

Nathaniel Bowditch Park Concept Plan

City of Salem, Massachusetts



Consultant: Sasaki Associates, Inc.

April 1979

NATHANIEL BOWDITCH PARK
CONCEPT PLAN
CITY OF SALEM, MASSACHUSETTS

CONSULTANT:

Sasaki Associates, Inc.
64 Pleasant Street
Watertown, Massachusetts

April 1979

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This report was prepared for the City of Salem Planning Department, W. Gregory Senko, Director. The authors wish to acknowledge the participation and considerable contributions of Mr. Senko and his staff, Mr. David Lash and Mr. Michael Moniz.

This report was prepared by Sasaki Associates, Inc., of Watertown, Massachusetts: Maurice Freedman, P.E., Principal/Project Director; Lawrence D. Carr, Project Manager; Stuart O. Dawson, Participating Principal/Designer; Michelle Zippel, Project Landscape Architect. Layout and graphics by Lydia Richardson.

Assisting Sasaki Associates in the preparation of this study were:

Mr. William Avery Baker - Naval Architect, Historian. Mr. Baker is the author of numerous articles and books on maritime history and is the designer of several ship reproductions including the Mayflower II and Maryland Dove. He is also curator of the Hart Nautical Museum at MIT in Cambridge, Massachusetts.

Mr. David Carsen, P.C. - Structural Engineer. Mr. Carsen is a structural engineer with over 35 years experience. His evaluation of the structural stability of the South River Channel bulkheads was a major contribution to this study.

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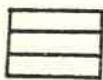
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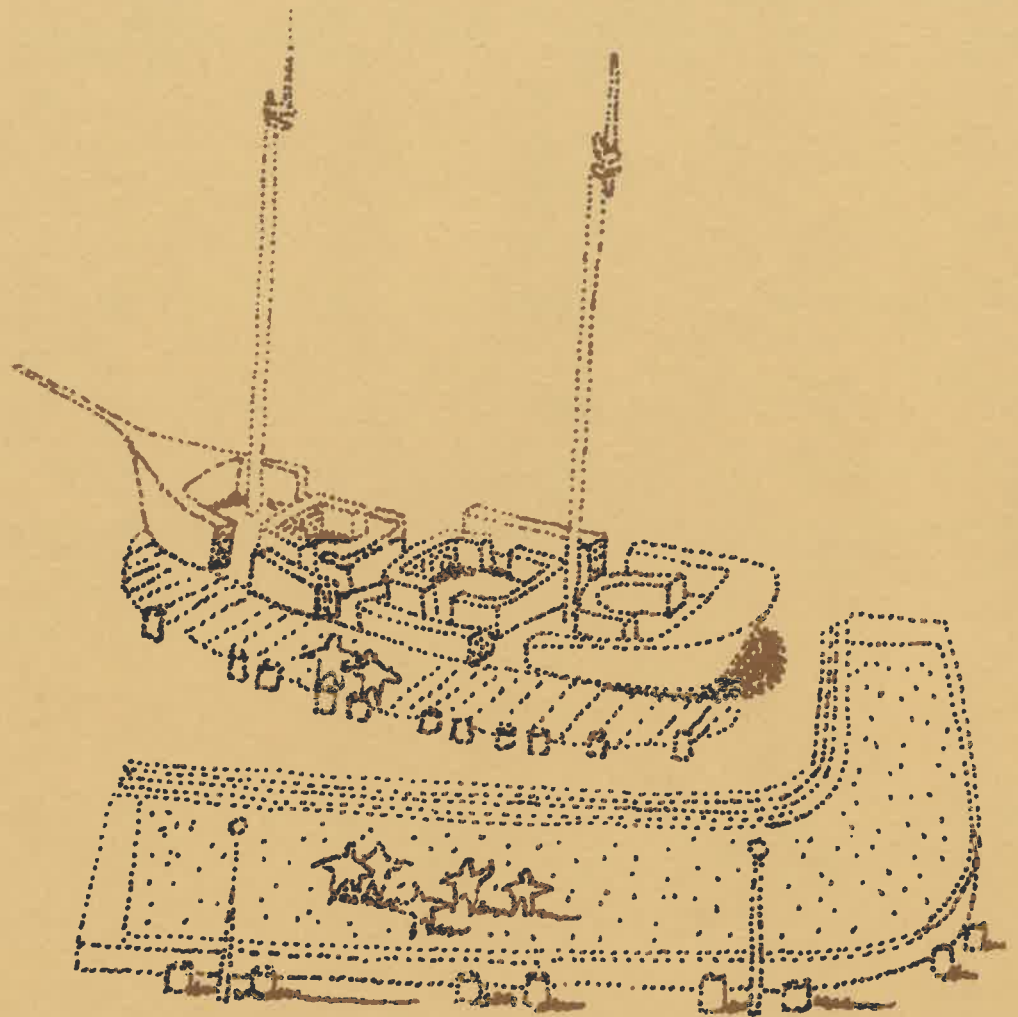
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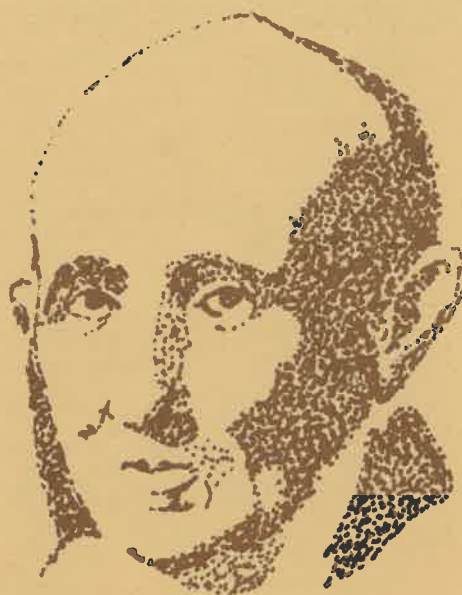


J. Penbody

Recommended Plan



Introduction



I. Introduction

A. Project Area History

Salem is a city in transition. A decade of intense planning and effective public/private cooperation are culminating in an unparalleled period of redevelopment and rejuvenation of downtown Salem (CBD). The mood of Salem businessmen and residents alike is one of optimism. It is difficult to pass a city block within the downtown where the manifestations of Salem's successful revitalization efforts are not apparent - major streetscape upgrading and beautification is underway accompanied by renovation of existing buildings and the construction of significant new development.

The keystones of Salem's renewal are: Heritage Plaza East - a downtown business renewal development which includes a 1,000 car parking garage, a pedestrian mall, new municipal offices, and the restoration of existing historic buildings; a new development of market rate condominium housing units bordering the CBD and focusing on the historic Universalist church; and, Pickering Wharf, a five to six million dollar privately-sponsored, mixed-used development consisting of some 55 condominium housing units, restaurants, tourist attractions, retail stores, and boat berthing facilities. Salem has also received an Urban Development Action Grant (UDAG) Application for \$1.3 million in an effort to anchor some \$3 million worth of private sector investment in the seriously run-down Point Neighborhood.

Amidst these centers of on-going and proposed urban revitalization lies the under-utilized Derby Street strip at the edge of the South River Channel. This area, also known as the Derby-Peabody Link, lies between Heritage Plaza East and Pickering Wharf and surrounds the remnants of Salem's South River (Fig. 1). The Derby-Peabody Link is an area of some 10.7 acres devoted primarily to auto-dependant retail uses and public utilities. It is a formidable area - it presently functions more as a barrier than as a link. High walls and barbed wire-topped fences along Peabody Street block access to the waterfront and hinder the social and economic integration of the Point Neighborhood with the rest of the city.

Congress Street, the Link's eastern boundary, Derby Street on its north, and Lafayette Street to the west are all wide, heavily utilized, urban arterials with parking on both sides. These streets and their broad unsignalized intersections pose a barrier to cross-movements of pedestrians and effectively isolate the "link" despite its vital locational relationship to Salem's renewal areas.

The Derby Street Strip has not always been an underutilized auto-oriented commercial strip it was once at the center of Salem's thriving maritime trade.

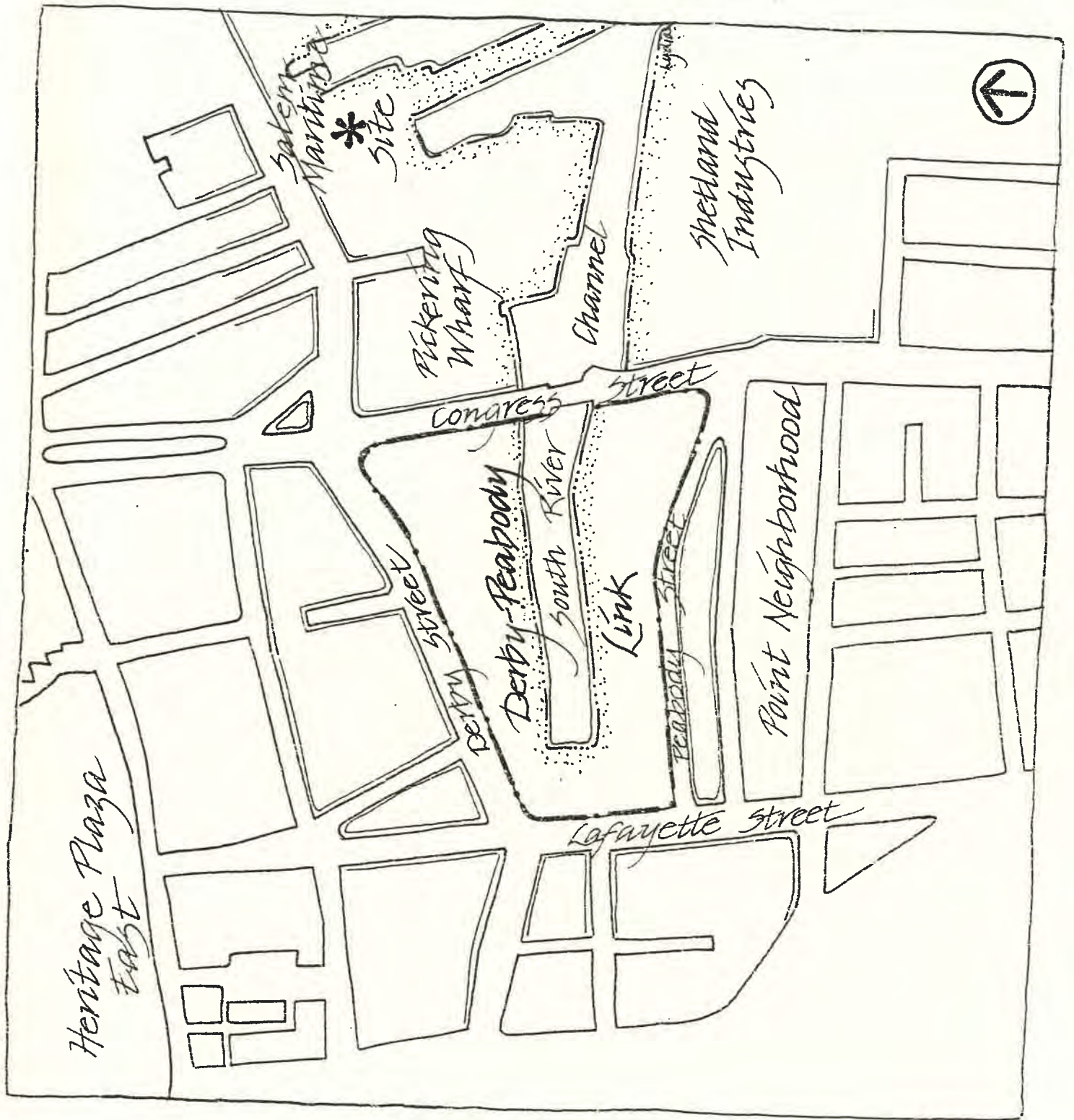


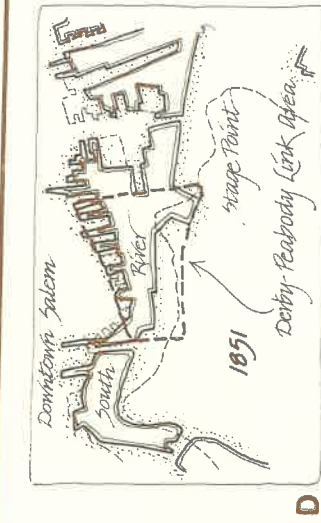
Figure 1
Site Locals

FIGURE 2

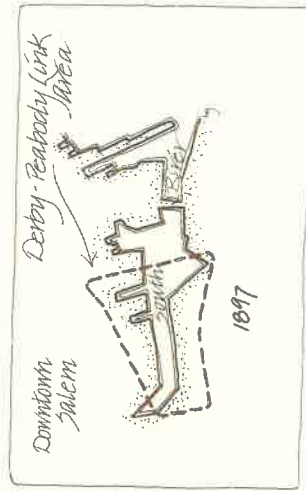
Topographic
Change 1700-1941

Funding for this study was provided
by a Grant from the Massachusetts
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Affairs, Coastal Zone Management
Division.

