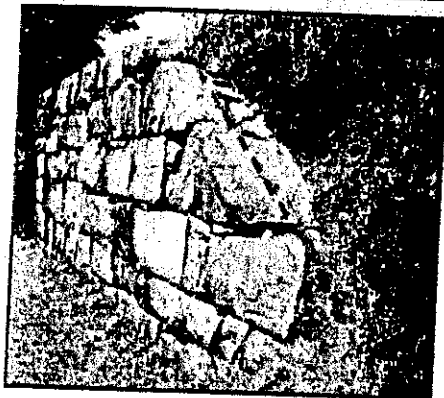


Fig. 56: Parade side flank of entry wall showing soil erosion. Soil should be restored to cover to the red line.



Fig. 57: Entry wall becomes more disheveled on its wet ditch side face, and needs partial rebuilding and chinking.

fort. It should be used as a model for rebuilding and repair of the other dry stone walls at the fort. Soil erosion at the wall's margin at the parade side of the rampart threatens to undermine the cap stones. Some graffiti is present. The wall turns the left corner to face the wet ditch where its condition becomes more disheveled. It then makes another turn and becomes largely buried in the soil of the collapsed rifle gallery roof.

Recommendations – North Rampart Entry Wall

Short term – Stabilization:

- West Face: Chink voids in joints to match existing chinking, and fill large void on left side with a single stone plus chinking. Restore soil cover to parade side flank. Remove graffiti.
- Wet ditch Face: Rebuild with added chinking to match character of west face. Restore soil cover to top.

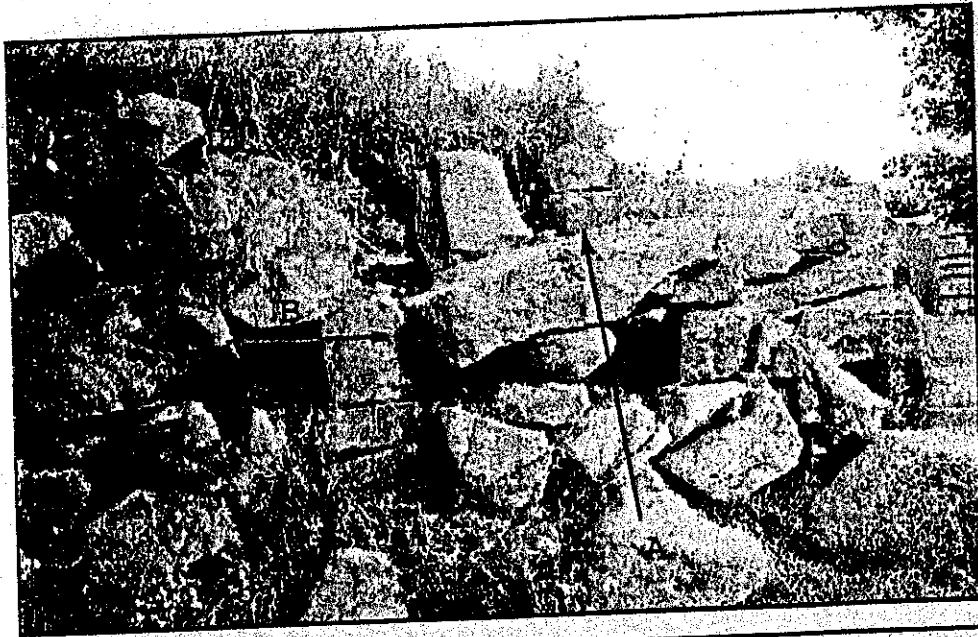
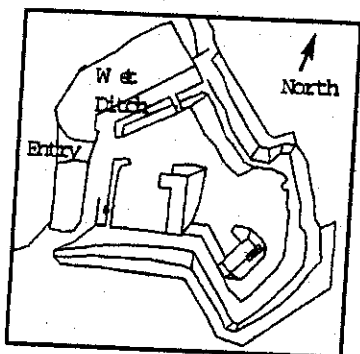


Fig. 58: Rifle gallery wall at entry corner - current view. Rock marked "A" has fallen or been pushed off the wall since 1998 (Arrow marks 1998 position). Soil behind corner with entry flank wall is also deeply eroded and will eventually undermine the corner of the entry wall. At minimum this section of wall should be rebuilt and the grade behind it restored to the top of the walls in order to stabilize this corner. Gap at B may be former chimney and should be maintained in rebuilding.



Fig. 59: Rifle gallery wall at entry corner - 1998 view showing Rock marked "A" in position. Note that the other voids in the wall in Figure 55 were also present in 1998, indicating that the disintegration of this wall is a relatively slow process.

North Rampart Rifle Gallery Rear Wall



The typical condition of this wall is shown in fig. 50. Its appearance in 1942 is documented in fig. 61. The wall currently appears as an informal fieldstone wall without a uniform top and with occasional dislodged stones at the foot of the wall. It was not a visible part of the Civil War ramparts, but could be considered significant to the fort's 20th century appearance as a ruin. Other than its condition near the entry flank (Fig. 58 and 59) and

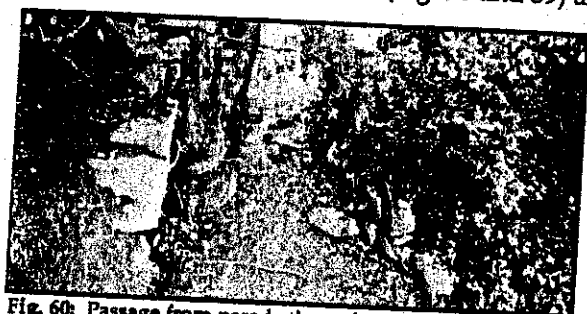


Fig. 60: Passage from parade through rampart into north rifle gallery, looking from parade. This was a bomb proof passage with a timber roof covered with soil. The roof collapsed and is presumably buried beneath the surface of the cut. The large tree threatens the wall remaining below grade and obscures the visible feature. It should be removed above grade with its roots left in the ground to decay naturally. There is substantial soil erosion occurring to the rampart on each side of the cut.



Fig. 61: C. 1942 photo looking over remains of north rampart rear rifle gallery wall to magazine B (B) and remains of west rampart. Arrow points to passage from parade to rifle gallery. Short term work to rifle gallery wall should aim to stabilize the wall to this condition. Photo was taken from position of "B" in Fig. 63. Photo, Salem Community Development Dept. (CD)

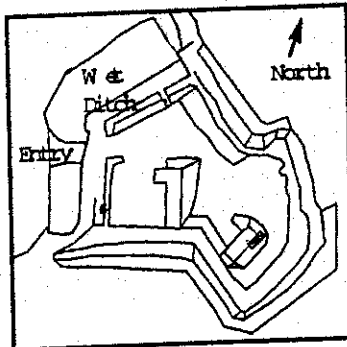
the passage from the gallery parade (fig. 60), its generally disheveled appearance and continued deterioration does not threaten the overall stability of the ramparts. Rebuilding can be limited to work needed to stabilize erosion and any obviously loose stones. As the historic appearance of the wall is likely preserved below the soil, we do not see an imperative to precisely maintain its current appearance as long as its general character is preserved. The appearance of the wall in the 1942 photo in fig. 61 is a reasonable standard to match in minor rebuilding and stabilization work. Careful comparison of that photo with the same area currently at the parade passage reveals specific stones that have tumbled off and now lie at the foot of the wall. As with the other masonry features embedded in vegetation, the full extent of work needed cannot be determined until the vegetation is removed.

Recommendations – North Rifle Gallery Rear Wall

Short term – Stabilization:

- Rebuild corners at rifle gallery passage, and at west end as required to stabilize the flanking walls and retain soil. Rebuild remainder only as required to stabilize erosion and secure random loose stones. Maintain general existing appearance of wall, using 1942 photo as guide for rebuilding the rifle gallery passage. Archeological testing is not required as long as the soil below grade will not be disturbed by the work.

Walls at east end of wet ditch



The walls retaining the end of the main rampart as it drops down to the spit of land between the wet ditch and the beach are illustrated in Fig. 62-64. They have lost considerable height and much of their original chinking. Based on Fig. 63 their original character was similar to the entry flank wall of the north rampart with moderately uniform but roughly dressed stone and much tight chinking. Wall "A" currently looks much less regular than

the historic photo, and may have already been partially rebuilt using the remaining original stone. It is currently threatened by the deep erosion of the path up the rampart. This is a very heavily traveled path, as it is the main link between the picnic area and the east rampart. Wall "B" is completely hidden by vegetation except the upper face of the top stones. The wall at the end of the wet ditch remains sound and appears to be as originally constructed.

Recommendations – East End Walls @ North Wet ditch

Short Term – Stabilization:

- Limited rebuilding and chinking of wall "A" fig. 62 & 63 and reset any loose stone. The extent of repair needed at wall "B" cannot be determined until the vegetation is removed.

Mid Term – Restoration:

- Fully rebuild both walls (A and B) to their origi-

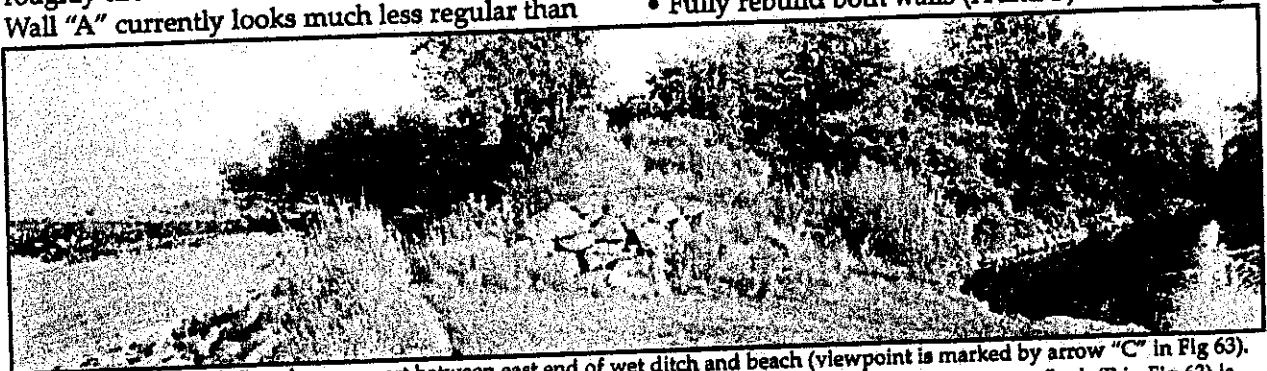


Fig. 62: Looking south from low rampart between east end of wet ditch and beach (viewpoint is marked by arrow "C" in Fig 63). Wall marked "A" has lost height, its uniform appearance, and is threatened by erosion from path. Its return flank (B in Fig 63) is concealed by vegetation, but likely is in similar poor condition.

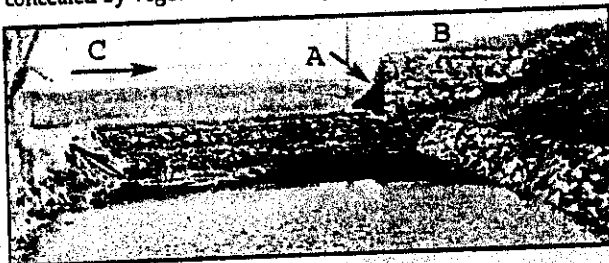


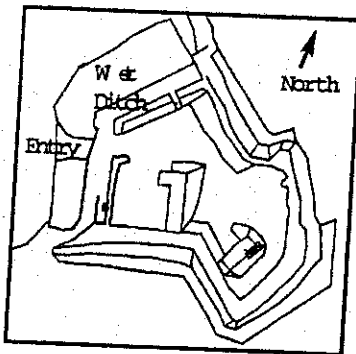
Fig. 63: C. 1900 photo of east end of wet ditch showing intact appearance of wall "A" in Fig. 62 and its return section "B". These walls were well chinked like the main entry flank wall in fig. 55. Photo courtesy PEM.



Fig. 64: Erosion from path behind wall "A" threatens to undermine the wall.

nal height and character with tight chinking.

West Rampart and West Wet ditch



General

This portion of the fort was originally identical to the north rampart with a rifle gallery overlooking a wet ditch accessed by a passage through the rampart from the parade, but has been subjected to more extensive alterations during the 20th century. The 1864 fort plan drawing includes a section through the west rampart and rifle gallery.

West Wet ditch

This feature is partially filled in and is currently covered with dense marsh vegetation. It was originally identical to the existing north wet ditch with a rip rap stone bank on the fort side. It was separated from the beach by a rip rap berm. Whether its current condition is a result of conscious filling (perhaps with spoil from the former west rifle gallery), or a natural result of its water supply being cut off by the construction of the modern entry causeway and/or beach erosion is not known. The rip rap bank was found to remain, but dense vegetation currently prevents a precise evaluation of its full extent and condition. The rip rap berm at the southern end has disappeared and beach sand has filled in the south end of the wet ditch.

Recommendations -- West Wet ditch

Short term -- Stabilization:

- Remove existing vegetation along all banks and determine full extent and condition of rip rap. Assuming wet ditch is to remain as is (i.e., not dug out and re-filled with water), repair only as necessary to stabilize the rip rap in its current state.

Long term -- Restoration:

- Dredge and restore wet ditch with reconstruction of any missing or badly deteriorated rip rap to match the rip rap at the north wet ditch, including the berm (i.e., seawall) at the south end. Restoration of the wet ditch would also likely require opening a clear passage for water to flow under the causeway from the north wet ditch.

West Rampart and Rifle Gallery

The area between the rear rifle gallery stone wall and the wet ditch has been cleared out down to the grade of the current entry causeway (note; the southern end appears to be a few feet higher than the causeway grade). The northern half of the west rampart, including associated stone walls, has been cut down to a height of a few feet above causeway grade, while the southern half remains up to the top of the rifle gallery rear wall. Both actions likely occurred in the early 20th century prior to the 1942 photographs.

The dry laid stone wall that originally formed the right side of the main entry passage is currently an informal wall about 3' high that has none of the character of the existing original wall forming the right side of the passage. Probably this low wall was crudely rebuilt when the rampart was cut down.

The former rear wall of the rifle gallery along the northern half of the west rampart remains as a loose jumble of stone about 2' high.