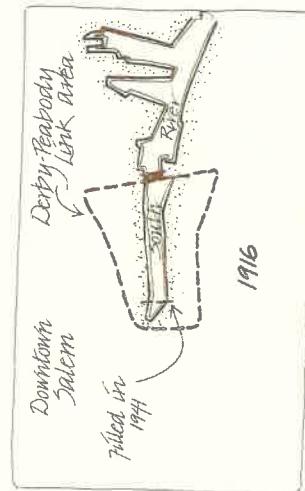
SALEM SOUTH RIVER CHANNEL



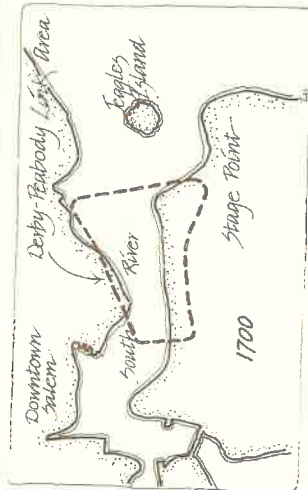
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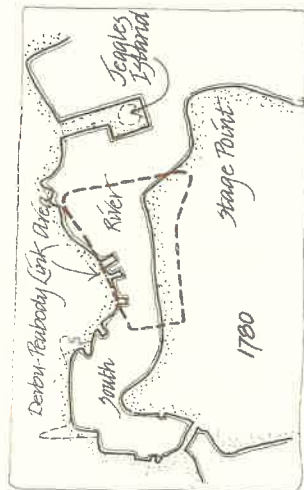
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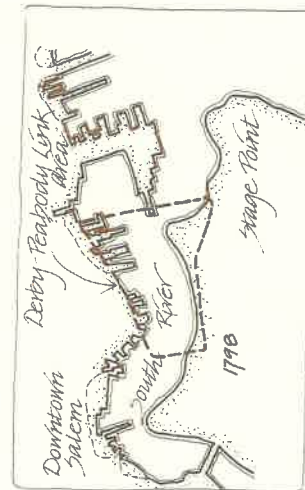
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A



B



C

It has been said that water was the great common highway in New England (1). Bad roads and a limited number of bridges caused waterways to be used as the major avenue of transportation during the seventeenth and eighteenth centuries. The oceans provided the "highway" conveniently linking coastal areas and lands across the sea during this period. Towns, of necessity, grew along the water's edge, with front doors' growing out towards the harbor or the river. Salem, situated on a peninsula with the North and South Rivers on either side, was readily accessible to water from all parts; and thus it was from its first beginnings, a maritime place. Early maritime history in Salem was largely related to its substantial fishing industry, which was in its heyday from 1630 to 1740. It was not until after the Revolutionary War that Salem's commercial fortune was at its greatest. After the war, Salem found itself with many large ships which had been built as privateers. These ships, which were too large for coastal trade or short voyages, were soon put to use opening up new avenues of trade to distant countries. With no lack of able seamen to man the vessels and the sport of adventure left over from the war, a Salem vessel was the first American ship to sail to the ports beyond the Cape of Good Hope, to Africa, India, China & Australia. From 1776 to 1806, Salem was at the height of her commercial prosperity.

Salem's growth as a trading capital during the post-Revolutionary War period is shown in the evolution of the city's coastline. Up until and immediately following the Revolution, the South River cut a large swath through the city. The shoreline was regular and natural except for a few small piers which were built along Derby Street in the Revolutionary period (Figure 2A and 2B). By 1798, Salem was in its heyday as a leading port for international trade. Numerous wharves had been built off Derby Street; Jeggles Island, in the mouth of the South River, had been incorporated into a peninsula of piers and wharves which is today Pickering Wharf; and the South River was a major shipping lane and sailors' haven which also offered excellent protection in times of storm. By 1851, bridges crossed the South River in two locations in the downtown and changes in the shoreline tended to take the form of filling between wharves to once again create a regular shoreline -- Salem's heyday as a port was passing.

By the close of the 19th century, the irregular, saw-toothed wharfscape characteristic of Derby Street in the second half of the eighteenth century had all but disappeared. The South River was virtually non-existent west of Lafayette Street as Salem turned its back to the sea. The next seventy years were to see the water's edge become both a commercial strip zoned for the kinds of land-use activities that were shunned inland and an industrial complex where the few remaining industries which could take economic advantage of the waterfront were to remain.

(1) History of Essex County, Mass., Vol. I, p.9 Salem - Chapter I by Rev. George Batchelor.

Salem is perhaps best known for the persecution of persons believed to be witches and as the home of author, Nathaniel Hawthorne. Less well-known is Salem's major contribution to the nation's development. For nearly a century Salem was second only to Boston as the leading seaport in the northeast. Dozens of ships each year sailed out of Salem with American products and returned laden with goods from far away ports. The East India Trade did much to bolster the economy of the newly independent nation. Salem's period of maritime dominance gave rise to several personalities whose achievements still live on. Among the most important of this period, but also among the least known to the general public, was Nathaniel Bowditch.

Born in Salem in 1773, Nathaniel Bowditch was one of six children born to Habakkuk Bowditch. Although formally schooled for only five years, Bowditch had a natural aptitude for mathematics. At the age of 12, he was apprenticed to Ropes & Hodges, ship chandlers. It was at this time that he began his informal self-education. He was given access to the philosophical library, said to be the finest scientific library north of Philadelphia. During his term of apprenticeship, he learned to read Latin & French; later in his life, he acquired some knowledge of Spanish and German. His facility in reading foreign languages opened, to him, the scientific literature of Europe, and gave him an advantageous position of general mathematical knowledge while still an apprentice. In 1794, after his term of apprenticeship ended, he was given the post of assistant surveyor to Captain John Gibaut to survey the Town of Salem.

In January, 1795, Bowditch began the first of his five sea voyages to the East Indies. Bowditch made four journeys with Captain Prince, first as captain's clerk and nominal second mate, and on his final three voyages with Prince as Supercargo. On Bowditch's fifth voyage he was Master and Supercargo of the Ship Putnam on its sail to Sumatra and Ile de France.

Life at sea gave him the opportunity to work on his mathematics and to put his theory of simplified navigational calculations and procedures to the test. In 1799, Edmund M. Blunt of Newburyport published the first American edition of John Hamilton Moore's New Practical Navigator, "corrected by a skilled mathematician and navigator". It was not until the 2nd edition, in 1800, that Bowditch was actually credited with having done the work. The errors which Bowditch had discovered in the original work were so extensive that in 1802 when Blunt published a third edition of the New American Practical Navigator, the credit for authorship for this volume was given solely to Bowditch. This book and Bowditch's laymen's tables for practical navigation revolutionized the subject. No longer was nautical navigation such a mystery. Rather, it was a skill which could be acquired by anyone capable of basic mathematics.

Shortly after his last voyage, Bowditch was elected President of the Essex Fire and Marine Insurance Company, a position which he held until 1823. During the summer of 1804, he resumed his surveying of

Salem harbor, as well as the harbors of Marblehead, Beverly and Manchester. Apparently Bowditch's survey is as good today as it was then; in 1935, a professor of geology at Dartmouth College checked a number of Bowditch's figures and found that they tallied exactly.

In 1810, Bowditch was elected overseer of Harvard College, a position which he resigned in 1826 when he was elected to the corporation. In 1816, Harvard made him an honorary Doctor of Laws. In 1823, Bowditch accepted the positions of actuary of the Massachusetts Hospital Life Insurance Company and President of the Commercial Insurance Co. (Fire and Marine), both in Boston. He moved his family to Boston, where he died in 1838. The headstone of his grave site in Cambridge's Mt. Auburn Cemetery is shown in the photograph on the cover of this report. A more complete biography of Nathaniel Bowditch is in the appendix to this report.

B. Project Objectives

The importance of the Derby-Peabody Link is embodied in the following characteristics of the block:

Lying at the geographic center of the City's major revitalization efforts, which together represent over 50 million dollars of public and private investment; the Link is a potentially major catalyst to the overall success of these projects. It is a potential amenity vital to the efforts to physically rejuvenate and economically stabilize the Point Neighborhood. It offers an opportunity to provide much needed recreational facilities for the youth of the Point Neighborhood.

The link is intrinsically high value waterfront land which is currently underutilized by uses which are inconsistent with their shoreline location.

It offers an unparalleled opportunity for Salem to reclaim its forgotten waterfront and capitalize upon an aesthetic, economic, and recreational amenity.

In an effort to restore the Derby-Peabody Link to a position of prominence within the city befitting its role in Salem's heritage, and to re-enforce ongoing and proposed revitalization efforts elsewhere within the downtown, the City of Salem proposes to undertake a series of improvements within the block. These improvements will feature four important urban planning principals:

The water's edge is a public amenity and as such, where possible, the public should be guaranteed ready and free access to the water.

Recreational facilities and public open space are vital elements in the quality of a living environment. Neighborhood solidarity and viability are as dependent on access to open space as they are on access to other public services and employment opportunities.

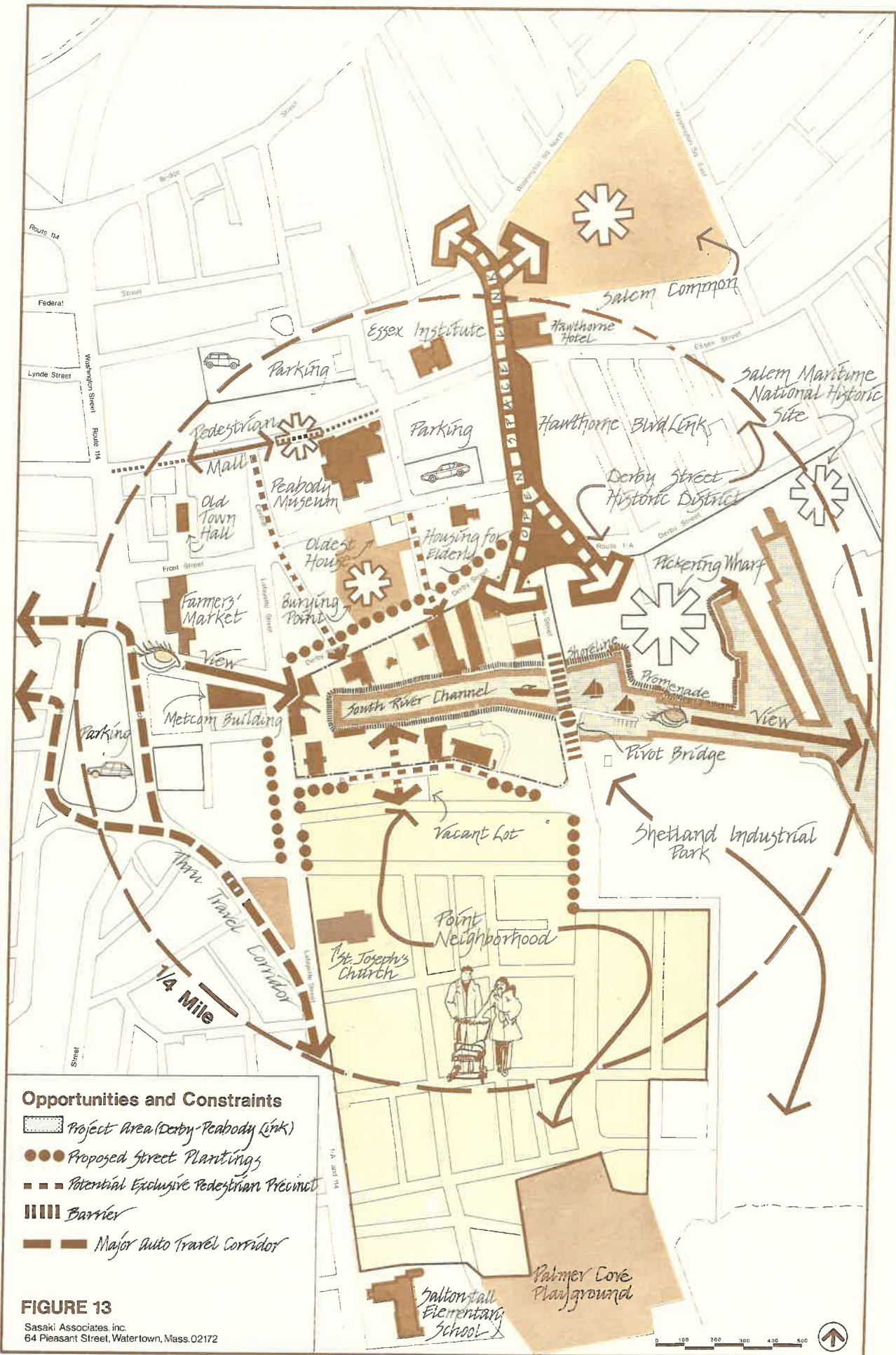
Urban environments succeed partly because of the diversity and spontaniety that occurs in cities. For this reason, revitalization

of an area should respect the need for a vital mix of activities. A sense of "place" is important to the success of an area.

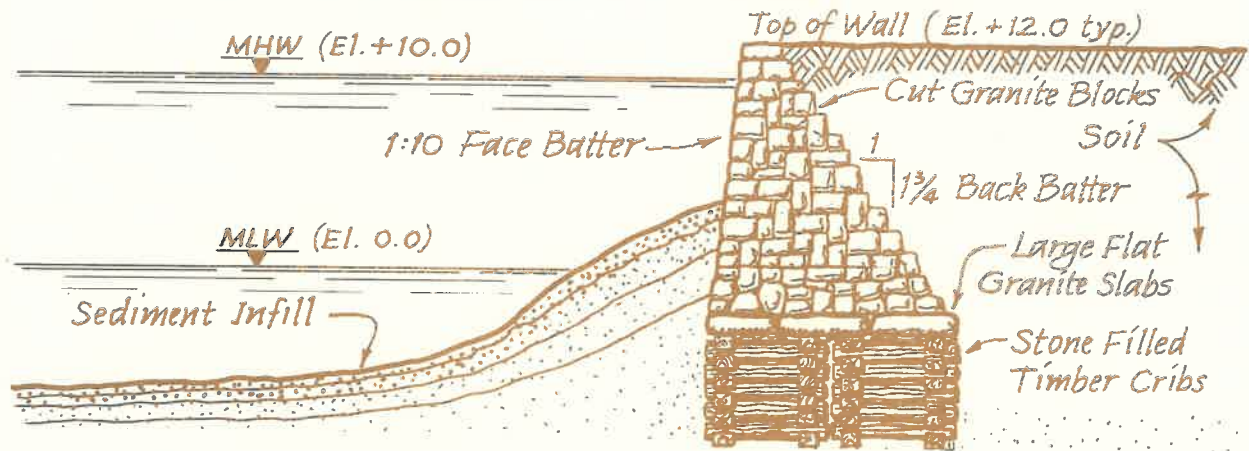
The preservation and adaptive reuse of existing structures provides for twentieth century progress and change, while maintaining important ties with an area's heritage.