The rear stone wall of the rifle gallery along the southern half of the west rampart is largely intact and presents a reasonable sense of the the original

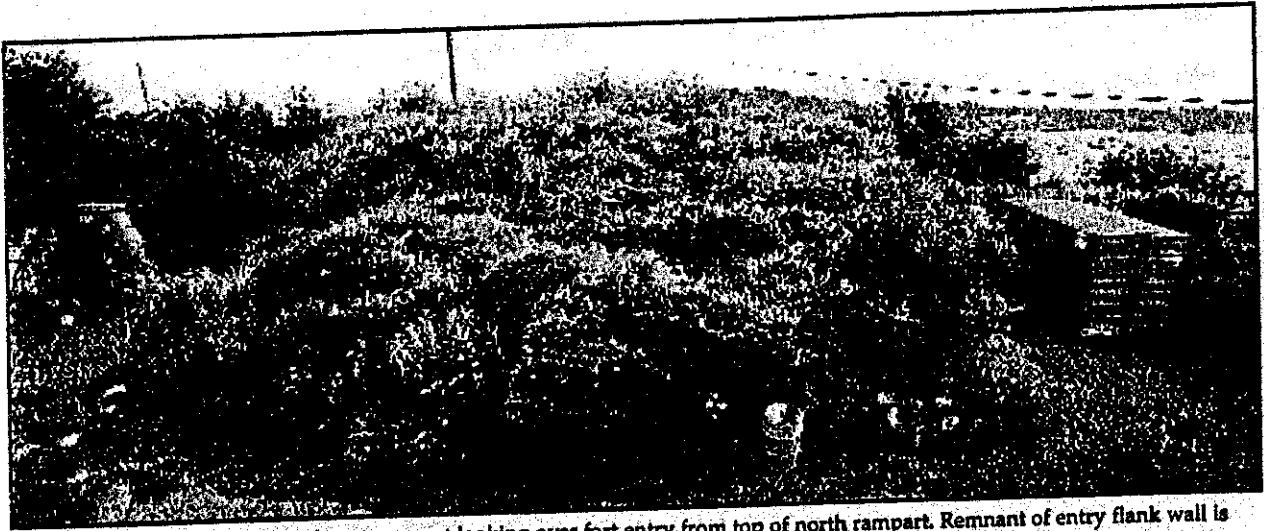


Fig. 65: Overview of remains of west rampart looking over fort entry from top of north rampart. Remnant of entry flank wall is marked by arrow. This wall originally mirrored the wall in figure 55. The entry to magazine B is marked "B". The red storage container is on the site of the former west rifle gallery.



Fig. 66: Remains of rifle gallery rear wall at south end of west rampart. Area marked by red circle bulges and may require rebuilding. The rest of the wall needs chinking. Arrow points to location of beam end in fig.67. The slot once occupied by a chimney is marked "CH".



Fig. 67: Remains of beam end that was part of rifle gallery construction embedded in wall. Additional pieces remain in place at this height at irregular intervals across the wall. After being stabilized, the wall and related archeological features in the ground in front of it should be interpreted with signage explaining the former rifle gallery.

wall that was enclosed by the rifle gallery. Wood beam ends from the original rifle gallery construction remain imbedded in the wall at irregular intervals about 4--5' above the current grade. The current character of the masonry is substantially looser than the entry flank of the north rampart. It is not clear if this difference stems from the collapse of the rifle gallery, or if the wall was less artfully constructed. A vertical slot in the wall has been identified in the archeological report as the location of a former chimney, serving the rifle gallery. The archeological survey noted a line of stones at grade about 15' west of the wall (i.e., midway between the wall and the wet ditch). These are probably the remains of the foundation for the outer wall of the rifle gallery.

The entire wall should be rechecked to secure any loose stones. The northernmost portion of it bulges slightly and could potentially collapse. It warrants partial rebuilding to stabilize it. The wall is currently heavily obscured by vegetation.

Because the west rampart does not currently present an entry flank wall matching the one at the north rampart the historic entry to the fort is not well defined. This presents a confusing image to visitors. Reconstruction of the entry end of the west rampart to match the contours documented in the 1864 drawing, including a section of the rifle gallery would improve the entry and provide a full scale vignette of what the fort actually looked like. The southern end of the rampart would be retained as is as an archeological site to help the visitor understand how archeology informed the reconstructed segment.

Recommendations - West rampart and Rifle Gallery

Short Term - Stabilization:

- Remove existing vegetation from walls.
- Recheck to secure any loose stones (do not disturb remnants of wood beams).
- Partially rebuild the northern portion where it bulges as required to stabilize it.

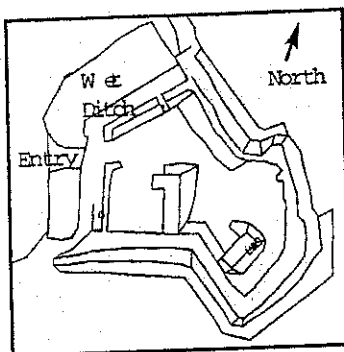
Mid-Term - Interpretation:

- Provide signage to interpret the archeological features at the southern end of the west rampart (rear rifle gallery wall, wood beam ends, chimney slot, and rifle gallery front foundation).

Long Term - Reconstruction:

- Reconstruct the entry end of the west rampart to match the contours documented in the 1864 drawing, including a section of the rifle gallery. The total length should be about 60' terminating at the former passage from the parade. This should be coordinated with the restoration of the west wet ditch.
- Consider using the interior of the reconstructed rifle gallery as a visitor center.

South and East Ramparts



General

These earthwork ramparts form the seaward perimeter of the fort from the south end of the west rampart around to the east end of the north rampart at Wakiki beach. Visible masonry features are limited to low dry stone retaining walls (i.e. parapets) along the interior side of the south rampart, and rip rap forming the seaward base of the entire rampart length.

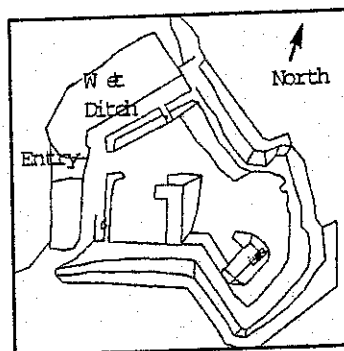
According to the 1864 plan these ramparts included 11 embrasures for gun emplacements. The locations of at least 5 of these are indicated by the current erosion patterns in the east rampart, and 7 are apparent in the 1930's-40's aerial photographs. There is no remaining visual evidence of the other embrasures.

The original configuration of the south rampart is shown in section on the 1864 fort plan drawing.

South Ramparts

From the corner of the west rampart to Magazine B, the presence of some masonry is indicated by a few stones poking through the foliage, but its condition and extent is completely obscured by rampant, nearly impenetrable vegetation. One of the c. 1900 photographs shows a scattering of large stones a little below the crest of the parapet. The

1864 plan shows an abrupt 4' drop in the height of the rampart about 35' from the corner of the west

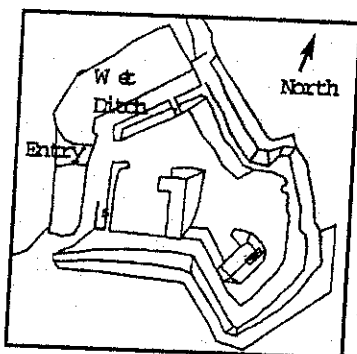


rampart. This is visible in the background of one of the historic photographs, but is no longer apparent.

The section between magazines B and C consists of a haphazard row of large stones just inside the crest of the parapet.

Starting at magazine C the stone wall becomes more organized and forms a low parapet wall even with the top of the rampart. This turns the corner at the lighthouse and runs about 100 feet easterly, at which point it starts to peter out, disappearing entirely after about 50'. This section of the rampart has a very broad and level top with a well defined path, mowed grass, and several benches. There is a small set of stone stairs set in the wall in the midst of this section. The 1864 plan shows several embrasures in this section, but there is currently no visible trace of them. A sub-surface test pit in the area of the benches (Archeological Report), pp. 125-6 and figure 5.5) did not further clarify the history of this area. One wonders whether this area was reworked to a uniform height in the late 19th or early 20th century, perhaps in conjunction with the installation of the lighthouse.

East Ramparts:



The next section exhibits considerable erosion, is obscured by vegetation, and lacks the well defined parapet of the previous section. At several locations clumps of stone are present a few feet below the crest of the parapet. Whether these are the remains of a deteriorated parapet stone wall or some other feature such as an embrasure is not evident.

The last section of the east rampart shows no visible evidence of stone walls or parapets. It is more heavily eroded and obscured by vegetation than the other sections. In this and the previous section the deepest patterns of erosion running at right angles to the rampart roughly align to the embrasures on the 1864 plan.

Recommendations – South and East Ramparts

Short Term – Stabilization:

- Remove existing vegetation using care to not disturb any stones including those that appear to be lying at random.
- Rethink any loose or missing stones in the areas having well organized stone parapet walls.

Mid-Term – Research and Testing:

- Carry out archeological testing at locations of former embrasures and gun emplacements for evidence of their construction detailing.
- Carry out additional document research at

the National Archives and Coast Guard archives for details original construction and later changes.

Long Term – Restoration:

- Consider restoring more sections of organized stone parapet walls along the ramparts if further research and physical evidence indicates they were present.

Long Term – Reconstruction:

- Consider reconstruction of an embrasure and gun emplacement to further the interpretation of the fort, depending on the results of archeological testing and research.

Tidal Rip Rap

The rip rap forming the seaward base of the ramparts remains in sound condition. It should be inspected on a yearly basis in the spring for any loose or dislodged stones, and any substantial soil erosion that might undermine the stones at its junction to the base of the ramparts.

Recommendations – Tidal Rip Rap

Near Term – Maintenance:

- Inspect rip rap every spring for loose or dislodged stone, and soil erosion at its top perimeter; repair any such defects as they occur.



Fig. 68: Well organized parapet wall at south rampart requires minor chinking. It is not clear whether similar walls existed at the top of the terraplein behind all the ramparts. Although the 1864 plans show an embrasure at this location, there is currently no sign of it. Perhaps the rampart top was reworked c. 1900.

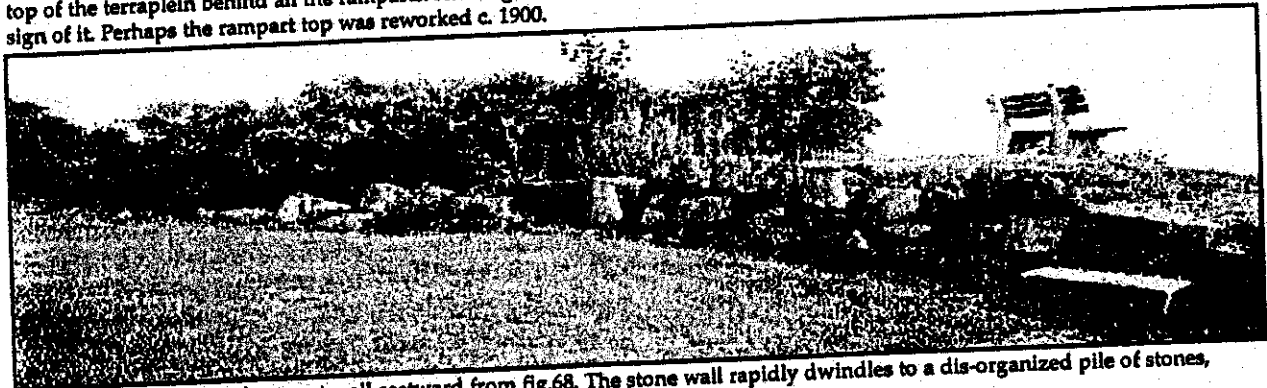


Fig. 69: Continuation of parapet wall eastward from fig.68. The stone wall rapidly dwindles to a dis-organized pile of stones, and then stops. A few random groups of stone occur further to the east of this section.



Fig. 70: 1942 aerial photo shows a series of deep gullies across the east ramparts that correspond to the embrasures shown in the 1864 plan in fig. 71. Arrows marks typical gullies. Photo from City of Salem office of Planning and Community Development.

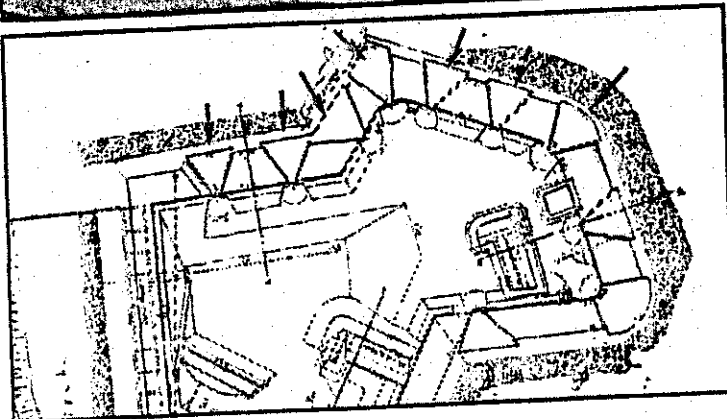


Fig. 71: Portion of 1864 plan of fort with east ramparts on top. Arrows marks typical embrasures that can be correlated to gullies visible in fig. 70. Plan from National Archives. Refer to Archeological Report for 1830 drawing of typical gun embrasure similar to ones on this plan.

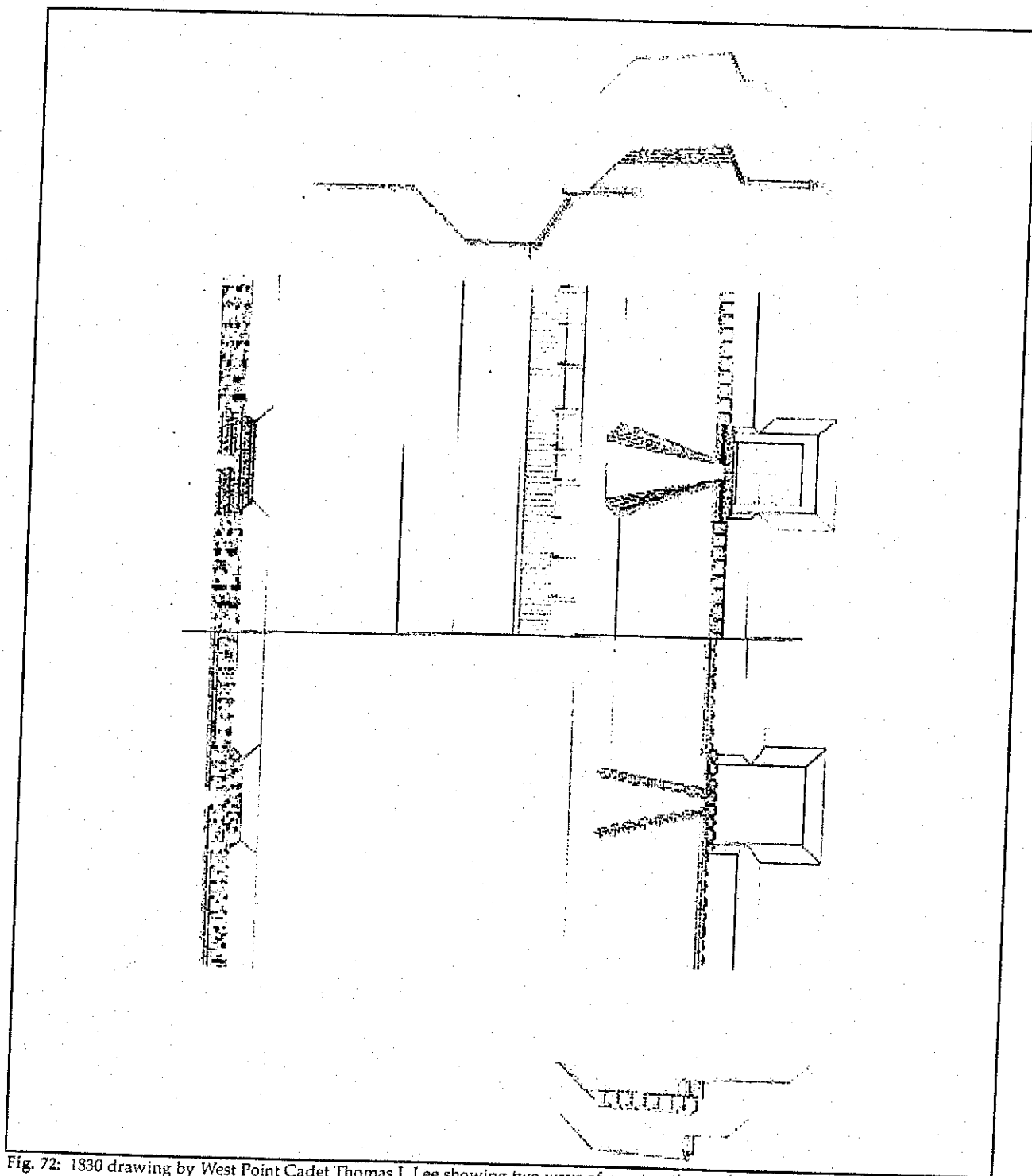


Fig. 72: 1830 drawing by West Point Cadet Thomas J. Lee showing two ways of constructing embrasures and gun emplacements. A long term interpretive goal is to reconstruct a typical embrasure, but more archeological and document research is needed in order to determine the construction details used at Fort Pickering to design and carry out a reconstruction. Drawing is from a portfolio of original drawings in Finch & Rose collection.

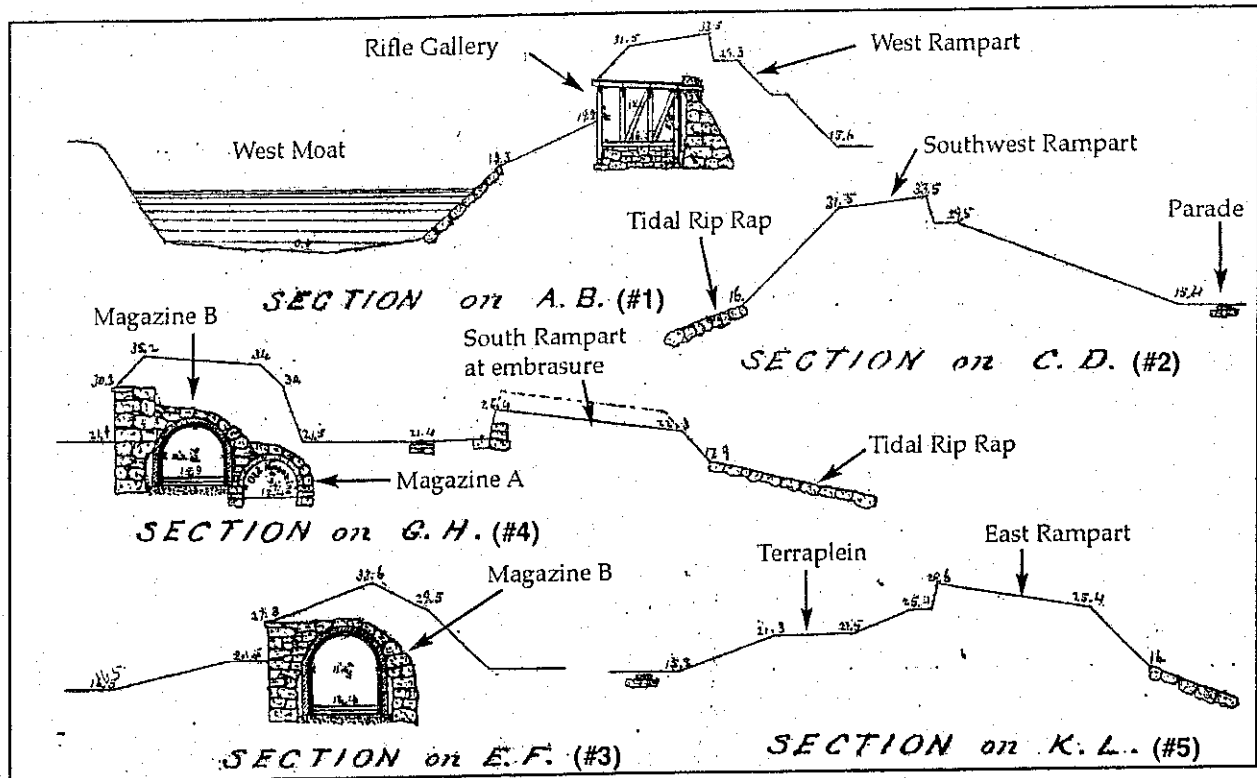


Fig. 73: Sections through magazines, rifle gallery, and ramparts from 1864 plan drawing (note; the sections have been rearranged from the original drawing). Original drawing from National Archives.

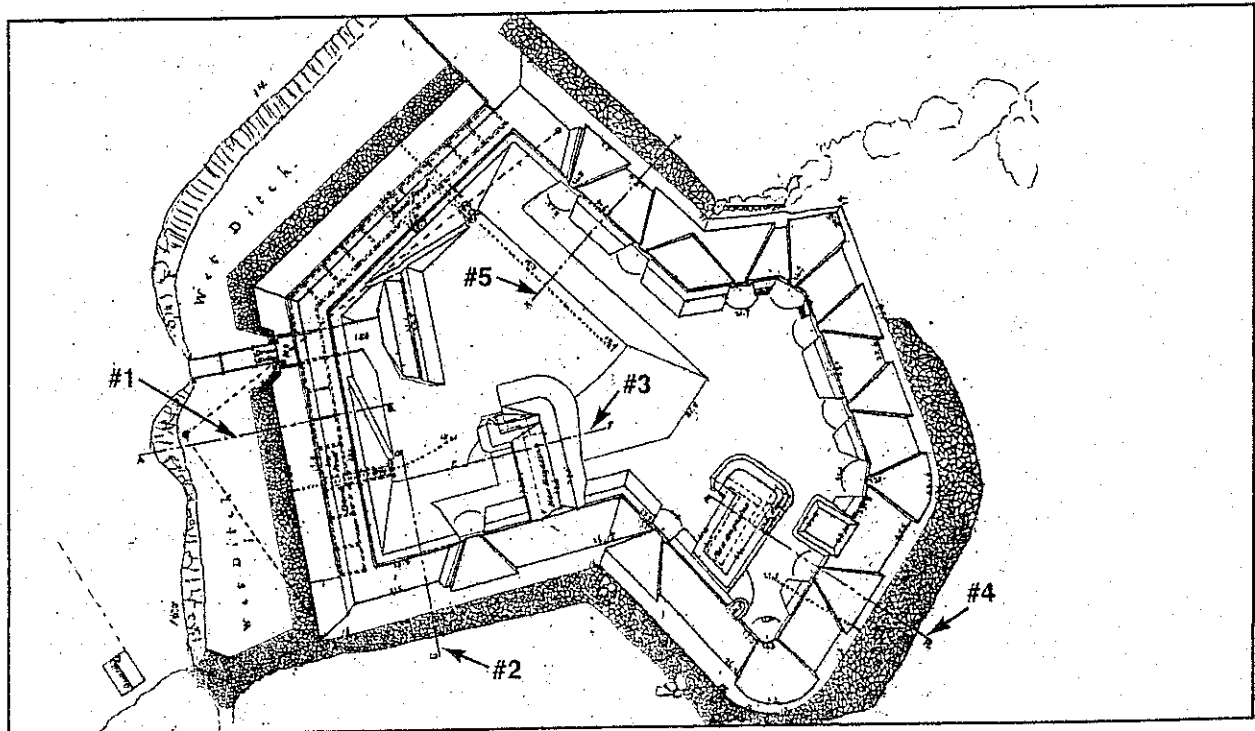
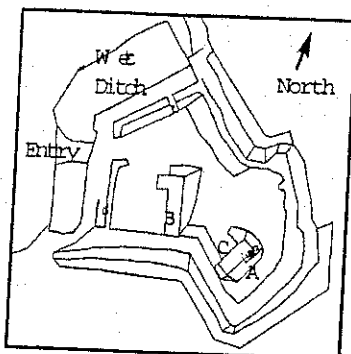


Fig. 74: 1864 plan of Fort Pickering with section lines locating details in 24a above. Scale as reproduced is 1:100. Original drawing from National Archives.

Magazines A, B, and C



General

There are three intact semi-underground powder magazines in the fort parade adjacent to the southerly ramparts, each utilizing a combination of stone and brick vault construction, and covered by a deep layer of earth to make them "bomb proof." With their earthworks protection, they form large mounds rising to about the height of the adjacent ramparts. One of these magazines, designated as "Magazine A" in the archeological report, was constructed in 1794 as part of the cellar Rochfontain blockhouse. The other two, Magazines B and C, were constructed during the Civil War period. Magazine C is located next to magazine A, and they are jointly covered by a single earth mound that currently rises several feet above the adjacent south ramparts, from which it is physically separated by a narrow terraplein. Magazine B is located in a separate mound midway between C and the the west rampart. Its earthen top is physically connected to the adjacent south rampart and is at the same elevation. The plans and generalized sections of all three are shown on the 1864 plan of the fort.

The brick utilized in all three magazines are small waterstruck brick measuring about 2 3/4- 2 7/8" high, 3 1/2" wide and 7 1/2" wide. The bricks used in B and C tend to be on the larger side of this range, and those in A are at the smaller end. Waterstruck brick of this dimension are typical of late 18th century construction, but unusual for the

1860's when brick sizes usually are closer to 2 1/8" - 2 1/4" high. The 1794 Rochfontain fort reportedly had brick walls, and it seems reasonable to speculate that the 1860's magazines may have been constructed with brick salvaged from the 1794 fort.

The original mortar used to construct all three magazines has survived in remarkably good condition given the chronically damp conditions of the underground construction. Samples were taken from magazine A for very basic physical examination, but have not been subjected to any sophisticated chemical or petrographic analysis to identify the mortar constituents (such testing is expensive and well beyond the scope of this study). A conventional pure lime mortar would be unlikely to survive in sound condition in this damp environment (water would have dissolved and leached out the lime), but modern Portland cement mortars were unknown in 1794, and were just beginning to become available in the Civil War period.

Most likely the type of limes known as "hydraulic" lime and "natural" cements were used instead of conventional lime. Unlike conventional lime, "Hydraulic" limes and natural cements have the ability to set up under water. Naturally hydraulic limes were identified by empirical experience, and sometimes created or further enhanced by the addition of puzzolanos (a volcanic ash material from Italy) to natural lime. The earliest well documented English investigation into the characteristics and chemical nature "hydraulic" limes occurred in 1756 with the construction of the Eddystone Lighthouse by civil engineer John Smeaton. Some research was also being done by French engineers in the late 18th century. However, it was not until the early 19th century that these materials became well understood and widely publicized through the work of the French Engineer Vicat (first published in 1819). Thus the apparent use of hydraulic lime in the 1794 construction of Magazine A indicates a very sophisticated understanding of construction technology for the period. The use of either hydraulic lime or a natural

cement in the Civil War period construction is more routine. The civil engineering textbook used throughout the 2nd third of the 19th century at West Point describes the use of both hydraulic limes and natural cements from Ulster County NY (known as Rosendale cement) for use in fortifications (*An Elementary Course of Civil Engineering for the use of the Cadets of the United States Military Academy*, by D. H. Mahan, Prof. of Military and Civil Engineering at the Academy, first published in 1837). The army engineers who constructed Fort Pickering would undoubtedly have taken Prof. Mahan's courses at West Point. Mahan also describes the use of bituminous tars to waterproof the tops of brick vault construction that was to be covered by earthworks. Remnants of tar waterproofing were observed on the portion of the brick entry vault to magazine C that is currently exposed due to soil erosion.

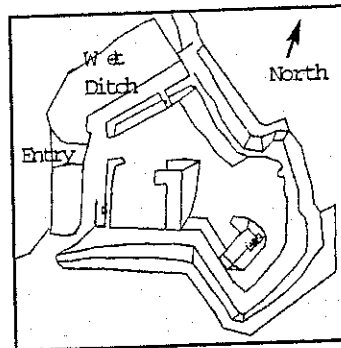
The magazines share a number of features and alterations in common. All three have ventilation systems utilizing areas of double wall construction to create a plenum to bring in outside air without having any openings that communicate directly between the magazine interior and the outside. The actual construction details of the system are only partially evident. All three are secured by iron bar doors that date to WWII or later, and are locked by modern chains and padlocks. The locks on all three have been breached often enough in recent years to generate substantial amounts of trash in the vaults. Early 20th century photographs show solid doors at the entries, but do not show enough detail to enable accurate reconstruction. All three also once had doors at the vault levels that are now missing. Magazines B and C were used for storage during WWII, at which time metal conduit and electric lights were installed in them. the conduit is no severely rusted.

All three magazines are moderately littered with modern cans, bottles, and other debris left by persons that have broken into them, or simply tossed the debris between the bars of the doors. All three also have an accumulation of silt on the floors and stairs. Both the accumulated silt and the modern

debris should be cleaned out.

Scaled plans of all three magazines are provided in the Archeological report.

Magazine A - Description



This magazine was constructed as part of the 1794 Rochfontain fort as the part of the cellar for the blockhouse. The civil War period construction



Fig.75: Entry to Magazine "A".