The City arrived at its plan for the Derby-Peabody Link following several months of planning studies.

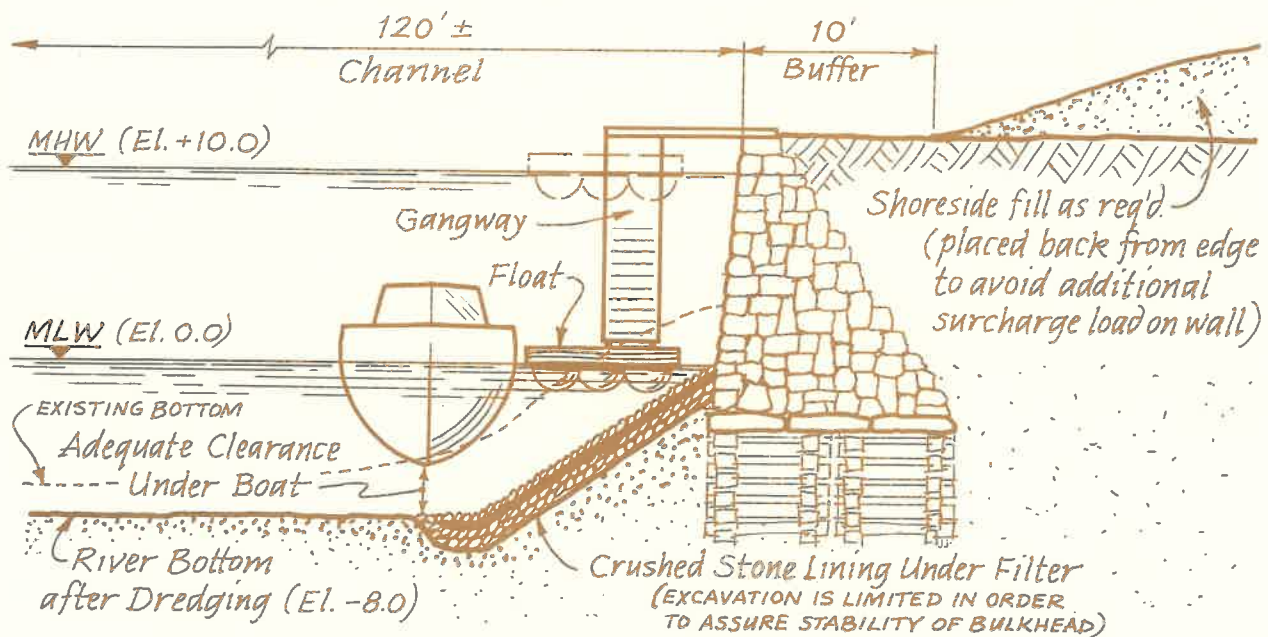
The following report details these studies and discusses the iterative process used to evaluate alternatives and arrive at a consensus plan. The appendix to this report contains supporting documentation and a chronology of the public participation process, which was an integral part of the planning and project programming.



100-Year Flood (El. +15.0)



Typical Granite "Gravity" Bulkhead



Channel Dredging and Lining
(Integrity of Original Bulkhead is maintained)

NATHANIEL BOWDITCH PARK

South River Channel

TYPICAL SECTIONS

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64 Pleasant Street, Watertown, Mass. 02172

Planning • Architecture • Landscape Architecture
Civil Engineering • Environmental Services

Scale 1" = 10' approx.

Figure 12

FIGURE 11

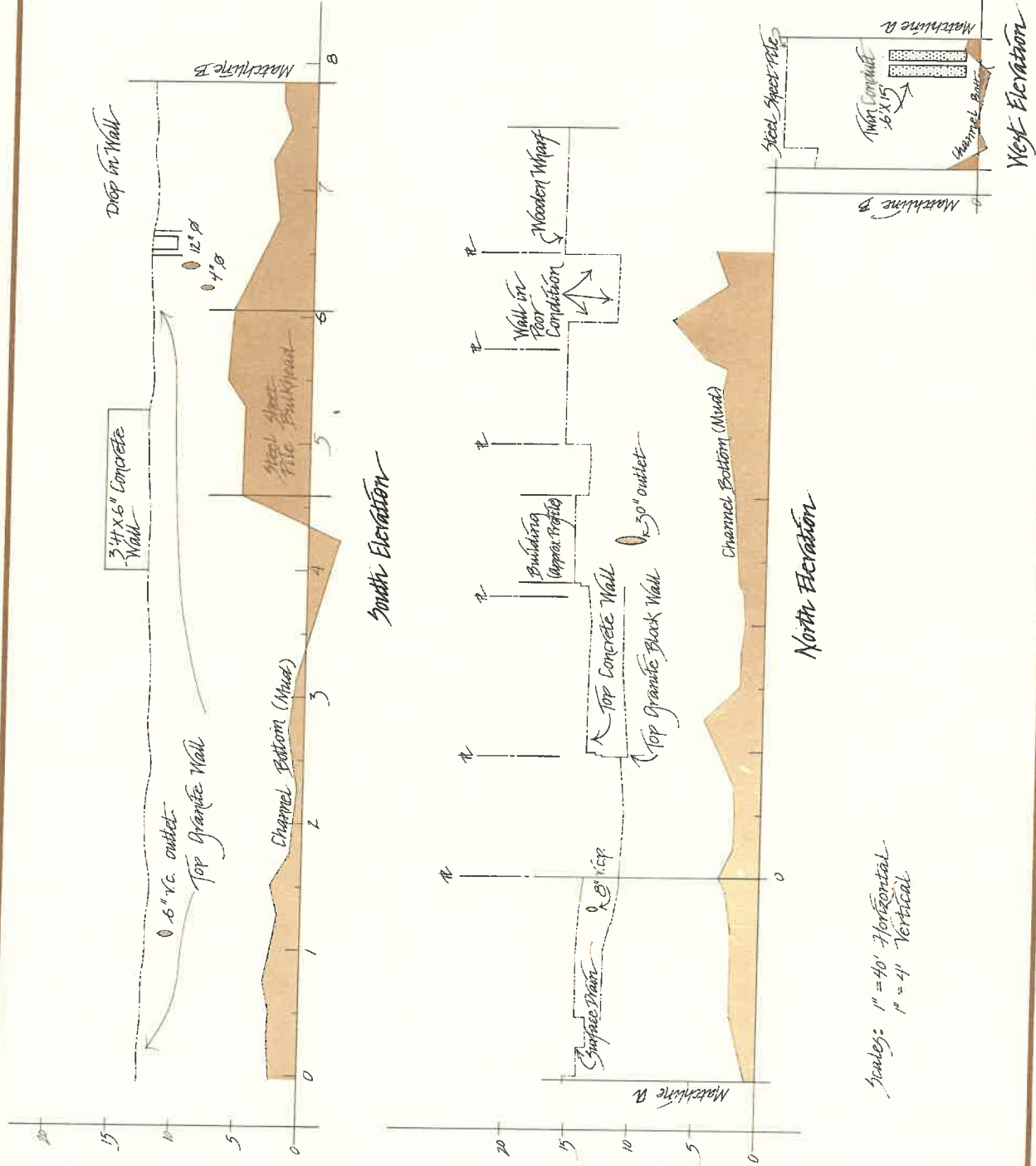
BULKHEAD PROFILE

Working for this study was provided
by a Grant Office of Environmental
Protection, U.S. Department of
Interior, Bureau of Land Management
Division

SALEM SOUTH RIVER CHANNEL

SA

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Planning - Architecture - Landscape Architecture
Civil Engineering - Environmental Services



II. Recommended Plan

A. Plan Selection Process

The process leading to a consensus concept plan for the revitalization of the Derby-Peabody Link included inputs from and/or coordination with the Planning Department, Design Review Board, City Engineer's Office, Parks Commission, Recreation Commission, Waterways Advisory Board, Historic Commission, Harbor Master, Conservation Commission, National Park Service, and other elected or appointed public bodies and officials.

Two public meetings and numerous work sessions with property owners, abutters, and private organizations with an interest in the outcome of plans for the Link were held.

A chronology of major meetings and their participants conducted during the plan development process appears in the appendix to this report.

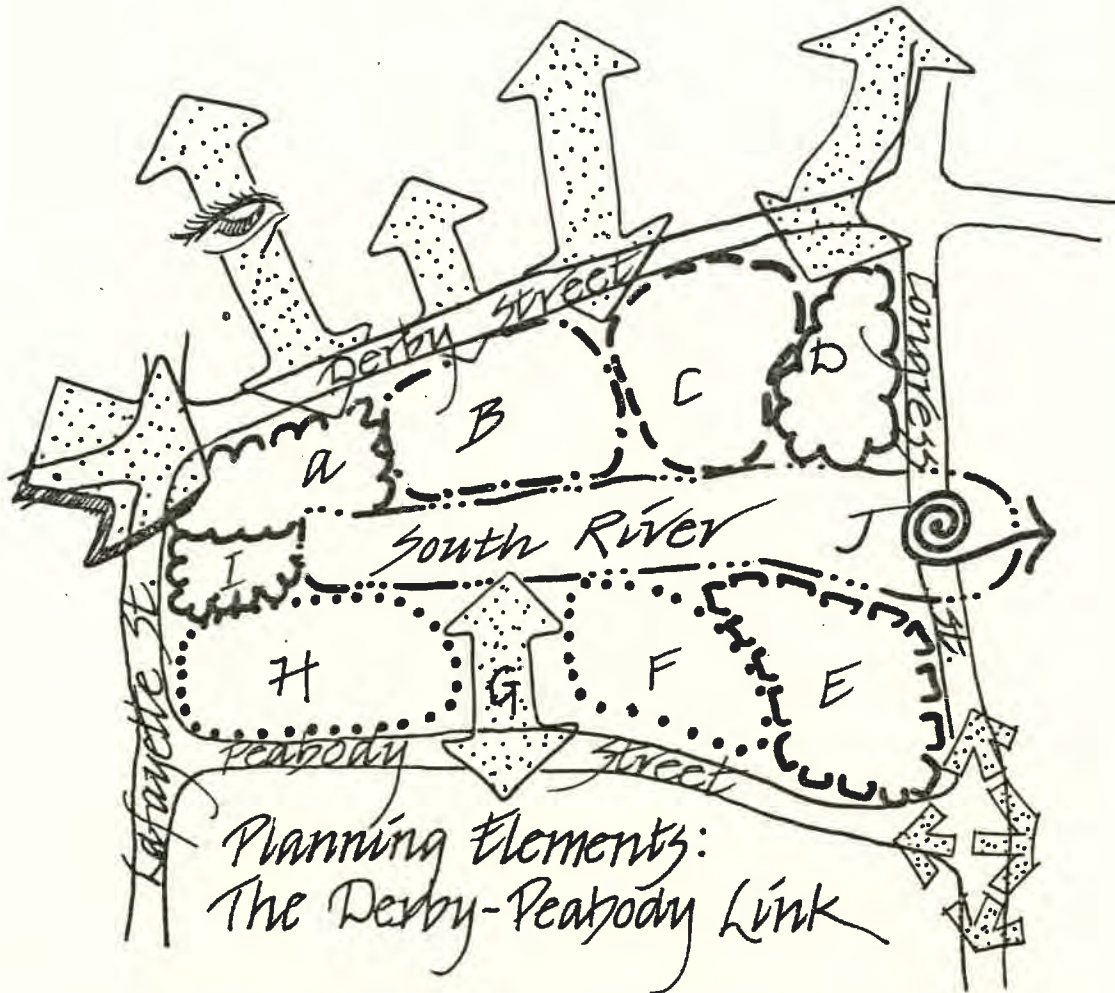
The selection of a Recommended Plan for the waterfront was an open, public, rational process involving the evaluation of numerous and widely varying alternatives and consideration of the views and opinions of all participants to the process. The plan selected best reconciles the sometime competing concerns of private interests and of the greater public benefit. The plan described in this section is a concept plan which sets forth the intent of the City with respect to the target area.

B. General Description

The Recommended Plan for Nathaniel Bowditch Park accomplishes five major planning objectives:

- . It reclaims and revitalizes one quarter mile of waterfront and returns it to the public.
- . It provides an important recreational area for the Point Neighborhood, including: A ballfield, a multi-purpose paved area, running track, and tot lot.
- . It provides for a diverse public place combining open space, retail/commercial, recreation, and marine uses.
- . It calls for the renovation of existing buildings to uses more appropriate to their waterfront site.
- . It removes visually blighting uses incompatible with the waterfront (gas stations, tire stores, etc.) and replaces them with major public open space, a boat basin, and retail/commercial activities appropriate to the waterfront.