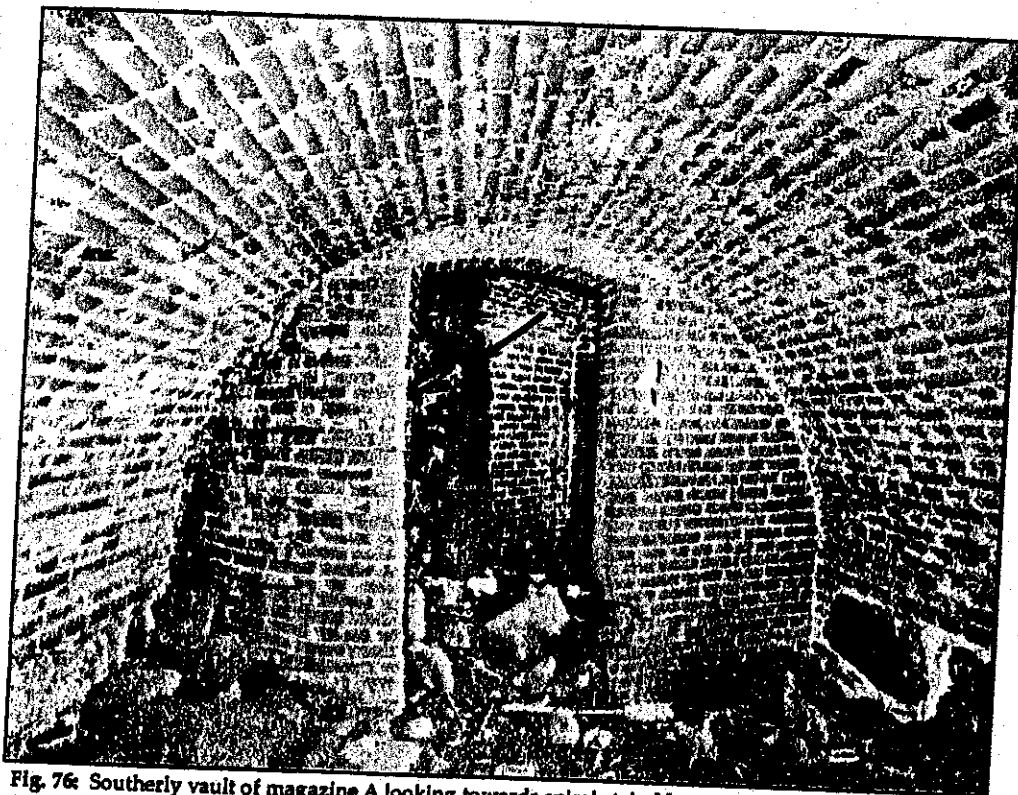


Fig. 76: Southerly vault of magazine A looking towards spiral stair. Note missing newel at stair and adjacent brick that is dark from water draining down the stairs (Arrow).

removed the blockhouse but retained the cellar vault. The magazine is reached by a circular stone stair accessed from the south side of the mound covering both magazine A and C. This stair originally also rose to the second floor of the 1794

blockhouse, as evidenced by three pie shaped stones remaining as the current ceiling of the stair. The magazine consists of two brick vaulted rooms, one on each side of the stair that descends into the center of the cellar space. The rooms are linked by

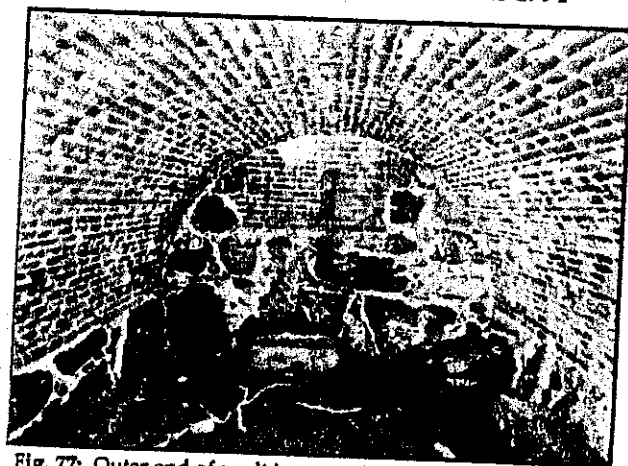


Fig. 77: Outer end of vault in magazine A with single ventilation slot in wall.



Fig. 78: Vestigial stair treads left in place from when this stair led up to the second floor of the 1794 blockhouse. Iron at top left is hardware in jamb for current door.



Fig. 79: Lower portion of spiral stair in magazine A showing broken brick at missing newel. Note debris on stair.



Fig. 81: Top of spiral stair showing threshold stone "B" with partially supported stone "A" under it. Note missing portion of stone tread at "C" that adds to the difficulty of using this stair. Also note green algae on brick from chronic dampness due to surface runoff draining into the stair.

a short corridor that wraps around one side of the brick masonry enclosing the stair. The

combination of the circular stair and vaulted rooms makes for some very unusual circular geometry in the brick masonry. Each room consists of low vertical sides in mortared rubble stone topped by a brick vault. The outer end walls are stone topped by brick masonry with a single ventilation opening in the center of the wall. The inner ends are brick masonry curved to reflect the geometry of the circular stair. The floors appear to be dirt, as probing down several inches did not reveal any masonry. Each room had a few random

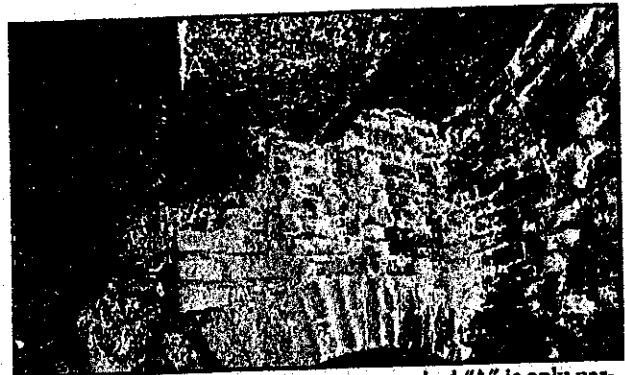


Fig. 80: Top of spiral stair where stone marked "A" is only partially supported by remaining brick.



Fig. 82: Looking up at the underside of stone marked "A" in fig. 80. Stone marked "B" extends completely over top of "A" and is supported by the brick perimeter walls. This stone forms the entry landing of the spiral stair.

pieces of stone strewn around the floor. Each room was once closed off from the corridor with a door set on iron pintels in the brick masonry that formed the door jambs. The doors are now missing.

Magazine A - Conditions

The condition of the masonry and mortar joints in the vaults was very good. The underside of the vault bricks still retained the original mortar that was caught between the wood centering used to support the arch during construction and the brick. The dirt forming the floors of the vaults was noticeably damp.

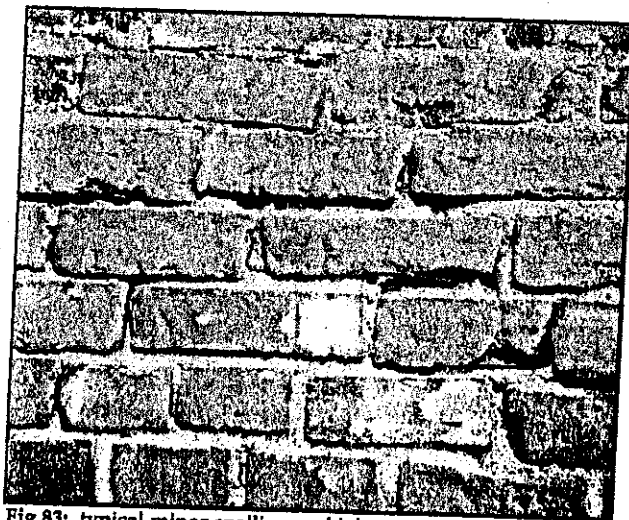


Fig.83: typical minor spalling and joint erosion in staircase. brick joints in upper section have been poorly repointed many years ago.

The brickwork surrounding the circular stair did have some problems. The original newel post that would have risen up the center of the stair is missing with the adjacent brickwork broken out. It is not known whether this newel was formed of stone or brick. The remaining brickwork and the stair treads do not show any obvious structural distress from this damage. There is, however, a large stone in the ceiling of the circular stair that has lost half of its brick underpinnings on the center side due to the missing newel. The stone immediately over the one with questionable underpinnings is a very large unit that functions as the entry threshold. It spans clear across the full width of the stair and therefore does not rely on the stone under it for support. This is probably the reason there is no visible distress related to this condition. The first tread below the threshold stone is broken off near the newel and presents a hazard.

The newel post and related masonry including the brickwork under the partially supported ceiling stone, and any broken treads, should eventually be restored following further study of this stair and other similar stairs in order to determine as closely as possible how the original newel was

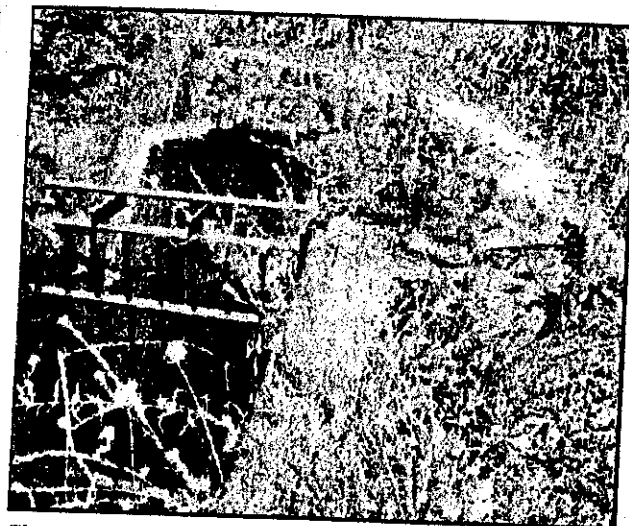


Fig.84: Top entry to magazine A showing missing stone lintel that further exacerbates the drainage problem at the stair.

constructed.

There are some areas of moderately spalled brick in the outer walls of the staircase, especially in the lower portions just above the stone stair treads. The mortar joints in these areas is also eroded back about 1/4". A heavy growth of moss on some of the brick is indicative of chronic excessive moisture. The extent of spalling and eroded mortar is too shallow to warrant replacement of individual spalled brick or repointing, but steps should be taken to reduce the chronic moisture affecting the stair.

The source of the moisture is surface runoff from the exterior area around the entry. The grading at the doorway leads this runoff directly into the top of the staircase, at which point it cascades down the stair saturating the adjacent masonry. The problem is that 1860's construction raised the surface grade in this part of the fort at least a foot above elevation of the 1794 threshold to create a broad terraplein. The problem is further exacerbated by the fact that the outer lintel for the stair entry is missing. this allows runoff from the earth mound directly over the vault to drop directly onto the stone stair.

Treatment of this issue should include regrading

the ground around the door to direct runoff away from the entry, and replacing the missing stone lintel. Detailing the lintel to direct water coming down the mound to drain over to the sides of the jamb rather than directly into the opening below the lintel would also be desirable. The regrading problem is complicated by the fact that the current door swings outward. This creates a large level area below the grade of the adjacent terraplein to collect water. Shortening the door and adding another step at the entry threshold to allow the outside grade to be filled enough to direct water away from the entry is probably the least disruptive way to improve the situation, assuming the new door would not be too short for comfortable entry. Reworking the door to swing inward is another possibility, but the geometry of the stair may preclude this. Note that any solution that requires removing soil to regrade will require archeological recovery work as a prelude to the construction and should be coordinated with the findings of sub-surface test pit (Unit N53 E470, pp.122-3 in the Archeological Report) excavated a few feet outside of the doorway. A test pit excavated a few feet outside of the doorway indicated the area is rich in historical artifacts.

Because of its curved geometry and its age, this would be the most interesting of the three magazines to open up for limited public tours. Unfortunately, the steep circular stair poses significant liability and code issues for such tours.

Recommendations – Magazine A

Short Term – Maintenance:

- Clean modern debris and accumulated silt off the stairs and the corridor floor below.

Short Term – Stabilization:

- Regrade the surface area outside the entry and/or rework the door and threshold to direct surface runoff away from the staircase.
- Replace the missing lintel stone at the top of the entry.

- Include professional archeological planning and recovery for any work that will remove existing soil. See text above and Unit N53 E470, pp.122-3 in the Archeological Report for more detailed discussion.

Mid Term – Research and Testing:

- Examine existing newel area of stair and related period examples and literature to determine how best to restore the missing newel post. The study should include an engineering evolution of the the newel area and the masonry immediately above it, and sophisticated analysis of the historic mortar to design a suitable mortar formula for rebuilding work.

Long Term – Restoration:

- Restore the missing staircase newel post and related masonry including any broken or partially missing stair treads.

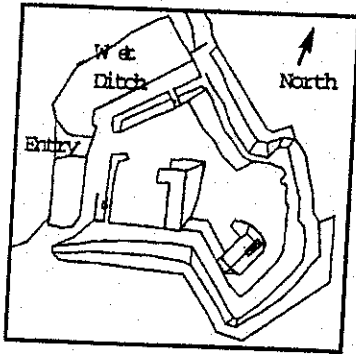
Long Term – Interpretation:

- Consider opening the interior of this magazine to guided public tours for small sized groups, assuming safety and liability issues can be resolved.

Long Term – Preservation:

- Monitor condition of interior masonry regarding spalled brick and eroded mortar joints on a yearly basis, but do not replace spalled brick or repoint masonry unless significant deep deterioration is detected.

Magazine B - Description



This magazine is located in a separate mound midway between Magazine A and the the west rampart. Its earthen top is physically connected to the adjacent south rampart and is at the same elevation. Externally, its entrance is framed by and "L" shaped rubble stone wall with mortared joints. The wall is finished with roughly dressed rectangular cap stones both on its top and its sloping sides. The west flank of the earthen mound covering the vault is finished with a roughly dressed dry-laid stone wall topped by rectangular capstones. This wall is clearly shown in several historic photographs, but is now obscured by nearly impenetrable woody vegetation.

Beyond the current entry door, there is straight 10' long corridor having mortared rubble stone walls with a vaulted brick ceiling leading to a solid iron door in the end of the left hand wall. A large opening in the left hand wall just before the door apparently supplies part of the external air for the vault ventilation system. The door leads immediately into a straight stair of 7 stone steps down to the floor level of the vault. The stair runs at a right angle to the entry corridor, and terminates in a landing currently topped with a piece of sagging plywood. The stair has brick walls and a brick vaulted ceiling sloping downward to match the pitch of the stairs. There are several ventilation openings in the wall at the foot of the stairs. At the lower landing the corridor turns right and runs

about ten feet to a brick framed doorway entering directly into the magazine storage vault. The door and its wood frame are missing except for a fragment of the wood lintel at the top.