The Recommended Plan was assembled from varied alternatives for each of ten planning sub-elements --



The section of this report entitled "Planning Analysis" describes the methodology and rationale for dividing the Link into the planning Elements A thru J shown above. This section also describes the how and why of the plan concepts; the function of each element. As described in the subsequent section the plan concepts are:

- . Element A: A Gateway and Orientation Area because of its important corner location. This area "opens" both the adjacent park (Element B) and the water to the view of the motorist and pedestrian.
- . Element B: A "Feature Park" because of its visibility from the Downtown and the opportunity it presents to recreate the wharfscape of Salem's maritime heyday.

- . Element C: A Commercial/Retail Node because of the quality of the existing buildings and the reality that commercial activity will help keep year-round activity in the park.
- . Element D: Parking area for the park and marina - a basic necessity in a location which can serve both easily.
- . Element E: Recreation space because of its proximity to the Point Neighborhood, its relatively large size, and regular shape. Needed by the neighborhood -- will help reduce the social isolation of the residents.
- . Element F: To remain basically intact because of the prohibitive costs of acquisition relocation, and demolition.
- . Element G: A Link with the Point Neighborhood. It is necessary to remove the physical barriers that now reinforce the social and economic isolation of this neighborhood.
- . Element H: To remain intact, except for some acquisition of the parking area. An important employer of Point Neighborhood residents. Acquisition, relocation, and demolition costs would be very high.
- . Element I: Parking for the park spaces. Buildings to be acquired and razed because to do otherwise would partially defeat the function of the adjacent Gateway (Element A).
- . Element J: To be a Boat Basin with a Pedestrian Promenade along the entire perimeter of the channel. These uses will once again make Salem's waterfront a center of activity and excitement. The water and its edge will again be public.

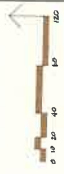
The Recommended Plan is shown on Figure 3. The elements of the plan will have the following features:

- . Element A: The Gateway will have a land-based replica vessel as the major visual clue to the waterfront and as an introduction to Nathaniel Bowditch Park. This vessel, Figure 4, will replicate in cast-like-wood concrete (see discussion of materials appearing later in this section) the deck arrangement, masts, spars, and rigging of a ship

FIGURE 3

Funding for this study was provided by a Grant from the Massachusetts Executive Office of Environmental Affairs, Coastal Zone Management Division.

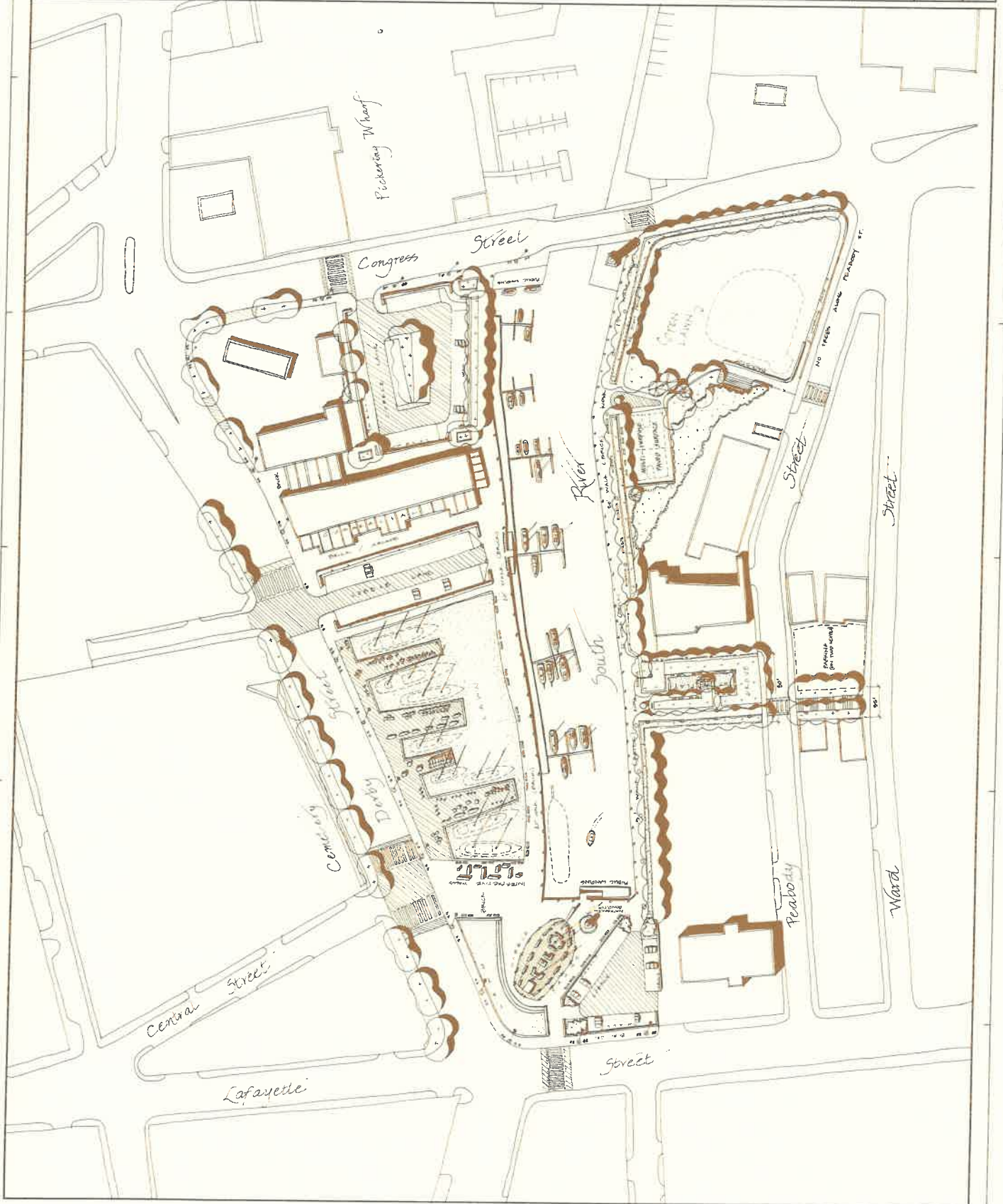
SALEM SOUTH RIVER CHANNEL

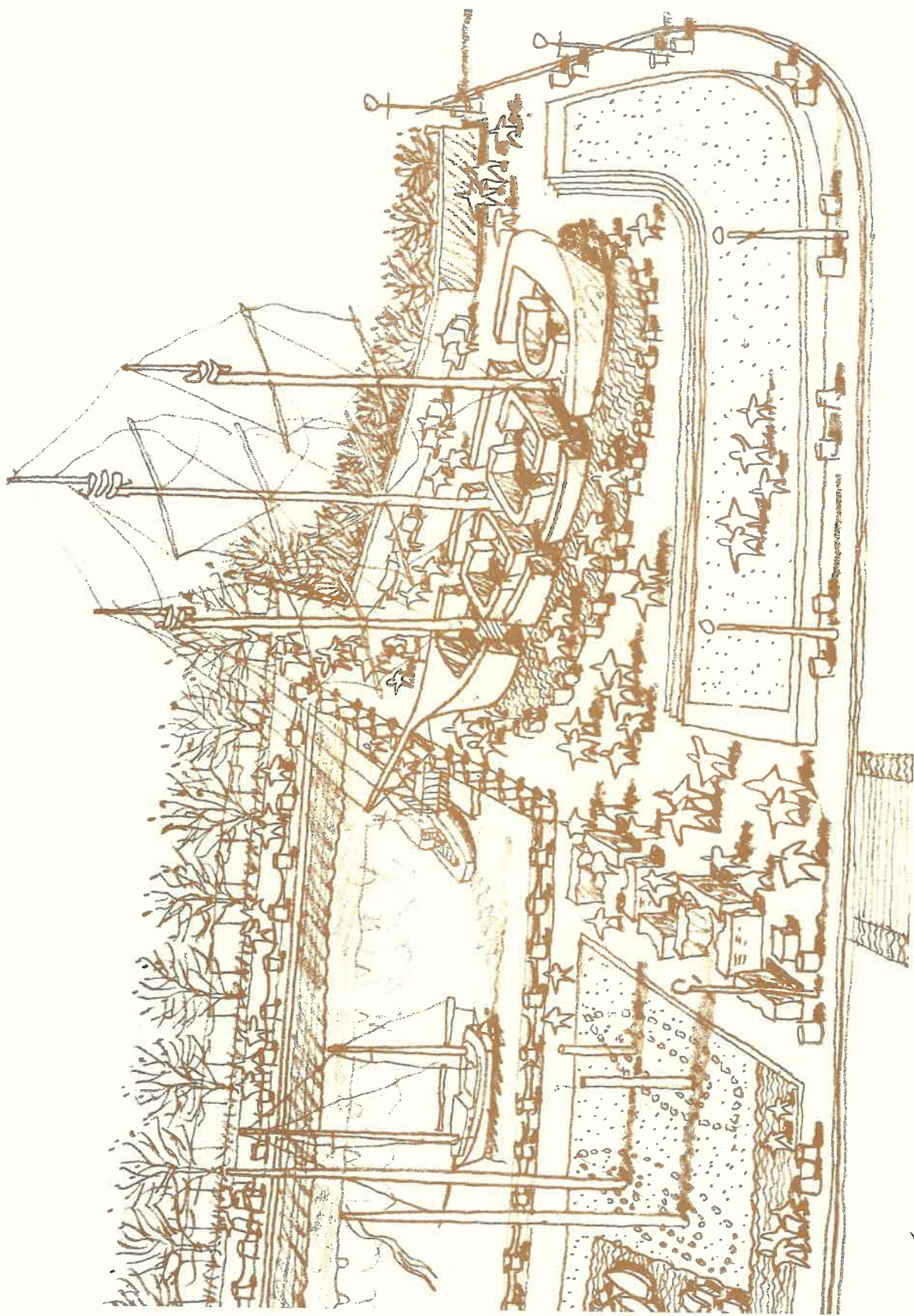


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SCALE 1"=40'-0" DATE August, 1979
DRAWN BY MSZ

CHECKED BY	PROJECT NO
APPROVED BY	NOTES





Main Entrance Orientation Exhibit with Bowditch Ship and
Nathaniel Bowditch Monument
Figure #4

of the late 1700's - perhaps a ship on which Bowditch himself sailed.

It is in this gateway area that the life of Nathaniel Bowditch will be explained. The replica vessel will help to illustrate the methods which Bowditch used for navigation. Perhaps a working chart or an old navigational map will be displayed. Surrounding the vessel will be plaques charting the actual route voyaged during Bowditch's journey, taken directly from the journals which Bowditch kept and which are at the Peabody Museum (See accompanying photograph).

Also within the Gateway element of the park will be orientation markers which will aid the visitor in understanding the wharfscape theme which appears in the "Feature Park", Element B (Figure 5).

Element B: The feature park area, Figure 5a, will be designed and constructed so as to be reminiscent of the wharf outline which characterized the Derby Street side of the channel around 1806 (The year of Bowditch's survey of Salem Harbor). Granite blocks will delineate the wharf edges and cobbles in the lawn will delineate authentic outlines of ships which sailed from Salem on the East India Trade. This unique feature, complete with masts, spars, and colorful flags, will convey a true sense of the small size of these vessels which one sailed thousands of miles in the turbulent Atlantic. There will be a slight change in grade between the wharf edge and the lawn area to further impart a sense that the grass areas are intended to simulate "water" and that the cobble areas are intended to be wharves (Figure 5).

Within this wharfscape will be interpretive exhibits which will convey the story of Salem's heyday. The exhibit will consist of nautical artifacts typical of the period between 1750 and 1850. These artifacts will be displayed and adapted to demonstrate their function where appropriate.

The overall effect will be a park which can be enjoyed in two ways: as a pleasant outdoor space along the water's edge, and as an historic museum which informs visitors about Salem's most important contribution to the nation - the East India Trade - and about one of the most interesting personalities of the period, Nathaniel Bowditch.

Element C: The park visitor will step into another era upon "entering" Element C. Here the brick wharf buildings will be reconditioned and remodeled. They will house contemporary retail and commercial activities compatible with the waterfront in buildings reminiscent of a century ago. The decision to retain these buildings was made for several reasons:

Nathaniel Bowditch's Journals in the Ship
Alma; Henry Prince, Master.

July 1. 20, at day break we discovered the Head of Trinity Island, by the means of several good lunar observations, and made the longitude of 28° 39' W. which is nearly 2° left than in Moore's Almanac, and in other books and charts the last observed time great difference existed as to the time observations while in sight of the Head, one of which agreeing in 3 with each other, left no doubt of their accuracy.

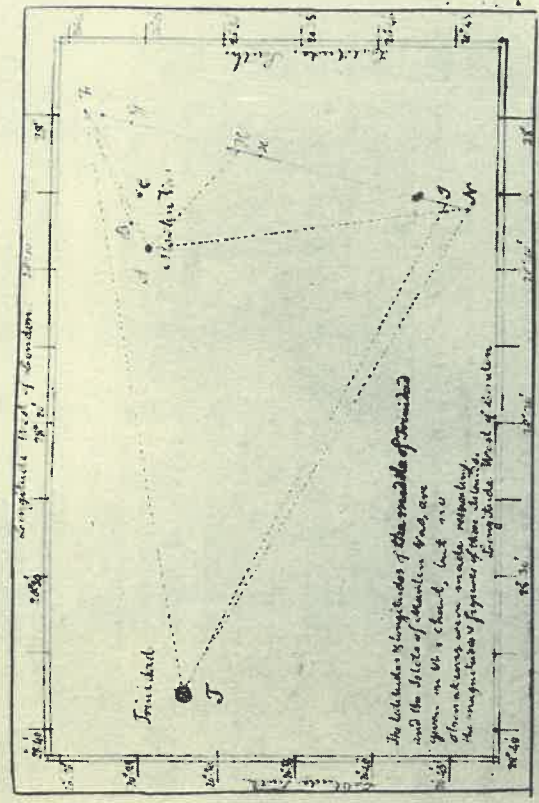
The result of the several observations taken near Trinity is given in the adjacent table, which makes the longitude at noon 28° 1' W. by our equinoctial observations mentioned in meeting it was found that the time of Trinity was 33' W. of the ship at noon, consequently the longitude of the Island is 28° 34' W. these places it in 30° 30' W.