The magazine vault consists of a brick floor now covered with dirt and vertical brick walls rising about 8' to the spring of the vaulted brick ceiling for a total height of about 13.35'. The walls and ceiling have the remnants of many past layers of whitewash paint. The side walls have a brick ledge about 1' wide set on the floor. The remains of a wood floor system are present at the far end of the vault. The floor system consists of wood sleepers set on top of the brick ledge with 2" thick wood plank flooring nailed to the sleepers. The visible nailing is a combination of wire nails and cut nails, making it difficult to determine whether this is an original raised floor system or a later replacement.

There are regularly spaced ventilation slots in the side and end walls. The brick floor ledge has periodic slots in its vertical face that apparently were intended to drain the brick floor and/or provide ventilation for the area below the wood floor. The side wall construction is a double wall that appears to consist of a single inner wythe of brick, a 2" cavity for ventilation bridged by occasional header bonding bricks, and an outer brick wall of unknown thickness. Presumably the cavity terminates at the spring of the vaulted ceiling. The sections on the 1864 construction plan indicate that the vertical brick walls are linings for outer stone walls.

There are three horizontal pieces of wood about 2" x 12" set at regularly intervals into the brick side walls and one of the end walls. Whether these were only used as part of the framing for the wood centering used to construct the vaulted ceiling, or were also used as nailers for a wood lining and/or shelving system is not known. We have seen wood linings used in small brick powder magazines to minimize the chance of accidental sparks. The fact that there are no paint shadows from former woodwork within the remnants of

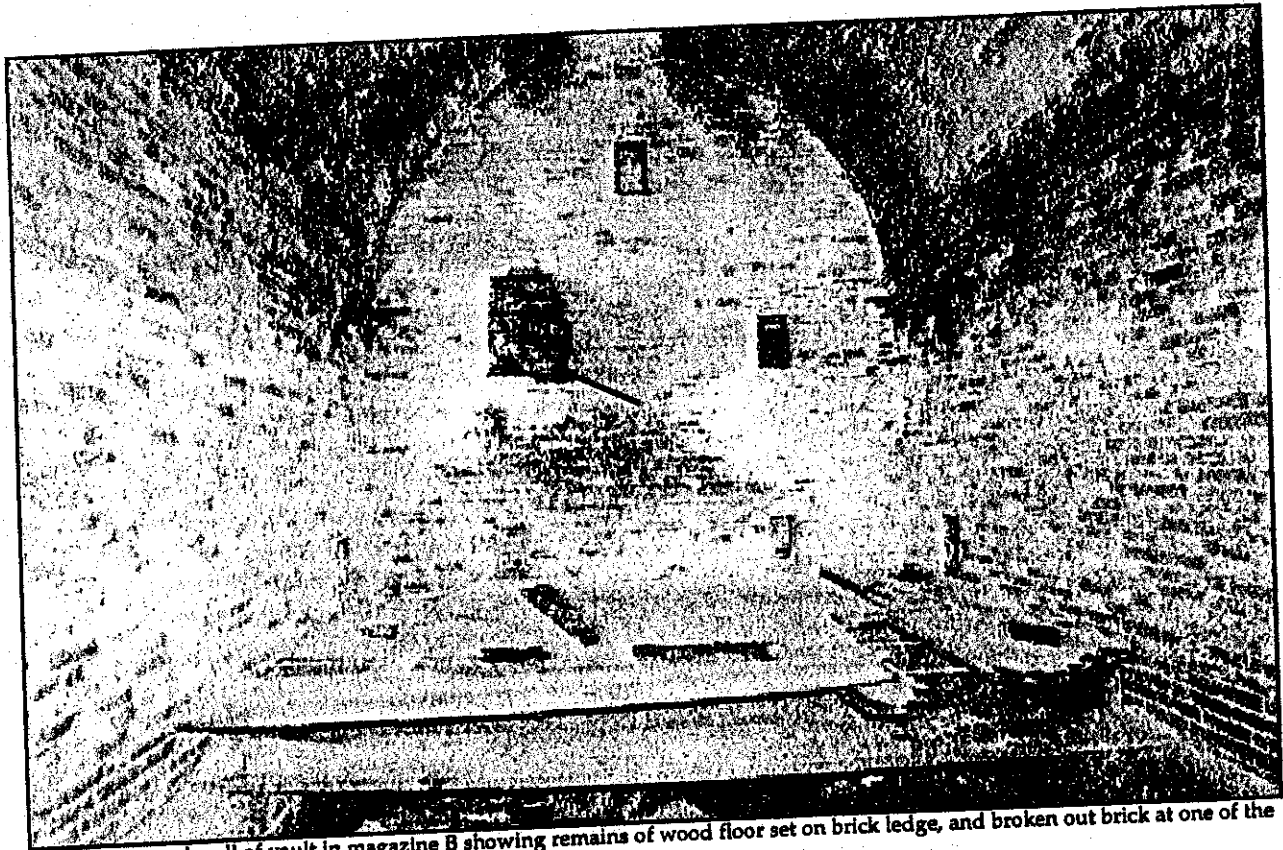


Fig.85: Rear end wall of vault in magazine B showing remains of wood floor set on brick ledge, and broken out brick at one of the ventilation slots (arrow).

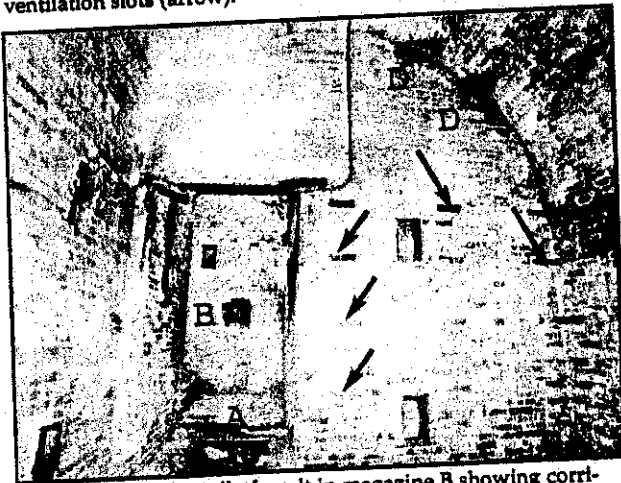


Fig.86: Front end wall of vault in magazine B showing corridor at base of staircase with wood landing that needs to be rebuilt (A) and ventilation slot with broken out brick (B). Dark spots at edge of ceiling marked "D" may indicate dampness from roof seepage. Arrows mark some of the typical original wood nailers set in brick that may have been for centering to construct the arch.



Fig.87: Looking up stairs of Magazine B to iron door to entry level corridor beyond.



Fig.88: Undated photo of magazine B, probably c. 1900, showing entry door with masonry that appears to be whitewashed, and dry laid exterior side wall in right background. Note erosion is not a new problem. Photo courtesy PEM.

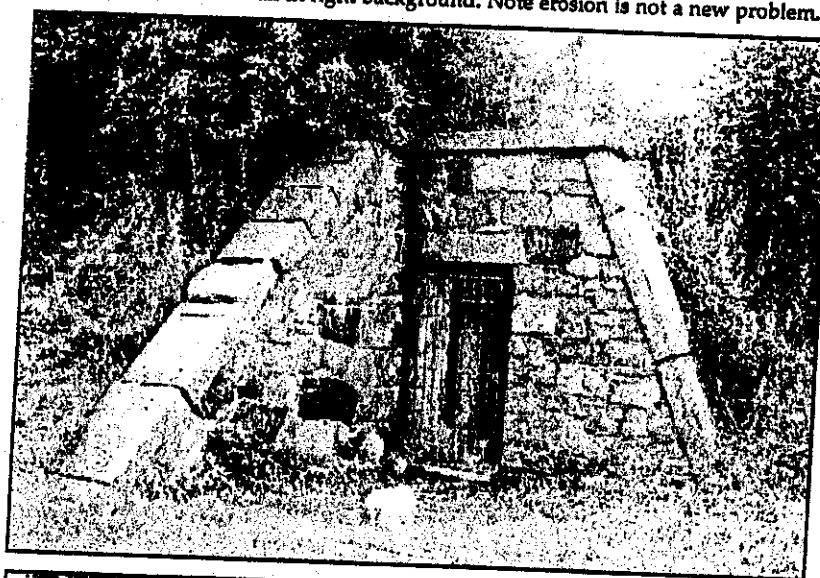


Fig.89: 2003 photo of entry to magazine B showed barred iron doors currently used on all three magazines.



Fig.90: Current condition of exterior side wall to magazine B obscured by rampant woody vegetation. Note missing stone in upper right.

whitewash on the brick suggests they were used only for the centering.

Magazine B - Conditions

The condition of the masonry within the entry corridor, stairs, and the magazine vault is remarkably good. The most significant defects occur at two of the ventilation slots where a substantial area of the finish wall brick have been removed. One occurs at the far end wall of the magazine vault, and the other in the wall at the base of the entry stairs. These do not threaten the stability of the walls, but should eventually be restored to their former dimensions matching the adjacent slots using matching reproduction water struck brick and a 1:1:6 mortar mix (Type S hydrated lime:white Portland cement:sand). masonry pigments should be used to tone the mortar to match the color of adjacent old mortar.

Some patches of dark coloration were noted in the ceiling vault adjacent to the end walls. These may indicate areas of damp masonry resulting from seepage through the vault roof. This situation warrants routine monitoring, but not active intervention. If the seepage becomes substantially more widespread or develops into an sizeable active leaks that threaten the integrity of the magazine, investigation into the condition of the vault roof from the top of the mound should be considered, followed up by appropriate repairs. Based on fragments of the entry ceiling vault top visible at magazine C, the roof likely consists of bituminous tar over the brick topped by a layer of rubble stone set in natural cement mortar. Such systems are very difficult to repair effectively, and disturbing it may make it worse rather than better; the vault roof should not be disturbed from the top unless leakage problems threaten the integrity of the magazine.

Despite the missing wood lintel the brick masonry over the vault door opening remains sound. Replacement of the wood lintel would prevent potential future settlement of the brick over the door, but is not critical.

The wood platform at the base of the stairs is unstable and should be completely replaced with new wood pressure treated framing topped with a plank floor (presuming the framing under the plywood is modern - it was not examined). If the framing is old, it should be examined and recorded by an architectural conservator before any work is done. If possible, the old framing should be saved or replicated, and new secondary framing added as needed to support the floor.

The exterior wall stone masonry at the entry is in generally sound, serviceable condition with only a few random open mortar joints. It appears to have been repointed a number of times with mortars that do not visually match each other. The joints between the capstones are largely void of mortar with remnants of previous pointing in some of them. The capstone joints and open wall joints should be cut and repointed as maintenance activity with mid-term priority. The 1:1:6 mortar indicated above for the brick should also be used for repainting the stone. The soil that has eroded away from the back side of the entry walls should be replaced.

Based on examination that was severely limited by the rampant vegetation, the side wall masonry is largely intact including the capstones, but has some sizeable areas of missing stone. There was no evidence of any original setting mortar, which is surprising because the exterior sidewall of magazine C is clearly set in mortar. Although not located in this survey, the wall likely has a ventilation port to provide make-up air for the vault ventilation system similar to the one at magazine C. After clearing the vegetation, the wall should be reinspected followed by repairs to fill in areas of missing stone with new stone similar in general size, shape, and finish to the existing, and rethinking. It should be retained as a dry laid stone wall unless clear evidence is found that it was set in mortar and has deteriorated to its current state.

Recommendations - Magazine B

Short Term - Maintenance:

- Clean modern debris and silt off the corridors, stairs and magazine floor.

Short-Long Term - Research and Testing:

- Monitor magazine ceiling for any substantial increase in seepage (check yearly in spring after winter thaw, and after periods of prolonged heavy rain). Actively investigate roofing conditions from above and institute repairs only if leakage develops to an extent threaten that the integrity of the magazine.

Mid-Term - Preservation:

- Replace framing and sagging plywood floor at base of stone stair to provide a sound landing platform.
- Replaces missing lintel in doorway to magazine vault sized to match the void of the original lintel. Use rot resistant wood such as white oak or black locust instead of modern pressure treated lumber or common pine.

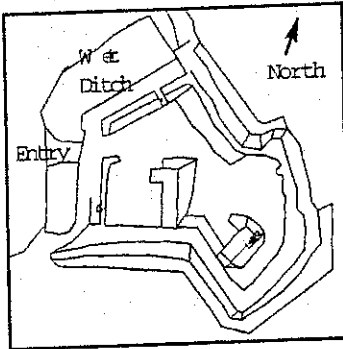
Mid-Term - Restoration:

- In magazine vault Restore 2 ventilation slots where the brick is missing using matching water struck brick and a 1:1:6 mortar mix (Type S hydrated lime:white Portland cement:sand) tinted to match adjacent mortar.
- At exterior entry cut and repoint capstone joints and open wall joints using 1:1:6 mortar.
- At exterior sidewall fill in areas of missing stone with new stone similar in general size, shape, and finish to the existing, and rechalk entire wall without using mortar.

Long-Term - Restoration:

- If the magazine is to be opened for limited public tours, consider restoring the wood floor in the magazine vault to match the existing 2" plank floor, applying whitewash to the masonry, and redoing the electric lighting.

Magazine C - Description



This magazine is located in the same bomb-proof mound as magazine A. Its layout, size, and detailing are similar to magazine B except for the entry corridor. At this magazine the current entry door is located inside the initial entry corridor at the head of the stairs. The existing fragmentary wood floor system is different from Magazine B and likely dates to WWII. Its sleepers rest directly on the masonry floor, with the 1" tongue and groove flooring sitting on the top of the masonry side wall ledge. The primary floor of the vault below the wood sleepers appears to be covered with some type of mortar and has a depression running down the center that may have been to facilitate drainage. Perhaps this is also a WWII improvement of the original floor. It is now totally obscured by dirt. Some of the ventilation slots in the vault are fitted with wood frames and hardware cloth screens. These were probably installed in WWII to keep out vermin.

The exterior masonry at the entry of this magazine is stone set in mortar with dressed capstones, all similar to Magazine B. The exterior west sidewall masonry is set in mortar rather than being dry-laid, and is finished with dressed capstones. A ventilation intake port is located at end adjacent to the ramps.