	Long. of Island in July 1. 1780.
By the 00 June 27, brought in by the 10	20. 42 74
Dr. 00 June 27	27. 59
8. 00 June 29	28. 12
5. 00 June 30	27. 44
3. 00 July 1 in sight of Trinity	28. 01
Mean, gives the longitude of the ship, at noon July 1. 1780.	28. 6 W.

To determine the latitude of the ship at noon, we had two different observations, one of the Moon, the other of the Sun. The moon came to meridian at 8° 32' A.M. when the alt. of her lower limb was 52° 44' the correction for second motion was + 16.57. Dip, - 4.53. 3's horizontal parallax 60.15, consequently her parallax in alt. 16.57 refraction = 35.58" hence her true alt. 58° 30 1/2. her declination being then 16° 1' 30" N. consequently the latitude was 20° 28' 1/2 at this time we were nearly in the parallel of Trinity. By bringing the lat. on to the log, I found that it was the latitude of the ship at noon 20° 45' of differing only 1' from the Sun's meridian observation. Now, the observed alt. of the Sun's lower limb was 45° 54' corr. for Dip & Refraction = 46° 40' the declination was 25° 14' consequently the latitude of the ship 20° 40' 1/2. Thus as the Moon was then 10' N. of the ship (by our survey) its latitude must be 20° 28' 1/2.

In the morning in the latitude of 20° 22' I observed the variation by the alt. of observations being then 12 leagues E. of Trinity. The mean of both made the variation 2° 36' W.

Alma; Henry Prince, Master.



Observations taken for establishing this chart

From the first making of the land till noon, the ship was sailing at a wind, 8 by 10 per compass, with a bore bearing making 6 W. the compass, which is the direction of the line. S. 33° E. N. 43° 45' A. M. appeared from the ship was at 3 at 7° 21' 12" at 4 at 8° 54' at 11° 43' 24" at 3, and at 12 noon at 11. The distances sailed by the ship during these times were measured by the log, which gave the length of the lines 49', 46', 40', and at each of these places the bearing of the point of Trinity & the plots of charted land were observed, and hence the bearing and distance of each of them from the ship were obtained; consequently by knowing the latitude & longitude of the ship at 11 it was, we obtained the latitude & longitude of each of these places, the following is the result of several calculations.

Trinity	Latitude	Longitude
Table of Martin has greatest A.	20. 28 1/2	28. 39 1/4 of London.
80	20. 28 1/2	28. 0
80	20. 24	28. 7
80	20. 25	28. 5

Since the above observations were made, & published in the American edition of Moore's Epitome, I have seen the observations of La Perouse on the place, which agree nearly with the above.

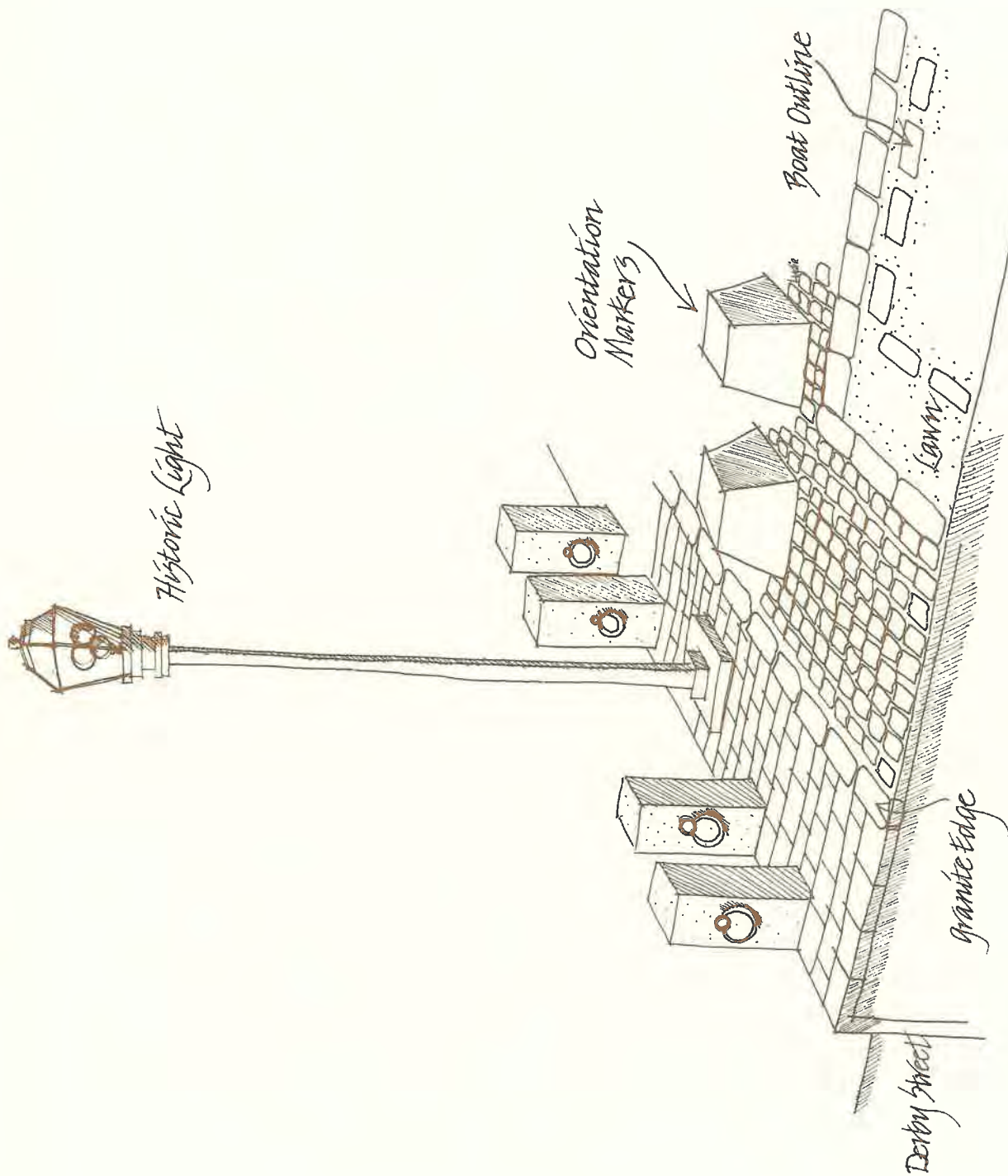
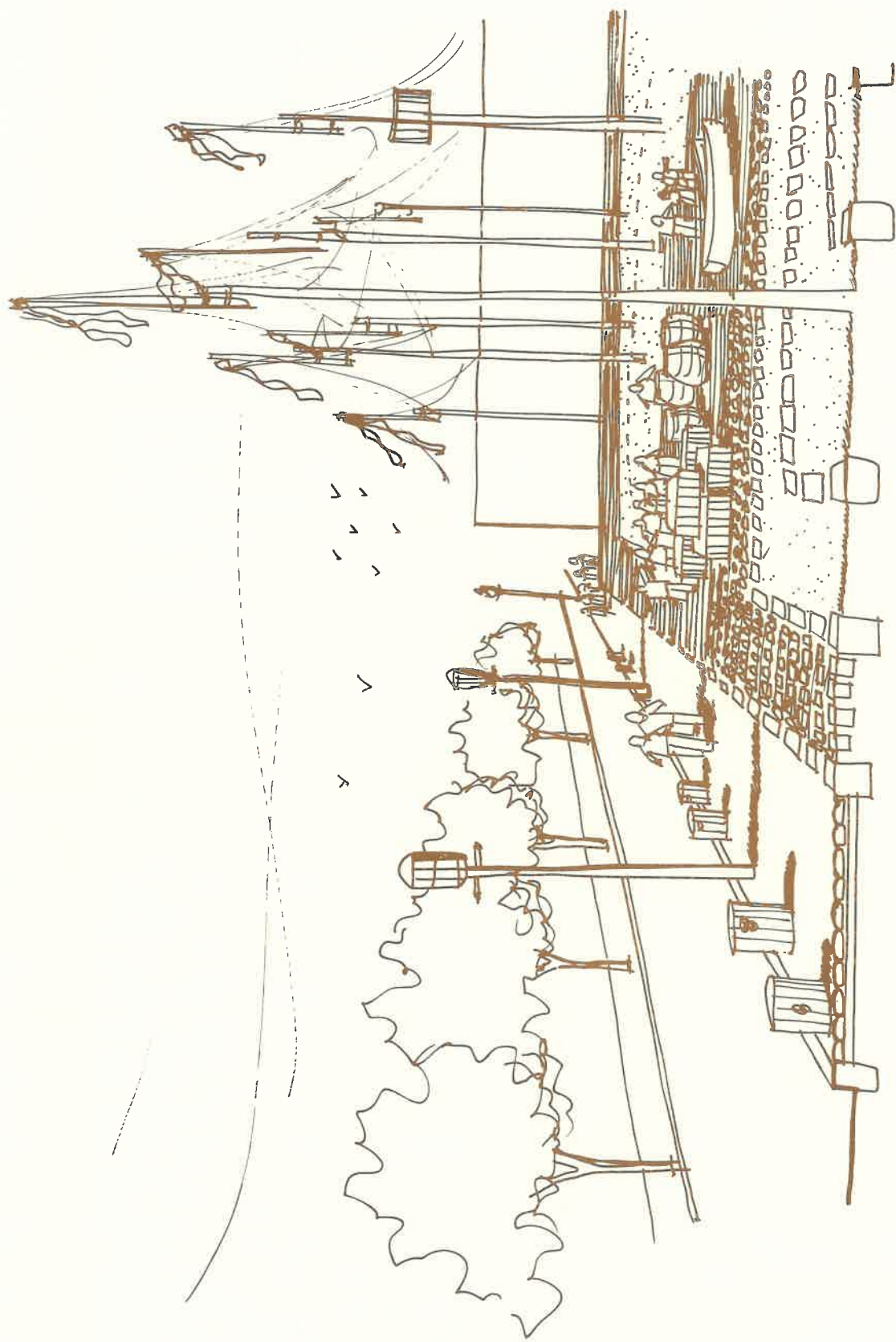


Figure #5



View East of Derby Street, Brick Sidewalk,
Cobble Wharf Exhibits and "Boat Prints" Figure 5a

- The buildings are sound and are "convertible" at reasonable cost to more versatile spaces.
- A retail/commercial activity will draw people to the area particularly in the fall and winter months when a park alone might not.
- The added activity associated with a retail/-commercial area will improve maintenance and enhance safety.
- A retail/commercial node will act as a "stepping stone" between the downtown mall and Pickering Wharf.
- The buildings are wharf buildings, their architecture and massing effectively continue the wharfscape theme of the park, albeit of a more recent time.
- In light of the above items, the added project costs of property acquisition, business relocation, and structure demolition are not warranted.

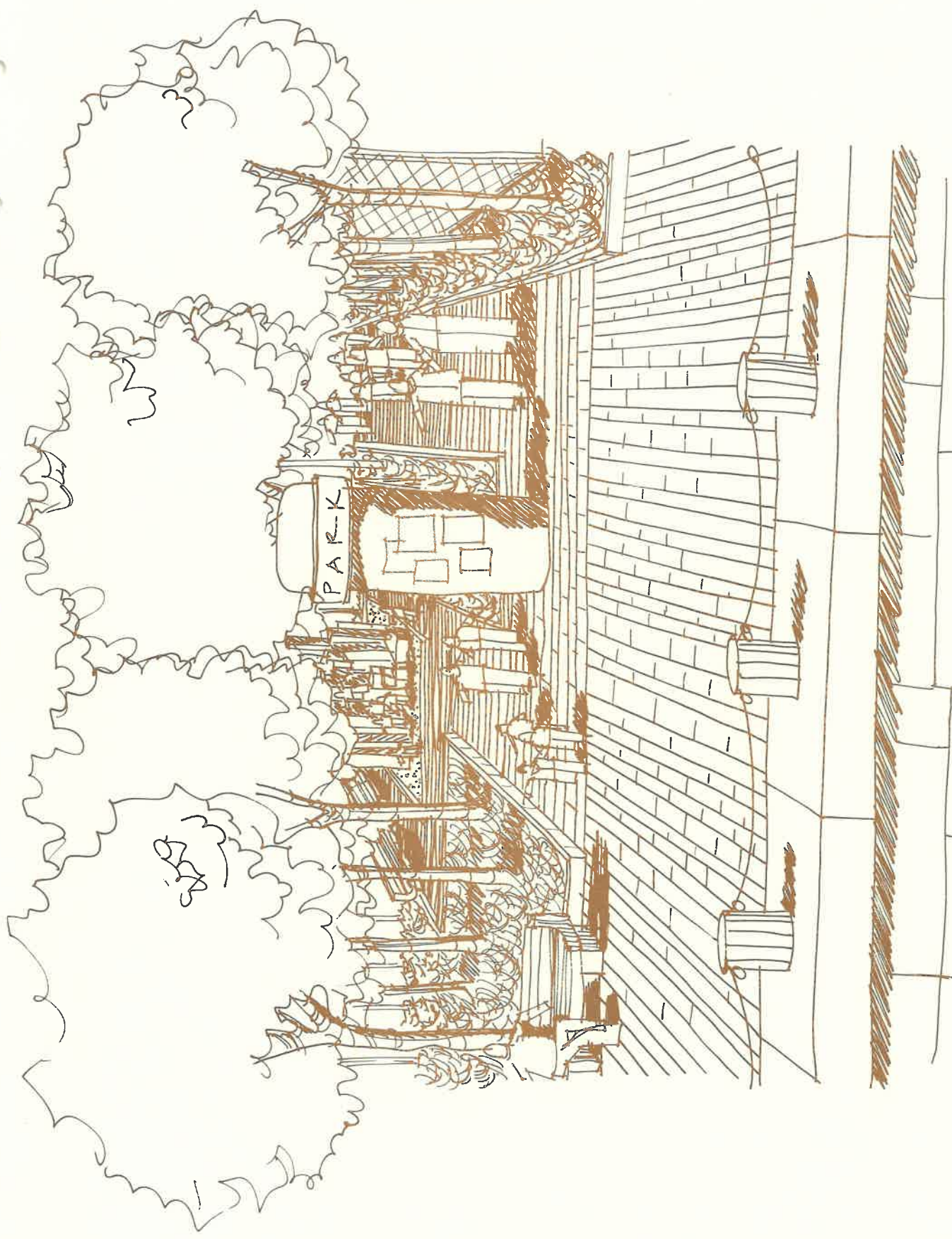
The retail/commercial node will consist of two buildings: that which is currently occupied by Waters and Brown and the adjacent building which houses the Taylor Rental outlet (Figure 3). The gasoline service station on the corner of Derby and Congress Streets will remain. An examination of the costs of acquiring this property and relocating the business lead to its designation as a fixed element. Screening and landscaping will be introduced into this area in order to make it visually compatible with its surroundings.