Magazine C - Conditions

The interior masonry of this magazine is in generally good condition other than the usual modern debris and dirt that needs to be cleaned out. The

whitewash in the main vault is somewhat more intact than in magazine B, and the ceiling appeared generally dry. Portions of the sidewall brick had extensive shallow surface spalling that had popped off the whitewash. This is probably due to some seepage of moisture into these portions of the wall. The damage to the brick is not currently sufficient to warrant intervention. As with the ceiling at magazine B, this situation should be routinely monitored, and with further investigation and repair only if the condition significantly wors-

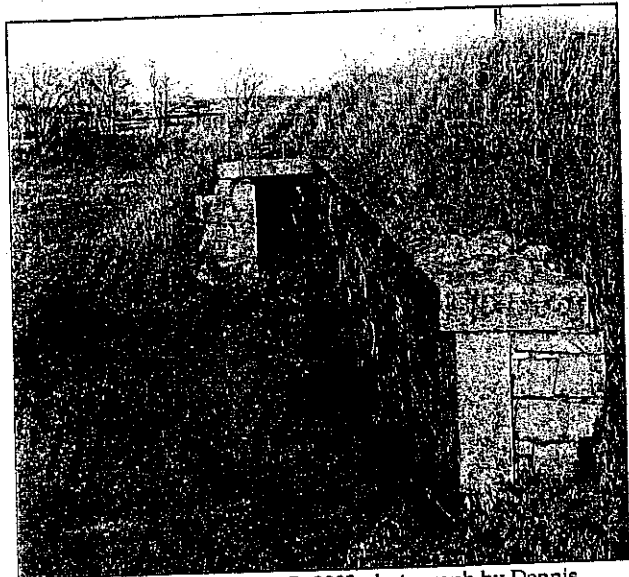


Fig. 91: Entry to Magazine B. 2002 photograph by Dennis Gray.

ens.

Similar to magazine B, interior door wood lintels and frames are missing or seriously compromised by rot or past fires. There are a few missing bricks above the current metal entry door.

The exterior masonry at the entry is in similar condition to Magazine B, the primary defect being open capstone joints.

There is serious soil erosion over the corridor vault behind the entry due to people climbing up the slope to the top of the mound. This has exposed the top of the vault in two places. One is

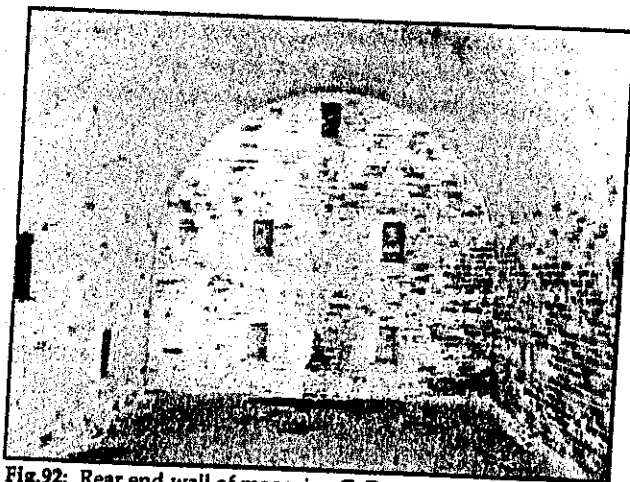


Fig. 92: Rear end wall of magazine C. Exposed red brick at right has areas of minor spalling indicating there is chronic dampness in this area.



Fig. 93: Detail of ventilation slot with wood frame. Some slots had metal hardware cloth in these frames.

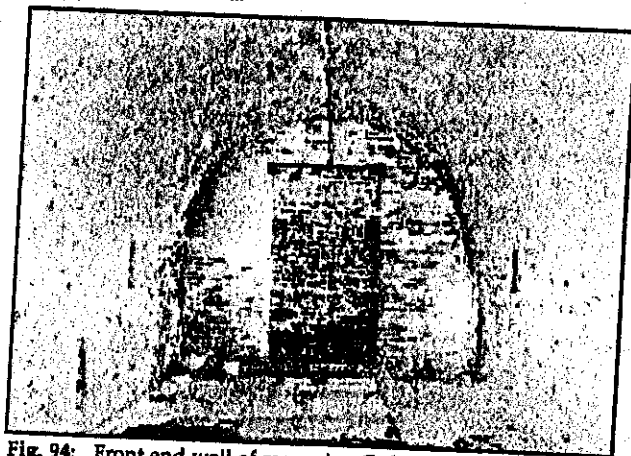


Fig. 94: Front end wall of magazine C showing remains of modern wood floor c. WWII.

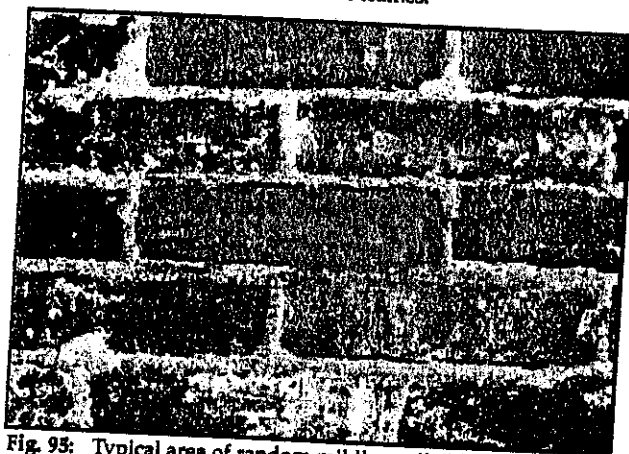


Fig. 95: Typical area of random mildly spalled brick where the whitewash has been pushed off by dampness.



Fig. 96: Area where soil has eroded to expose the top of the entry corridor vault. Arrow indicates tar waterproofing over brick, "A" marks thin rubblestone and mortar covering over brick, and "B" indicates Brick.



Fig. 97: Missing brick and rusted iron lintel bar over inner doorway to magazine C.

immediately behind the capstones. the other is about 5' further along the corridor. The vault construction as exposed is brick with fragments of bituminous tar waterproofing on it, and topped by a layer of small rubble stones in a thick bed of mortar. This does not yet appear to have caused serious damage to the brick vaulted ceiling of the entry corridor, but will if left in this condition for a long period. This example underscores the need to control erosion and pedestrian paths on the bomb proof magazines and ramparts.

The exterior masonry on the west sidewall is in good condition except for two limited areas with missing stone and mortar. these should be filled in with matching stone and mortar using the same 1:1:6 formulation recommended for Magazine B repairs.

Recommendations - Magazine C

Short Term - Maintenance:

- Clean modern debris and accumulated silt off the corridors, stairs and the magazine floor.

Short Term - Stabilization:

- Restore the soil cover over the exposed vault masonry above the entry corridor.
- Take steps to discourage people from climbing up the mound at this location.

Short-Long Term - Research and Testing:

- Monitor spalled brick in magazine wall for any substantial increase in seepage (check yearly in spring after winter thaw, and after periods of prolonged heavy rain). Actively investigate conditions and institute repairs only if leakage develops to an extent threaten that the integrity of the magazine.

Mid-Term - Preservation:

- Replace missing brick over current metal entry door.
- Replaces missing lintel in doorway to magazine

vault sized to match the void of the original lintel. Use rot resistant wood such as white oak or black locust instead of modern pressure treated lumber or common pine.

Mid-Term - Restoration:

- At exterior entry cut and repoint capstone joints and open wall joints using 1:1:6 mortar.
- At exterior sidewall fill in limited areas of missing stone and open mortar joints with new stone similar in general size, shape, and finish to the existing, using 1:1:6 mortar mix.

Long-Term - Restoration:

- If the magazine is to be opened for limited public tours, consider restoring the wood floor in the magazine vault to match the existing WWII flooring, applying whitewash to the masonry, and redoing the electric lighting.

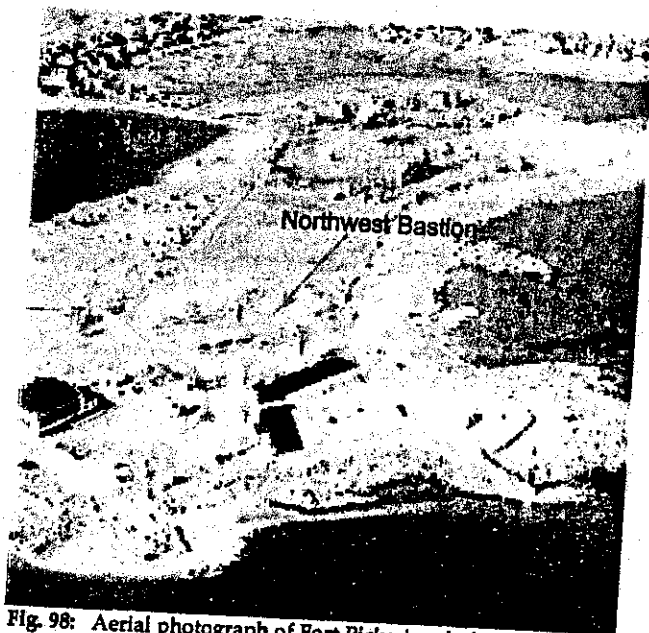


Fig. 98: Aerial photograph of Fort Pickering, before 1943, Winter Island Marine Park, City of Salem, MA.

Northwest Bastion

General

The northwest bastion is a group of connected earthwork ramparts surrounded on the north side by a dry ditch and located northwest of the north wet ditch. They enclose a flat parade area. Drawings from the National Archives indicate they were constructed c. 1870. Refer to the Archeological report for a full discussion of their known history.

The earthworks bastions were substantially altered by the Coast Guard during World War II to install of a munitions storage facility consisting of a series of precast concrete panels and open storage niches facing into the parade area. The niches are currently referred to as "igloos". A paved concrete roadway was installed around the inner perimeter of the parade for access to the storage niches. The roadway and storage niches survive today and are the principal historic masonry features of the northwest bastion area.

No documents concerning the construction of the storage system were located by this study. It is, however, obvious that considerable cutting and filling of the inner faces of the bastions was done to install the panels and igloos. The storage feature had not yet been constructed when aerial photos of the area were taken in April of 1942.

Storage Igloos and Panels: Description

The storage walls are formed by a series of vertical precast concrete panels interspersed by precast igloos set into the face of the wall at intervals of 30'-40'. The panels serve as retaining walls for the earthworks behind them. There are a total of 67 large panels and 10 igloos. Each igloo is topped by 3 small precast panels that align with the top of the main precast panels, making a total of 30 small panels. As they follow the slope of the igloo, the small panels are shaped differently for placement on the right side, top, and left, respectively. Thus the 30 small panels consist of 3 casting patterns of 10 units each. Most of the large panels are approximately the same size, but there are a few special shapes to form corners and ends, and several narrow units. It is not known if the precast panels and igloos were a standardized design, or specially designed and fabricated for this installation. The typical sizes of the precast units are as follows, with the vertical measurements being from the current grade of the concrete roadway.

Panels: 4'10" wide x 6'0" high x 3" thick.

Igloos: 10'9" wide x 6'10" high x 6'5" deep - wings flanking the niche; 4" thick.

Igloo top panels: 4' long x 12" high x 4" thick.

The current erosion of soil from the backside of several units reveals some details of the original construction. Each igloo was cast as a single large unit. Several loops of rebar were cast into the igloo top to provide lifting handles for a crane to lift and position the unit. All the precast units incorporate ferrous steel reinforcing bars and wire. The tops of the igloo and the back faces of all the pan-



Fig. 99: Overview of munitions storage igloos at NW bastion.

els were covered with a thick bituminous coating as waterproofing prior to their installation. The side faces where the units and panels butt together were not waterproofed. The various panels are joined together by two sets of bronze clips along each vertical joint. These are formed of 1/8" thick bronze sheet with 1 1/2" wide tabs folded to lap over the front and rear faces of the panels being joined. A few of the joints between the top igloo panels were observed to have mortar in them. There is no mortar in the joints between the vertical

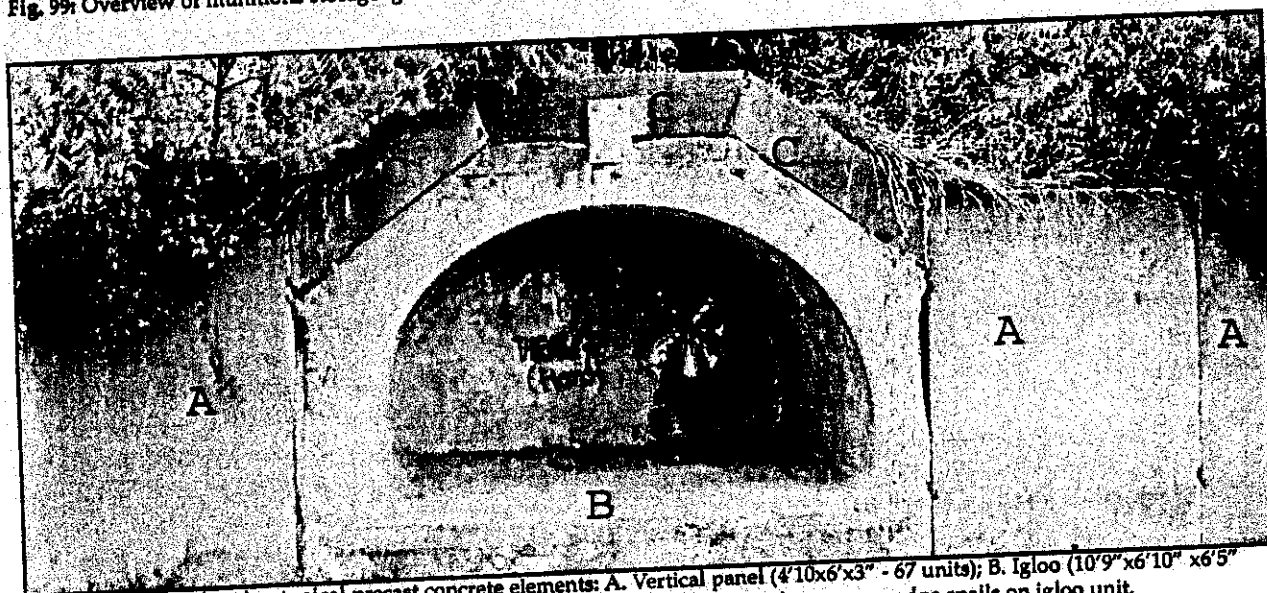


Fig. 100: Igloo #1 showing typical precast concrete elements: A. Vertical panel (4'10"x6'x3" - 67 units); B. Igloo (10'9"x6'10" x6'5" deep- 10 units); C. Igloo top panels (4'x1'x4" - 30 units). Note recent graffiti and numerous edge spalls on igloo unit.