- Element D: Parking is programmed for Element D (Figure 3). In light of the area's proximity to both the park and the boat basin, the use was a logical choice. Park visitors may use the lot for short-term parking; boaters may leave their cars while on a cruise. The architectural massing incompatibility of the tire company building and its inappropriate use resulted in the decision to acquire and raze this building.
- Element E: The plan for this area was known virtually from the outset of the process--recreation and open space. Its size, shape, and location close to the Point Neighborhood directed this choice. Meeting the Point Neighborhood's recreation needs is a crucial step if plans to rejuvenate the district through public and private expenditures are to succeed. Including recreation space for the neighborhood in plans for Nathaniel Bowditch Park will aid in "tearing down" the barriers which help to isolate the Point Neighborhood from the downtown.

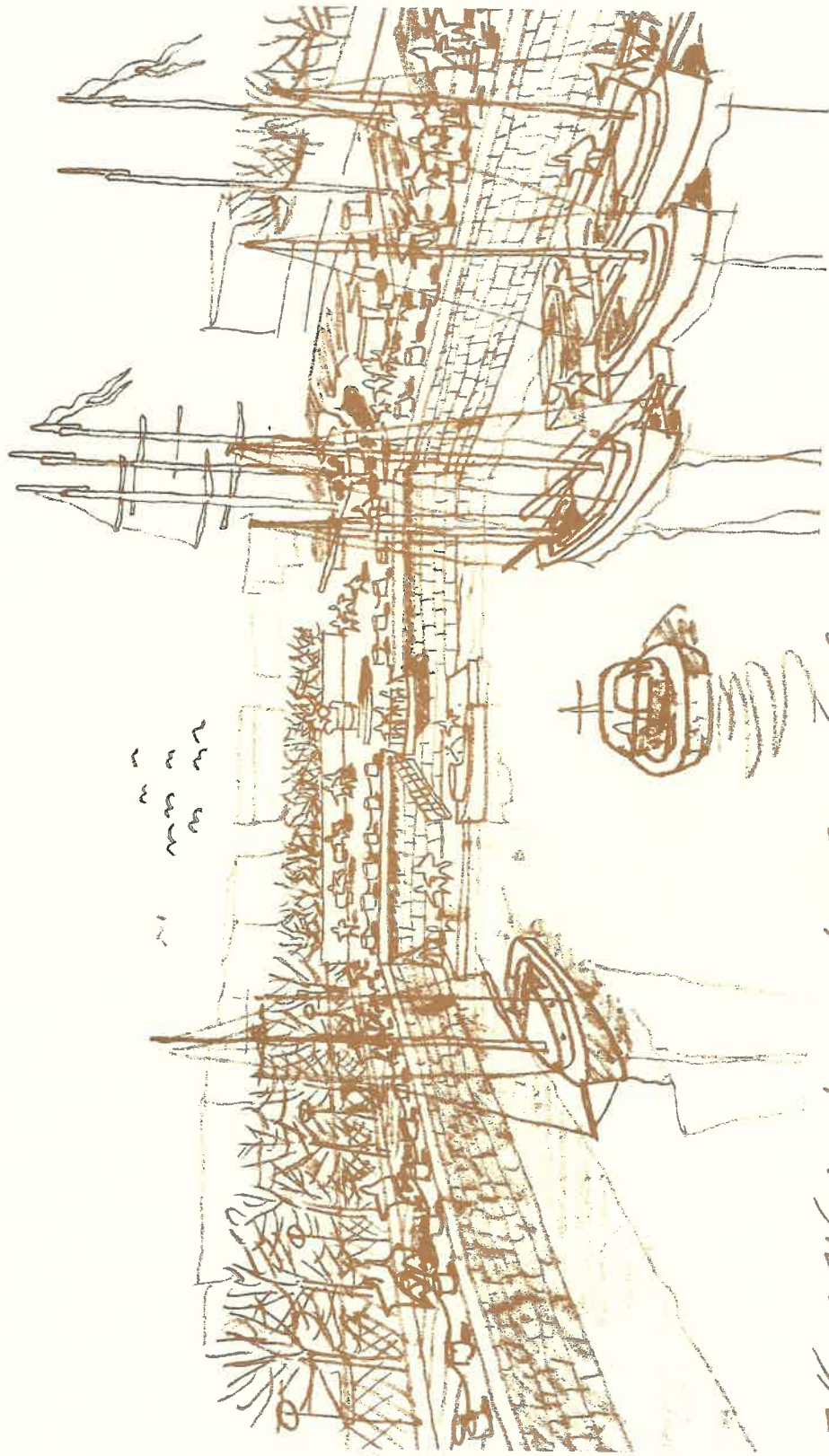
Specific facilities to be provided in the Recommended Plan include a combination multi-purpose paved area/basketball court, a softball field, and an informal running track (Figure 3).

- . Element F: Always a given within the plan this area will remain as the transformer facility. Massachusetts Electric Company is committed to a spirit of cooperation with the City on area improvements. Massachusetts Electric intends to yield much of their current site area as well as participate in a program of aesthetic improvements for both the building and the open transformer.
- . Element G: Carved out of a presently fenced industrial strip this element will become an important link for the Point Neighborhood--one which penetrates the Peabody Street barrier and allows public access to the water's edge. This link will further reduce the neighborhood's isolation. Total play facilities within this link will provide nearby play space for younger children. Benches will provide seating for supervising adults. Opportunities exist whereby this concept could be extended across Peabody Street to include a now vacant lot--a lot which could become an ideal "vest pocket" park (Figure 6).
- . Element H: Another hard area. SSI is an important employer costly, both directly and indirectly, to displace. This industrial facility will remain unaltered save the loss of some parking area (Element G) and the removal of the accessory shed.
- . Element I: This area now occupied by inappropriate uses in non-conforming buildings is an important adjunct to the Gateway (Element A) and to the channel (Element I). For this reason the properties will be acquired, the buildings demolished, and the area converted to parking. To retain these buildings would have effectively defeated the Gateway concept because of their visual barrier effect.
- . Element J: The Recommended Plan calls for the channel to be put to active use as a public boat basin with public landings at either end. To accomplish this end reapplication will be made to The Department of Environmental Quality Engineering (DEQE) and the Army Corps of Engineers for a permit to undertake maintenance dredging in the channel so as to achieve 10 feet of depth at mean low water (Figure 7).

To effectively implement the Recommended Plan for Nathaniel Bowditch Park will require consideration of certain critical issues. These issues are discussed in the remainder of this section.



Walk to Community Playground and Peabody Street
Figure #6



View West towards Public Landing and Statue
of Nathaniel Bowditch / Plaza

Figure #7

C. Materials and Maintenance

Materials to be used in construction of Nathaniel Bowditch Park will be chosen on the basis of four criteria: quality, durability, compatibility, and cost. High quality materials are often expensive; on the other hand, high quality materials are often less costly to maintain over the long-term. Durability includes the ability to sustain weathering and the resistance to vandalism. Materials selected must be compatible not only with one another but also with the design vocabulary established in related areas. Cost is, of course, a factor in any decision. The degree to which a particular material satisfies the requirements of quality, durability, and compatibility must be viewed in the context of its cost.

The quality and durability of the materials selected for the Nathaniel Bowditch Park are important for maintaining the overall standard established in other Salem civic works. The use of brick, granite and cobble help to reiterate the design vocabulary adopted in the downtown and provide a sense of continuity between the various areas of Salem. The durability of high quality materials reduces future maintenance costs and helps to maintain a maximum standard within the project during later years. Adopting hard materials such as cobble and granite reduces incidents of vandalism while giving a rugged, nautical appearance to the project site.

At this stage of project development, Concept Plan, materials and their application can only be recommended. The following is a list of materials and their appropriate application. This list is annotated as appropriate to reflect other considerations.

- . Criteria for all exhibits:

Weatherproof, vandal resistant, low maintenance, no moving parts or fragile objects, simulation of original textures and/or colors through the use of modern synthetic materials.

- . Wood:

Used for tot play structures, floats, benches, and pile tips and other limited applications. Should be pressure treated by appropriate salts for weather and rot resistance. Subject to vandalism ("carving" and "engraving") - its application must be limited.

- . Cobblestone:

Used for parking lot lanes, on the wharfscape, and in the lawn areas to mark ships' hulls. Durable and vandal resistant.

- . Brick:

Used on seawalk (promenade), in the Gateway area, and along sidewalks. Durable and vandal resistant.

- . Aluminum:

Used for spars. Lightweight. May be painted or anodized for color accuracy. Non-rusting, durable.

- . Steel:

Used for masts and bollards. May be welded to historically accurate shapes. COR-TEN or other types available in suitable colors with appropriate coatings. Durable. (Aluminum and steel should not be intermingled because of electrolysis in a waterfront environment.)

- . Granite:

Used for steps, as markers, and to replicate wharf edge. May be etched for durable interpretive markers.

- . Concrete:

Used to replicate deck structures and for crates and barrels. May be poured in wood forms and painted with special paints to appear like wood. Moderately durable (may crack) and is moderately vandal resistant (special coatings reduce paint bonding and make the removal of graffiti easier).

- . Fiberglass:

may be used for special features such as bas-relief molds. Can be treated to appear like other materials (bronze, wood, etc.). Could be used for floats.

- . Rubberized Asphalt:

For running track. Good running surface; durable.

- . Asphalt:

For parking stalls and multi-purpose paved area. Durable. Easily patched.

- . Polypropylene:

For rigging and other areas where "rope" is desired. Durable. Available in black and, as such, would simulate tarred manila rigging.

Plant materials must be chosen for durability in New England weather and should be resistant to bruising, trampling, wind, and high salt levels in the air and soil.

D. Boating Program

A key component of the Recommended Plan is the South River Channel Boating program. Studies indicate an approximate size mix of boats for small craft harbors as being: (2)

20 footers or less	=	35%
20 to 30 footers	=	45%
30 to 40 footers	=	12%
Others	=	8%

Using these ratios as a guide, a small craft boat basin has been designed for the inner channel of the South River. This basin will accommodate the following number of boats in the size ranges indicated.

<u>Accommodations</u>		<u>% Total Capacity</u>
20 footers or less	= 22	39
20 to 30 footers	= 28	50
30 footers and over	= 6	11
Basin Capacity	= 56	<u>100</u>

The plan calls for the smaller boats to be berthed at the east end of the channel and the larger boats at the west end (Figure 7). The layout's underlying rationale is to maximize the potential for larger sailing vessels to dock near the wharfscape park visible from the downtown. Space will be provided alongside the north bulkhead at the east end for one large boat, perhaps MEANS' research vessel, (see discussion of Retail/Commercial Node following), or perhaps a concession operated replica much like the boat now docked at Derby Wharf.

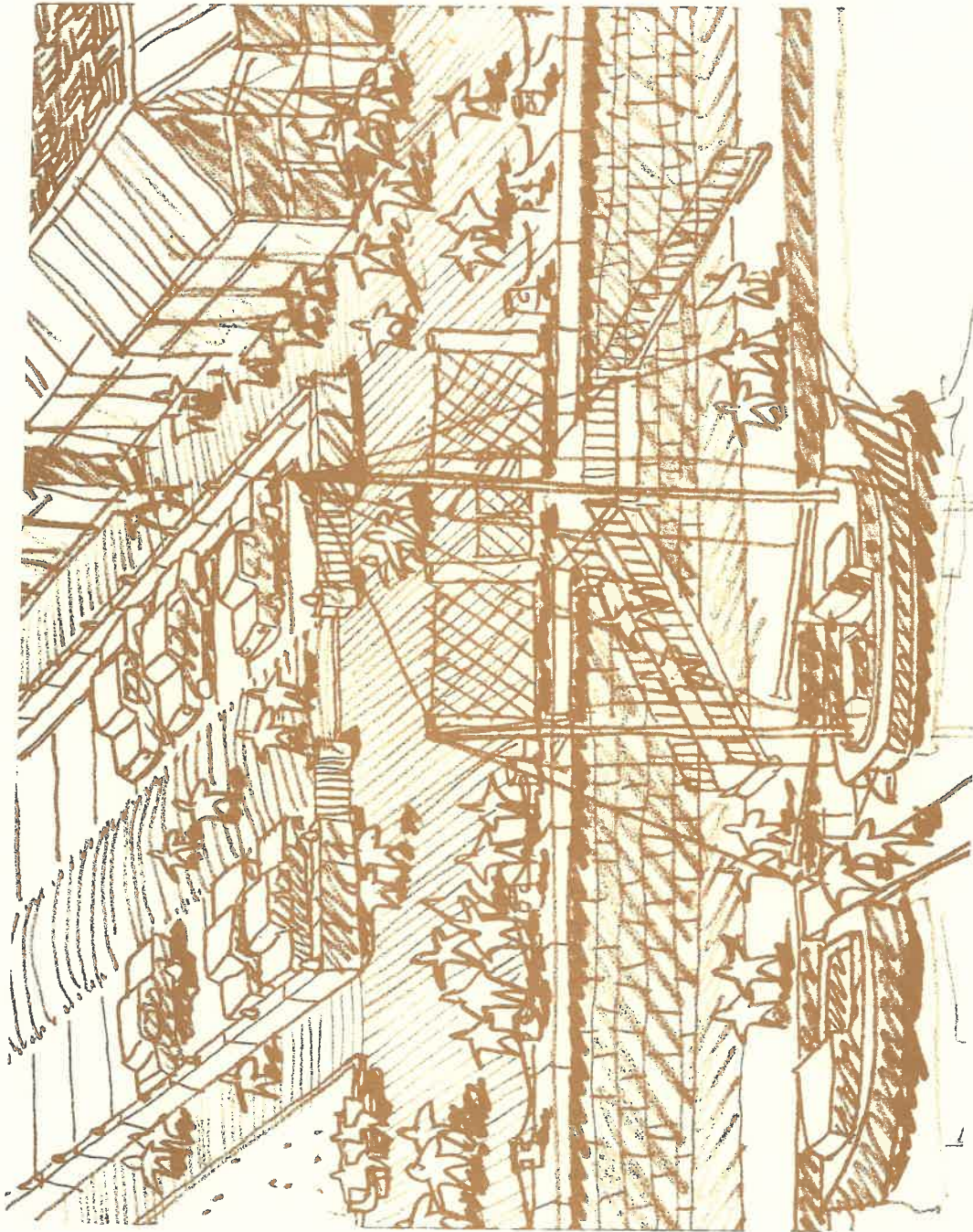
Two public boat landings will be provided in the channel; one at the west bulkhead (south of the conduit outfalls) and the other at the northeast corner near the bridge. The western landing will accommodate boaters headed for the park or downtown, the eastern landing will serve the retail areas and restaurants/cafes.

Access to the floats will be from a central ramp. Boaters needing to load provisions may utilize the central parking area opposite Liberty Place as a convenient drop-off point (Figure 8).

Application will be made to DEQE/Waterways and to the Army Corps of Engineers to undertake maintenance dredging of the channel in order to provide ten feet of depth at mean low water. This dredging would entail removal of approximately 13,000 cubic yards of spoil.

If the boat basin is to function with the least disruption to traffic movements across the bridge it will be necessary to limit bridge openings to off-peak automobile traffic hours. For example,

(2) ASCE "Report on Small Craft Harbors"; No. 50.



Promenade, Parking, Retail and Access to Private
Boat Floats
Figure #8

bridge openings should not be allowed during peak employee arrivals and departures at Shetland Industries. To do otherwise would cause serious traffic congestion and force traffic through the narrow streets of the Point Neighborhood.

The bridge could conceivably be left open to boat traffic on weekends provided suitable plans are prepared to ensure the maintenance of municipal services and public safety by alternate routes during these periods.

E. Retail/Commercial Node

The recommended plan for the commercial/retail node, (Figure 3), calls for the adaptive reuse of two buildings and the retention of the corner gasoline service station. The westernmost long, wharf-like building and the tire company building on Congress Street will be acquired and demolished.

The remaining buildings will receive facade improvements to make their appearance more compatible with the Pickering Wharf development and the design vocabulary specified for Nathaniel Bowditch Park. The heating plant in the long building will be relocated so as to accommodate the pedestrian promenade. In addition, the larger building will be rebuilt internally to create smaller retail areas suitable for cafes and small shops.

The buildings in the proposed retail node have been examined and a conceptual cost estimate has been developed for this work. The following is a summary of the architect's inspection report:

281 Derby Street (Waters and Brown Hardware)

This two story, steel, reinforced concrete and brick building is presently used as a hardware store. The 4,300 sq. ft. first floor is sales space with office and storage space on the second floor. The owners of the building and the business intend to reorient the store entry from Derby Street to the river side of the building.

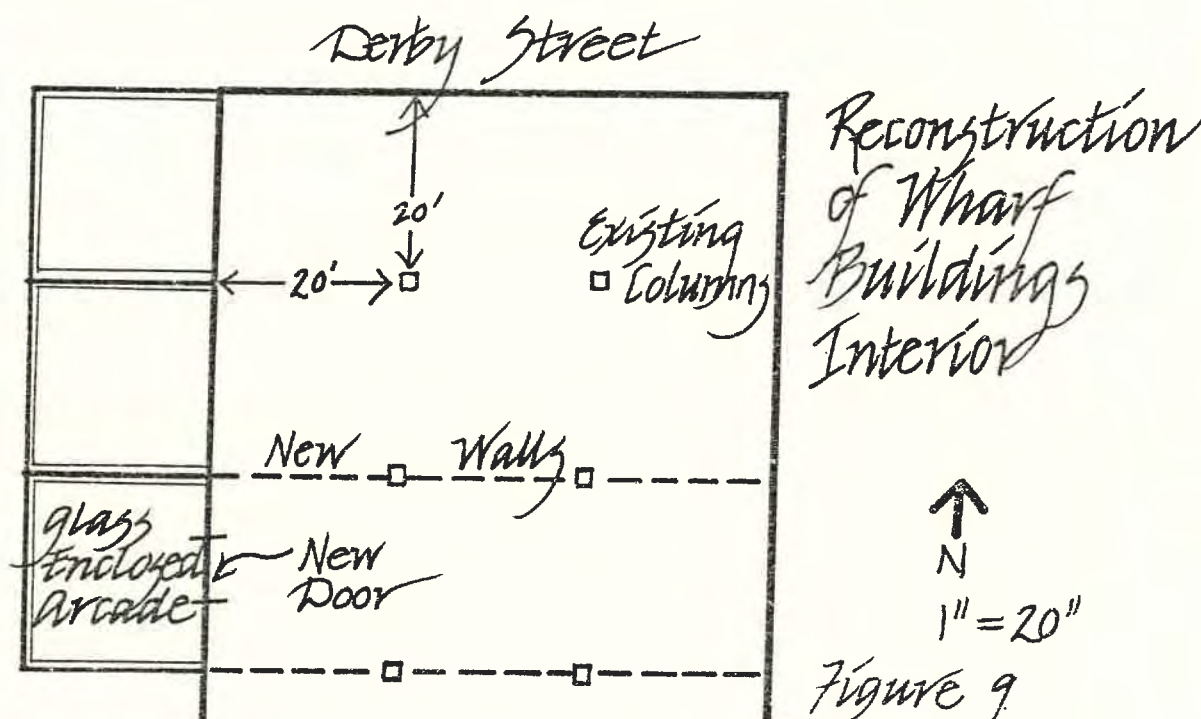
The building is sound and with internal adjustments should be able to work well as a hardware business. The exterior of the building should be refinished so as to make it more compatible with its surroundings. The building has approximately 6,000 square feet of exterior wall, which at an average cost of \$10 per square foot, will cost approximately \$60,000 to reconstruct.

283 Derby Street

This one story warehouse building is presently underutilized. The owner is considering what his immediate leasing policy should be. Presently there is an equipment rental business which is about to relocate and a cleaning business on the Derby Street end of the building. The rest of the building is used for storage. The warehouse character of the building and its size and bay proportions would make it a highly suitable building for retail recycling. The building is 55-60 ft. wide and is divided into 20 foot bays along its 220 foot length. The exterior of the building

has approximately 11,200 square feet of wall the refinishing of which will cost approximately \$12 per square foot or approximately \$134,400. Removal and relocation of the boiler room at the river end of the building in order to maintain a 20' wide river promenade will cost approximately \$25,000. The reconstruction of the 12,375 square feet retail shell will cost approximately \$15 per square foot or \$185,000. The retail finish would likely cost \$15-\$20 per square foot or \$185,000 to \$245,000.

Beyond this work the Recommended Plan suggests the extension of retail space at 283 Derby Street by means of an articulated glass canopy along the west and south facades. This space could include roll up glass panels that could be opened up in favorable weather. The approximate cost of this treatment for an average extension of 25' along the west and south facade would range from \$20 to \$40 per square foot depending on whether heating and/or air conditioning were included:



Part of the City's continuing efforts to maintain momentum and to expedite this project include the preparation of a feasibility study for this block. Negotiations are currently underway for a study which will include:

- A microscale market analysis for these specific buildings in this specific location. A retail market analyst familiar with Salem will be retained for this component.
- A cost/benefit analysis which relates reconstruction costs and facade improvement costs to the retail market potential. This analysis will help to define the scope of public improvements needed as incentive for the private investment.

- . . A study of the public sector tasks necessary to realize the desired conversions. This aspect of the work will pinpoint City by-laws and regulations which may be counter-productive to the effort. Strategies for creating special districts and the like will be developed as needed.
- . An analysis of the scope of public improvements necessary to give the private investor adequate assurance of the City's commitment. The cost/benefit analysis will give an indication of the extent of public improvements necessary to induce the desired private sector participation. One example of the type of appropriate waterfront activity which might occupy space in one of these buildings is the fledgling Marine Education Association of the North Shore (MEANS). This non-profit organization is temporarily housed in the basement of the Customs House. MEANS is an organization founded by college educators which hopes to offer students at the elementary, secondary, high school, and college level opportunities to become involved in marine research. At the lower grade levels the emphasis is expected to be on environmental awareness education and day-excursions to participate in marine sampling and other activities. College students may participate in longer term research endeavors.

MEANS has expressed an interest in Nathaniel Bowditch Park. The association would require classroom space, a reception area, and perhaps laboratory space. There is also a possibility that the association will obtain a research vessel. MEANS has expressed an interest in berthing such a vessel in the inner channel (a masted vessel docked at the west end of the channel could be a further enhancement to the park's marine image). The presence of an organization like MEANS at the park may provide an opportunity to display delicate nautical artifacts not easily exhibited out-of-doors. The presence of MEANS would surely complement the park and the marine theme of the park would be an excellent context for MEANS.

F.. The Nathaniel Bowditch Story

To convey the story of Nathaniel Bowditch's accomplishments in a way that is both informative and interesting to a broad range of park visitors will require much creative thinking. Bowditch was a mathematician and thinker. Most of his achievements are not easily translated into physical artifacts. Rather, they are in the form of ideas, formulas, and navigational charts. The objective will be to create exhibits that can be experienced, not just looked at.

In order to assist the planners in creating a park which does justice to Nathaniel Bowditch's multi-faceted career, the City will engage the services of an exhibit designer. In order to continue the City's commitment to this project and expedite its implementation, this design professional will be retained as soon as practicable.

G. Recreation Program

The Recommended Plan for the former coal storage area east of the transformer site (Element E) is to create both formal and informal recreation spaces. Because of the limited area available, the concept is to maximize the flexibility of the facilities. The multi-purpose paved area (Figure 3) will be designed so as to be useable for basketball, "street" hockey, paddle ball, shuffle board, and similar activities as well as neighborhood "happenings" such as craft fairs, art exhibits, and even outdoor dances. The open field area will be designed to accommodate softball games, but it will, of course, be suitable for other informal ball games (touch football, for example) and activities such as frisbee. The informal running track will also serve as a warning strip for outfielders pursuing balls near the perimeter fence.

Bleachers will be provided near the third base line for spectators. These, too, could be put to other purposes such as seating for musical concerts or childrens' theatre.

Tot play facilities will be provided in the Peabody Street neighborhood link, and will include such apparatus as wooden play structures, slides, fire poles, that will be erected in in a sand pit area. These elements can be assembled in a ship-like motif (the fire pole can be topped off with a crow's nest and climbing ratlines can be provided, for example. Ample seating and waste containers will be provided for the convenience of supervising adults.

In the future there is an opportunity to provide additional tot facilities in the vacant lot on the opposite side of Peabody Street.

Other informal recreational activities can occur in Nathaniel Bowditch Park. These activities range from passive enjoyment of the water by strolling on the promenade and sunning oneself on one of the benches to fishing or boating in the rehabilitated channel.

H. Parking Program

The Salem Planning Department established a design criterion of 125 spaces for the Derby-Peabody Link. These spaces have been provided in three lots in the Recommended Plan (Figure __). The first lot with 27 spaces is located off Lafayette Street at the west end of the channel. It is designed primarily to accommodate visitors to the park who approach from the Lynn/Swampscott area.

The second lot is mid-block on the south side of Derby Street opposite Liberty Place. Containing some 38 spaces this facility will serve the park visitor as well as the retail patron.

The third lot of 62 stalls will be off Congress in the area currently occupied by the tire company and the Waters and Brown parking area. This lot will serve the park, the recreation area, and the boat owner who requires longer term parking accomodations.