Fig. 101: Igloo #10 with deep soil erosion exposing top surface of igloo. Note bituminous tar waterproofing on top surface and remnants of tar on rear of igloo flank. Arrow indicates rebar loop that served as hoisting handle.



Fig. 102: Typical moderate edge spall without visible rebar. Arrow indicates bronze clip joining panels. Repair patch should not bond the adjacent panels together.



Fig. 103: Typical edge spall with exposed rebar. Rust must be removed from rebar as part of the patching process.

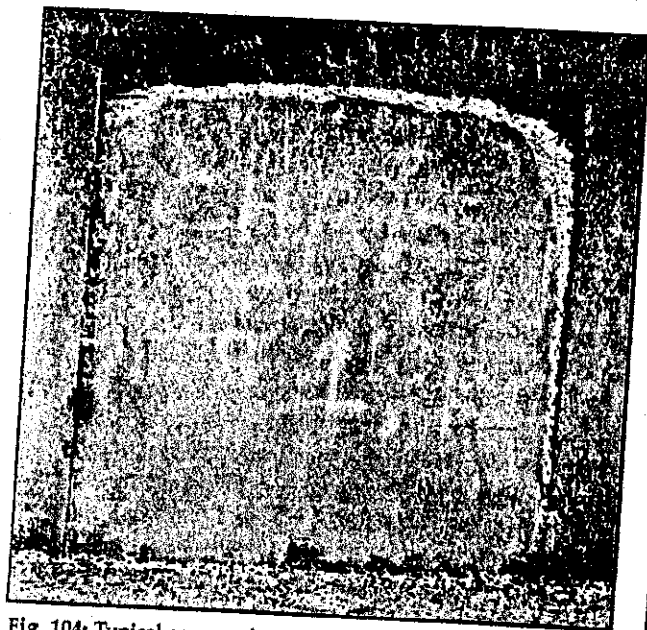


Fig. 104: Typical severe edge spall; Complete replacement of the panel with a matching new precast panel is recommended.



Fig. 105: Typical severe edge spall at igloo top panels; Complete replacement of the panels with a matching new precast panels is recommended.

panels. It is not known how far the panels and igloos extend below the current grade, nor what sort of foundation is under them. It is also not known what provisions were made on the backside of the panels to anchor them to the soil behind them. Each panel does have a single large weephole several inches above the concrete roadway. This would suggest that the original construction utilized gravel or some other drainage backfill along the rear base of the panels to facilitate drainage and minimize frost damage.

Storage Igloos and Panels: Conditions

These features were systematically surveyed and the obvious visible defects for each component were recorded on field notes. Typical conditions were photographed, and a series of photographs was taken recording all the panels and igloos in groups of 5-7 panels as a back-up to the field notes. The survey was started at the west end of the southwest bastion, and proceeded systematically from left to right (i.e., counterclockwise) around the parade. The individual panels and igloos were numbered on the survey notes starting at the west end of the southwest bastion. The survey was intended to provide a basis to characterize the extent and type of defects, and should not be considered definitive.

The panels and igloos exhibit a range of condition problems that are typical of reinforced concrete construction exposed to the weather. The igloos were generally in better condition than the panels, with most of their defects being relatively superficial. The panels over the igloos were in substantially worse condition than most of the large vertical panels, with 16 of the 30 panels needing to be replaced. The majority of the defects were confined to the edges of the units and relate to moisture penetration through the unprotected tops and sides of the units. The sources of the moisture are rainwater at the top of the units, and soil moisture traveling between the units. Although the weep holes at the bottom of the panels were probably effective initially, the drainage fill has probably become clogged with silt over time and is no

longer functional. The bituminous coating on the back faces of the units appears to have been effective in preventing damage to the central portions of the panels and the interior niches of the igloos.

Edge Spalling - The most common defect was edge spalling of the concrete with the mechanism of deterioration being repeated freeze-thaw expansion of moisture penetrating the unprotected edges of the units. In many cases the rebars are located too close to the surface of the concrete where they are not effectively protected from rusting by the concrete (deeply embedded steel is protected from rusting by the chemical environment of the properly cured concrete). The rusting steel expands and causes further spalling of the concrete. Given the proximity of the bastion to the ocean, the spalling may be further aggravated by salt present in mist and rain. This type of spalling often extended through the full depth of the unit along the edge face. It was most common at the top corners. In this study, spalling that was confined a single edge or corner has been termed "moderate edge spalling". Where the spalling extends continuously across the top and down both sides it has been termed "severe edge spalling".

Surface Spalling - In some cases the spalling occurred in the central portion of the unit and did not penetrate more than 1/2" - 1" below the surface. Some instances were due to wire rebars being very close to the surface and rusting. Other instances were not related to rebar rusting.

Incipient Spalling - This is characterized by numerous hairline cracks in an otherwise sound appearing concrete surface. Often the cracks are outlined with a white exudation consisting either of gypsum or salts leaching out of the masonry. This is indicative internal freeze-thaw damage (or salts buildup), and will eventually be followed by full spalling off of the surface.

Missing unit - Some of the 4' panels over the igloos are missing, probably due to their spalling being so extensive that they fell apart, or being pushed

off by wood vegetation.

Dislodged Unit - Some panel units have been pushed out so that they are out of plumb or no longer align with the adjacent units. Typically this is due to pressure from soil or tree roots at the top of the bastion. It is often accompanied by missing bronze edge clips. In most cases the dislodged panels have not been pushed out so far as to be in danger of falling, however, a few of the 4' panels over the igloos could fall with further soil pressure.

Missing Bronze Clips - Some of the bronze edge clips are missing, mostly at the 4' panels over the igloos, and at the top of a few vertical panels. There are several different configurations to the clip tabs, depending on their position.

Graffiti - Recent graffiti is present inside a few of the igloos. Shadows of old graffiti are visible on some panels and inside many of the igloos. Presumably this is the residue to partially efforts to remove the graffiti.

Vegetation and Soil Erosion - As in other areas of the fort, uncontrolled woody vegetation and soil erosion are major factors contributing to the ongoing deterioration of the concrete igloos and panels. Comparing current conditions with several photos from the 1998 Preservation Plan study indicates that woody plant growth is now more rampant. Root growth is a major factor in pushing panels out of plumb. Erosion has exposed the back surface of many of the upper igloo panels.

Summary of defects

For purposes of the survey, each area of edge spalling that was of limited extent, such as a corner, or along a single edge, was counted as a single moderate defect regardless of its length. This is because each separate defective area would be considered a separate repair by a contractor. Where the defect extends completely around the top and sides as a continuous deep edge spall, the unit is characterized as having "severe spalls".

Vertical panels (67 panels):

30 moderate edge spalls affecting 20 panels.
9 severe edge spalls affecting 9 panels
7 panels with surface spalls (avg. 9 sq. ft. per panel)
5 panels with incipient spalls

4' panels @ igloos (30):

16 panels missing or with major spalling

Igloos (10):

14 moderate edge spalls (7 @ igloo #1)
12 surface spalls (5 @ wire rebars)
2 current with graffiti, 4 with old residue

Bronze edge clips

50+ missing (40 at 4' panels over igloos)

The numbers provided in the above summary are estimates of current conditions based on a very brief survey, and accurate observations were further obscured by the current vegetation. Conditions should be re-surveyed in greater detail before specifying and carrying out actual repairs. In all likelihood, additional defects will be found on resurveying.

Storage Igloos and Panels: Treatment Options and Recommendations

Unlike Fort Pickering where the original form of the masonry features has been obscured by major deterioration and later changes, the original form and appearance of the World War II munitions storage area is readily apparent. The issues boil down to the following.

1. Determining whether these World War II features warrant the substantial expense that will be required to effectively stabilize and preserve them.
2. Determining the extent that original concrete panels should be retained and repaired rather than replaced with new concrete panels in order to preserve historic fabric.
3. Choosing the most appropriate technical

procedures to accomplish the goals.

Assuming the determination of the first item is to retain and preserve the storage area features, the following near-term actions are recommended (note; 2-4 can be accomplished by City of Salem staff provided the findings of item 1 are taken into consideration):

1. Fully excavate the rear side of a vertical panel under the joint direction of an archeologist and an architectural conservator in order to determine:
 - a. The construction detailing of the rear side of the panels and assess the feasibility of replacing severely spalled vertical panels.
 - b. The extent that replacement of individual vertical panels would impact potential remaining archeological features of the bastion.
 - c. The extent of previously disturbed soil behind the panels.
2. Clear all woody vegetation from the top of the bastions. At a minimum the area within 4' of the concrete panels should be cleared. Woody roots should be physically removed adjacent to the panels assuming their removal will not affect archeological features, will not further damage the panels, and that the soil surface will be immediately treated to prevent further erosion.
3. Provide fill to bring the soil surface level to the top of the panels.
4. Remove and store for future reinstallation any of the top igloo panels that are in danger of falling, or reset them to make them secure.
5. Remove graffiti (leaving it in place is an open invitation for more extensive graffiti).

Comparison of current spalling to 2 photographs from the 1998 survey shows little change. Thus the rate of deterioration is relatively slow, and repair and/or replacement of deteriorated precast units can be carried out over an extended period of time

as part of the mid-long term improvement program for the fort.

Th basic options for repair of the spalling concrete can be summarized as follows:

1. Coating the spalled area with material intended to waterproof it.
2. Patching with cementitious materials (called plastic patching).
3. Replacing the unit with matching new pre-cast concrete unit.

Method #1, waterproof coating – This is a short term solution that may cause more problems than it solves and is not recommended.

Method #2, plastic patching – This involves cutting back the friable concrete to sound material, removing the rust from any exposed rebar and painting them with a rust inhibiting material (or removing them entirely), and then installing a cementitious patch formulated to be compatible to the existing concrete. Deep spalls may require the installation of stainless steel dowels and wire to provide a mechanical bond for the patch. Achieving a good aesthetic match to the color and texture of the adjacent existing concrete surface can be difficult, and requires considerable skill and experience. This method is viable in practical terms provided the total extent of patching does not exceed the cost of a new unit, or where replacement of the unit is simply not feasible due to the construction details or historic preservation concerns. Each patch should be confined to a single precast unit, and should not be allowed to bond to an adjacent unit. This can be accomplished by applying a bond-breaking material to nearby surfaces of adjacent units. Several companies market proprietary cementitious patching materials that may be suitable plastic patching of the precast units ("Jahn M90" by Cathedral Stone Products, Inc., 7266 Park Circle, Hanover, Maryland 21076, and "Custom System 45" by Edison Coatings, inc., 3 Northwest Drive, Plainville, CT 06062)

Method #3, replacement – This is likely to be the

longest lasting solution, provides aesthetic uniformity within the panel, and is economical where the extent of patching would be extensive. The units should be fabricated by a firm that specializes in architectural pre-cast concrete rather being "home made" by a local contractor.

There is extensive technical literature on concrete patching and restoration ranging from expeditious solutions for parking garages and cement pavements to lengthy scholarly studies and reports on 20th century historic landmark structures. The factors affecting concrete deterioration are complex and effective long term preservation of original deteriorated fabric has often proved to be both very labor intensive and elusive. References to some of this literature is included in the Report Appendix. The execution of plastic repairs and replacement of deteriorated units should be preceded by a resurveying the units on a detailed level, testing and analysis of the existing concrete to determine its original formulation and any factors that may cause continued deterioration, and the preparation of detailed technical specifications based on the testing and above referenced literature.

The following order is suggested to prioritize the actual repair of the deteriorated concrete units.

1. Replacement of the 16 missing or severely spalled 4' panels over the igloos, along with minor patching and realignment of the remaining 14 sound units (many of this units are severely dislodged). Note that this will require 3 distinct casting patterns, and will also require the fabrication of at least 40 bronze retaining clips in at least two different configurations (1 at the tops and 1 at the lower sides).
2. Plastic patching repair of edge spalls at the igloos (14 individual repairs)
3. Plastic repair to shallow surface spalls at the igloos (12 locations)
4. Replacement of severely spalled vertical panels

(9 panels total, 5 being on the south wall)
5. Plastic patching repair and/or replacement of vertical panels having moderate spalls, together with realignment of severely dislodged vertical units.

6. Incipient spalls; postpone repair until spalling becomes more fully developed, at which time carry out plastic patching.

Access Roadway: Description and Condition

This feature consists of a conventional cast in place concrete roadway. It is 14' 7" wide with its outer edge butting up to the base of the igloos and vertical panels. The roadway is divided into large panels that form natural expansion joints. There is a narrow drainage swale along its inner edge at the junction to the grassed parade area. This swale is constructed of granite setts and may be relatively modern. It is largely filled in with dirt.

The concrete surface of the road is in fair condition with minor shallow spalling occurring over much of its surface. Its original texture was formed by brushing the concrete surface while it was wet. This brushed texture is now largely obscured. The joints between sections have been visually widened by edge spalling. No visible rebars were noted.

The road is no longer actively used for vehicular traffic, and the shallow surface spalling is benign from a functional perspective. Over an extended time the spalling will probably gradually worsen. The road is an integral part of the WWII munitions storage facility and should be retained as a component of its historic fabric. Given other needs and priorities at the fort, repair of the roadway should be postponed until the spalling becomes severe enough to be a hazard for foot traffic. At that time plastic patching repairs should be carried out with the surface treated to reproduce the original brushed surface texture. The dirt should be cleaned out from the drainage swale to enable it to effectively drain the roadway surface. Promoting good drainage will prolong the life of the concrete

surface.

Recommendations - North Bastion Masonry

Short Term - Stabilization:

1. Fully excavate the rear side of a vertical panel under the joint direction of an archeologist and an architectural conservator in order to determine:

- a. The construction detailing of the rear side of the panels and assess the feasibility of replacing severely spalled vertical panels.
- b. The extent that replacement of individual vertical panels would impact potential remaining archeological features of the bastion.
- c. The extent of previously disturbed soil behind the panels.

2. Clear all woody vegetation from the top of the bastions. At a minimum the area within 4' of the concrete panels should be cleared. Woody roots should be physically removed adjacent to the panels assuming their removal will not affect archeological features, will not further damage the panels, and that the soil surface will be immediately treated to prevent further erosion.

3. Provide fill to bring the soil surface level to the top of the panels.

4. Remove and store for future reinstallation any of the top igloo panels that are in danger of falling, or reset them to make them secure.

5. Remove graffiti (leaving it in place is an open invitation for more extensive graffiti).

6. Clean out drainage swale on the inner side of the concrete roadway.

Medium- Long Term - Preservation: (in prioritized order)

7. Replacement of the 16 missing or severely spalled 4' panels over the igloos, along with minor patching and realignment of the remaining 14 sound units (many of this units are severely dislodged). Note that this will require 3 distinct casting patterns, and will also require the fabrication of at least 40 bronze retaining clips in at least two

different configurations (1 at the tops and 1 at the lower sides).*

8. Plastic patching repair of edge spalls at the igloos (14 individual repairs)*

9. Plastic repair to shallow surface spalls at the igloos (12 locations)*

10. Replacement of severely spalled vertical panels (9 panels total, 5 being on the south wall)*

11. Plastic patching repair and/or replacement of vertical panels having moderate spalls, together with realignment of severely dislodged vertical units.

12. Incipient spalls; postpone repair until spalling becomes more fully developed, at which time carry out plastic patching.

13. At the roadway carry out plastic patching repairs to any areas where the surface spalling has deepened to become a hazard to pedestrian usage; treat the patched surface to reproduce the original brushed surface texture.

The number of repairs listed in the above recommendations are estimates of current conditions based on a very brief survey. The execution of plastic repairs and replacement of deteriorated units should be preceded by a resurveying the units on a detailed level, and the preparation of detailed technical specifications based on the literature cited in the appendix.



Fig. 106: Typical surface spall without exposed rebar that can be repaired with plastic patching. This condition occurs primarily on east wall panels, with each panel having several sizeable areas of spalling totaling 8-12 square feet of surface area.

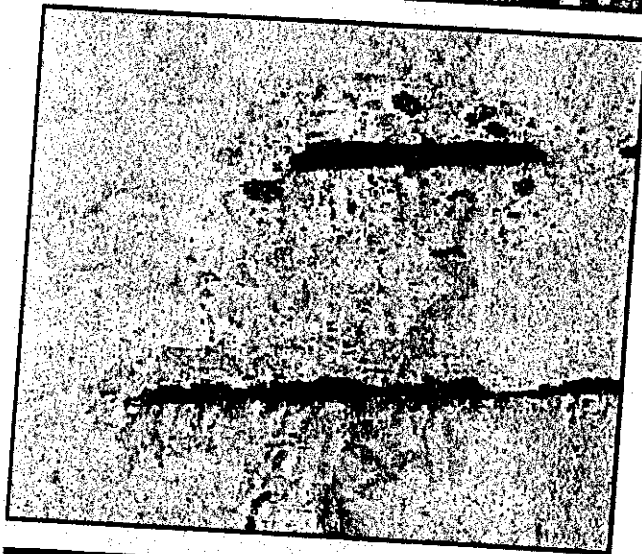


Fig. 107: Typical surface spall with exposed rebar. This condition occurs mostly on the inner faces of some igloo niches and results from the rebar being much too close to the surface. The exposed rebar should be cut out in conjunction with applying a plastic patch.

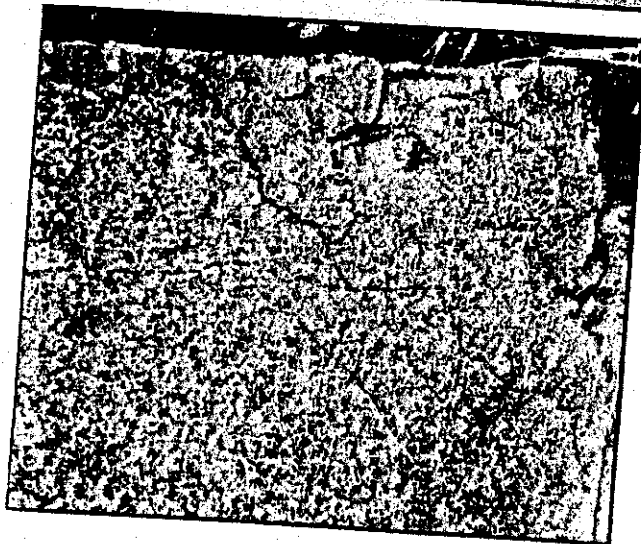


Fig. 108: Typical incipient spall at the top corner of a vertical panel. The visible cracks are the initial phase in developing a full spall. Repair can be postponed until active spalling occurs. Although the survey only noted 5 areas of incipient spalling, there are probably many more that were not observed due to overhanging foliage.

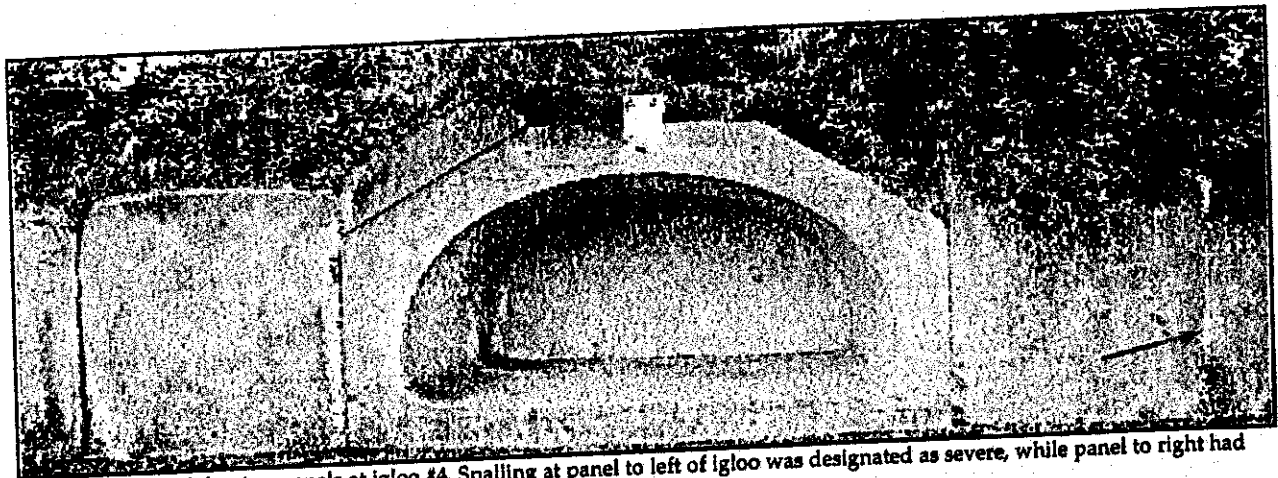


Fig. 109: Missing igloo top panels at igloo #4. Spalling at panel to left of igloo was designated as severe, while panel to right had moderate spall (arrow) and incipient spalling at the top.



Fig. 110: Dislodged vertical panel is pushed out at the top and is missing its bronze retaining clips. Although visually disturbing, the panel appears to be stable.



Fig. 111: Dislodged igloo top panel is pushed out by vegetation and lacks top clip. Many of the 14 remaining top panels are similarly dislodged.



Fig. 112: Typical bronze clip used to join vertical panels at the top.



Fig. 113: Invasive woody vegetation and related root structure has pushed off the top panel of igloo at right. Also note top corner spall to vertical panel at left.



Fig. 114: Surface spalling at concrete access road (right) including deeper spall along joint line (bottom), silted up drainage swale on left. Individual stones at upper left are the outer border of the swale.

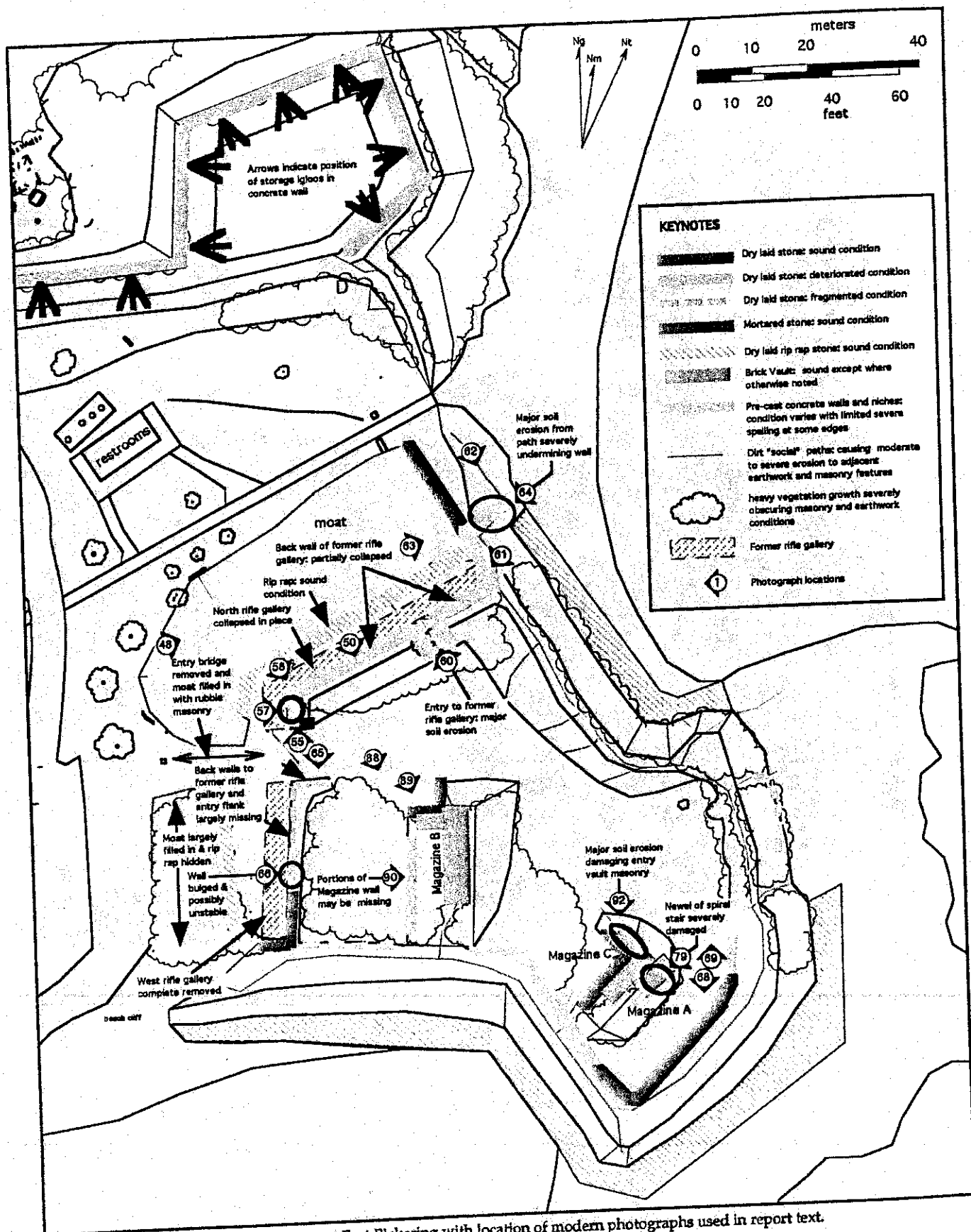


Fig. 115: Summary of existing conditions at Fort Pickering with location of modern photographs used in report text.

VII. MANAGEMENT, IMPLEMENTATION AND PRELIMINARY COST ESTIMATES

MANAGEMENT AND IMPLEMENTATION

A detailed study of maintenance operations, budgets, and staffing was beyond the scope of this study, but field observation and discussions with maintenance staff have pinpointed management opportunities within the Fort Lee and Fort Pickering sites.

ISSUES

Coordination

Issue

A formal coordination structure among the several departments whose work affects the Forts, Salem Willows and Winter Island should be established. Public Services, Department of Planning & Community Development, Park & Recreation and Open Space (including special events scheduling), have an informal, unstructured coordination system.

Recommendation

Improve coordination among departments whose work affects the Forts. Formalize the process of receiving information and recommendations from maintenance supervisory staff and improve communication among planning, design, and maintenance staffs. Maintenance needs and issues should be considered in design decisions, and design intent should be supported by maintenance practices.

Systematic Maintenance

Issue

Currently, there is no formal written plan for periodic maintenance and no overall plan for vegetation maintenance.

Recommendation

Appoint a Forts manager and develop a dedicated

Forts crew that understands both the historic landscape issues and those groups that use the Forts. Increase staff size to meet the needs of landscape maintenance. Appoint a Forts manager or superintendent to head this dedicated crew, to be accessible and accountable to Fort users, and to organize the efforts of staff, and volunteers.

Implement this study's short-term recommendations and maintenance tasks. This study recommends clearing in the short-term to allow full understanding of all conditions. Some of the clearing will be required yearly for preservation. The maintenance projects identified in this study should be modified based on further preservation that is completed over time and the budget increased accordingly to accomplish the required maintenance.

Staffing & Training

Issue

No crew is dedicated solely to maintaining the Forts.

Recommendation

Following the restoration of each fort complete a final maintenance work plan and schedule that addresses all maintenance needs. Such a plan will increase accountability and productivity and will support the implementation of recommendations.

Issue

Lack of awareness of the archaeological sensitivity of the Forts and the Forts area.

Recommendation

Provide training and appropriate information, such as maps and diagrams, to any and all staff and volunteers who will be working on the Forts and/or Forts area.

Funding and Maintenance

Issue

Current funding levels for maintenance are insufficient. The conditions of the Forts have suffered from deferred maintenance and have deteriorated to the point that they require an injection of capital funds for restoration. The annual maintenance budget for the Forts area should increase to provide for preservation as well as maintenance.

Recommendation

Increase maintenance budget. A proportional increase in maintenance budgets must be allocated and is as important as capital spending in creating a healthy and beautiful historic and recreational setting.

Establish a Friend's of Salem Forts Society. This society would be composed of citizens in the community with an interest in Salem's historic sites to assist in the forts preservation planning and to raise funds for the restoration efforts. Ideally, the Friend's of Salem Forts Society could be instrumental in establishing a full time staff position for the Forts director who would manage the Visitor's Center, assist with raising funds and be the liaison with other local historic groups.

CAPITAL EXPENDITURES

The table below summarizes capital expenditures for each segment of the Forts preservation, restoration and maintenance. These order-of-magnitude costs-expressed in 2003 dollars-are intended only for planning purposes. The tables group the recommended projects into short-, mid-, and long-term phases. The totals for the three phases add to \$1,985,900.

Short-term - Those recommendations where immediate implementation is possible using existing staff and little or no cost.

Mid-term - Those recommendations that existing staff may be able to accomplish (choosing one or more each year), that are very low-cost (or grants

are available to cover all the costs), that are for handicapped accessibility or simple signage, or are basic preservation measures that should not be deferred.

Long-term - Those recommendations where a major funding source would need to be identified and those that are more visionary and not absolutely required for stabilization.