All lots will have cobble lanes and asphalt stalls and will be screened by low brick wall enclosures.

I. Archaeological Survey/Environmental Clearances

In areas which are rich in history such as Salem there always exists a possibility that artifacts of historical interest may lie buried beneath the ground. As was discussed in the Introduction, the South River Channel area, the Derby-Peabody Link, is, for the most part, man-made land consisting of miscellaneous fill deposited over a period spanning two centuries. Because it is man-made land there is little probability for the recovery of valuable or whole artifacts present in original strata. However, there is a possibility that sitework may unearth portions of old wharves or remnants of cargoes from the East India Trade.

Because of this possibility and because of the opportunity to incorporate recoverables into the interpretive exhibits programmed for Nathaniel Bowditch Park, a phased archaeological survey program will be undertaken as part of the project implementation. The survey program will proceed in phases consistent with the implementation of the park development program. Initially, an archaeological reconnaissance review will determine the probability of finds, their type, their likely location, and their era. This phase of the survey, which will be conducted by a certified archaeologist assisted by a marine historian, should indicate little probability of significant finds, further archaeological surveys will be abandoned. If, however, it is thought that the probability of significant finds is reasonable, or, it is determined that recoverable remnants appropriate for the proposed exhibits (though perhaps of little cultural value as artifacts) are probable on the site, test digging will be undertaken to further ascertain the validity of these assumptions (phase two).

The outcome of the test holes will determine the need for more careful and extensive excavation (phase three). At the minimum, an archaeologist will be present during the critical site preparation phase to assist the contractor in salvaging any wharf remnants, china shards, or other recoverables that might be suitably incorporated into park exhibits.

The intent of this early action program, in which the archaeological study becomes a part of the project implementation process rather than a post-facto reaction to discoveries made during site preparation, is to realize an opportunity that might otherwise not be possible. Were the Derby-Peabody Link to be developed as independent private projects, for example, it is doubtful that any authority to force archaeological investigations would be available. Nathaniel Bowditch Park affords a unique opportunity to reclaim remnants of the past which might otherwise remain buried.

Project implementation will be expedited by initiating phase I of this work as soon as possible. The archaeological studies will be incorporated into a comprehensive report dealing with this issue and other pertinent environmental factors. This report will assemble in

one document all materials and data related to the various environmental clearances which are likely to be required to implement the project. These may include, but are not necessarily limited to:

- . Corps of Engineers Permits
- . Wetlands Approval (P.L. 131 S. 40, Notice of Intent)
- . DEQE/Waterways
- . Environmental Notification Form (MEPA)

This report may be expanded as necessary in order to meet the requirements for an Environmental Impact Report (EIR) if one is required by the Commonwealth.

J. Public Health, Safety and Welfare

Special provisions will be designed into Nathaniel Bowditch Park in order to make the park experience a pleasant and convenient one for all who visit. Among these will be:

- . Wheelchair ramps at curbs and at other key grade change locations.
- . Low level, cantilevered drinking fountains for those in wheel chairs.
- . Braille markers for the sightless.
- . Toilet facilities for the handicapped.
- . Marker descriptions at a height legible to someone who is seated.

During the design development phase consideration will be given to the dimensions of a wheelchair so that those confined to a wheelchair may go from one exhibit to another with the least possible difficulty.

One opportunity presented by the retail core is for the provision of public toilet facilities in this private space. In this way security will be maximized and maintenance demands on the city kept to the minimum.

Certain of the exhibits which will be part of Nathaniel Bowditch Park could pose a potential safety hazard if improperly and deliberately misused by visitors to the park. For example, concern has been expressed that the rigging of the feature vessel would be climbable and could cause injury. For this reason it is recommended that the rigging be kept to a minimum. (When in port much of the running rigging of sailing vessels was often secured to the masts.) Therefore, the historic accuracy will not be diminished if only limited rigging is used.

Since ratlines are readily climbable they will not be used. Again, the lack of this feature will not diminish historic accuracy.

Rigging lines will be tied down well off the ground so as to discourage climbing. Special treatments to the rigging lines, to be

further studied during final design, could render it too slippery to climb or too difficult to grip. Rat catchers might be used to prevent climbing.

Lighting will be introduced throughout the park and material changes will cue both pedestrians and motorists alike to crosswalks and other potentially hazardous areas.

A high fence around the ball field will minimize the possibility of errant balls leaving the site. The fence will also prevent balls from being pursued onto the street.

K. Costs

. Indirect

Projects which entail the removal of existing tax ratable properties in order that they can be replaced by non-taxable public property often appear at first glance to be counter-productive to the public interest. However, such projects typically result in a significant enhancement in the value of remaining real estate. The net effect is positive revenue returns - clearly in the public interest. This phenomenon is most apparent when the park proposal is but one element of an overall commitment to revitalize an area.

Salem is committed to the revitalization of its CBD and reclamation of its waterfront - Heritage Plaza East and Pickering Wharf Development being the premier examples of this commitment. The proposed Nathaniel Bowditch Park will dovetail with these two projects. The result will be an image for Salem as a city on the mend - a good place to live and work, a place where private investment gets the uncompromised support of public improvements. Such an image can only enhance Salem's competitive advantage with suburban shopping malls and industrial parks.

Indeed, one of the reasons for retaining a node of retail/commercial activity in the project area is to capitalize on this very phenomenon. The value of the remaining properties in the Link and the value of nearby real estate will be increased.

Direct

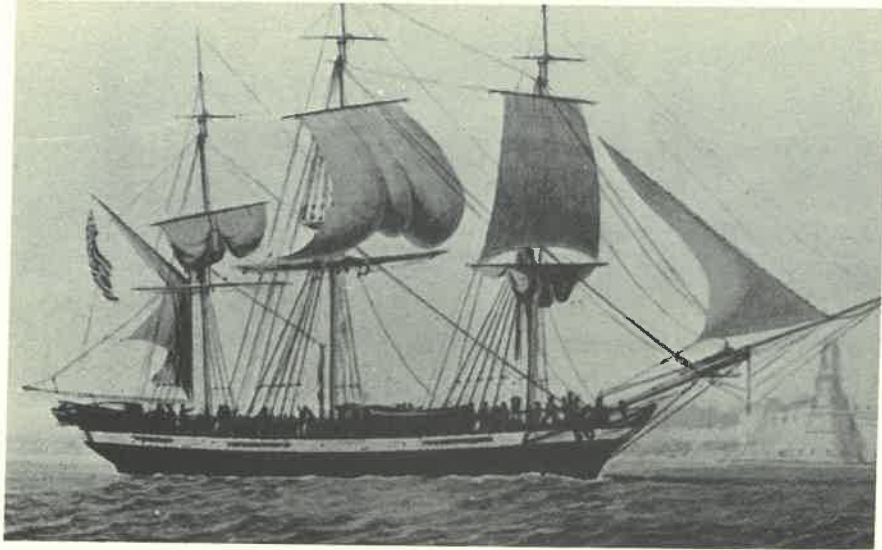
Preliminary Costs in 1980 Dollars:

Element A	\$529,488
Element B	1,148,900
Element C	442,140
Element D	288,230
Element E	437,160
Element G	143,580
Element I	114,335
Element J	1,443,117
Subtotal	\$4,456,950
30% Engineering & Contingency	1,364,085
Total	\$5,911,035

The following is a sampling of the types of artifacts and Exhibit materials which might be displayed as part of the interpretive exhibits for Nathaniel Bowditch Park. This sampling, which was prepared by Mr. William A. Baker, includes suggestions for applications and materials.

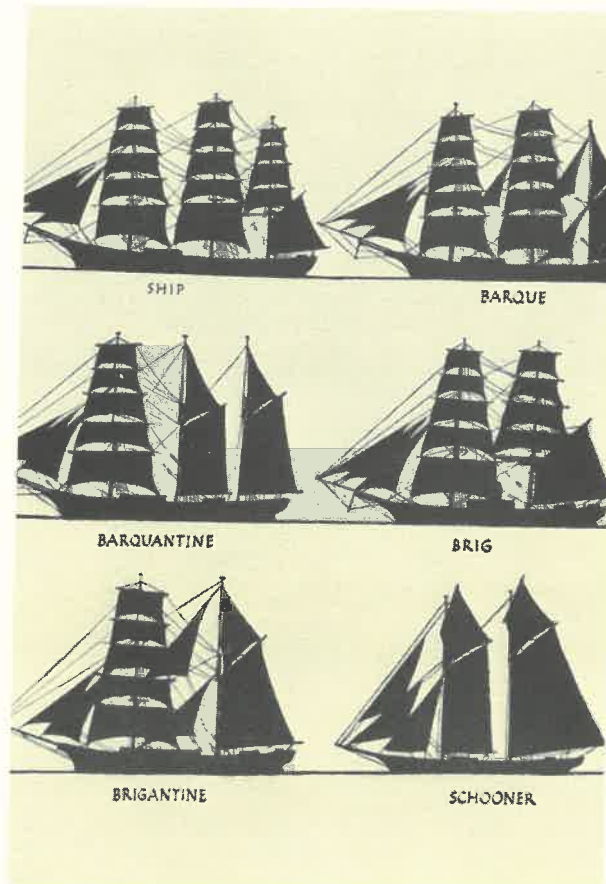


Figureheads are possibilities for display against the side of a building or as free standing sculptures. It should be possible to reproduce one or more of the well-known figureheads in the Peabody Museum and elsewhere. Small reproductions are now marketed but they generally are too small for display out-of-doors.



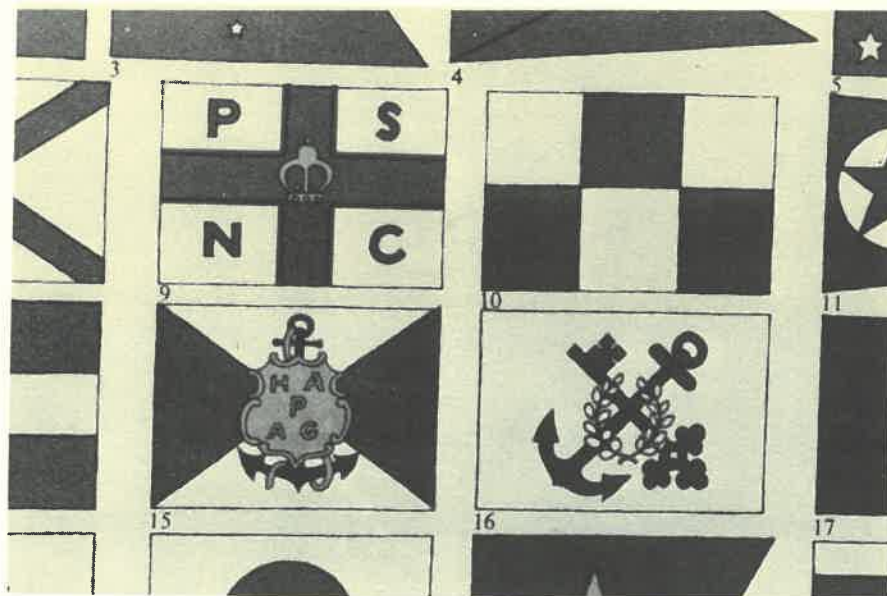
The main feature of the park might be a full-size reproduction of a Salem vessel from the waterline up. The hull could be constructed of concrete suitably imprinted to simulate wood with spars of steel or aluminum, and rigging of wire and synthetic rope.

Joseph Peabody's ship Francis had a hull length of about 100 feet, perhaps too large for the site but there were smaller Salem ships and a brig (two masted square rigger) would be equally appropriate.

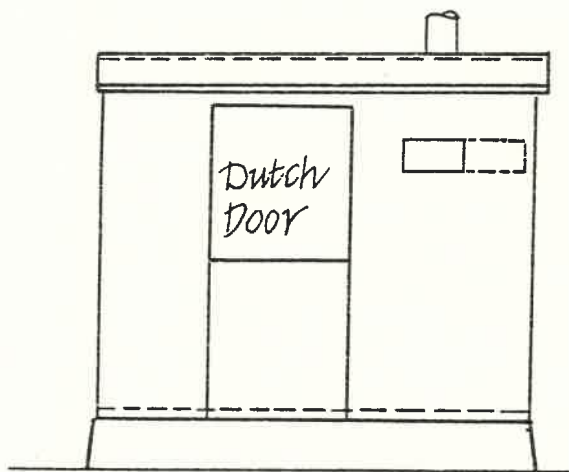


Rig profiles in bas-relief could be mounted on the outside walls of buildings on the site. These could be of molded fiberglass or similar composition with a built-in final color coat so that minimum painting would be needed.

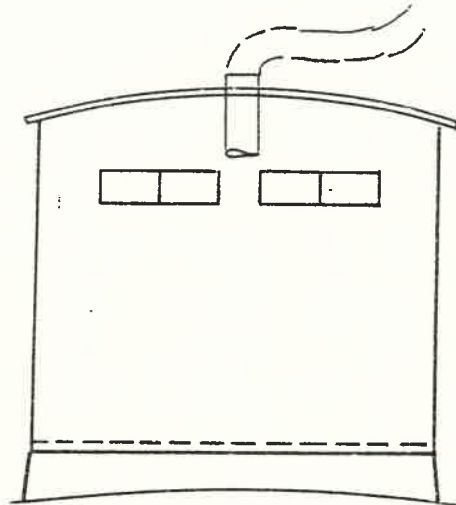
The six vessels shown here would have been typical of most of the rigs that sailed out of Salem but a few others could be added - Chebacco boat, sloop, and topsail schooner.



The site should be livened with a number of simulated masts or flagpoles to create some impression of the above harbor scene. The spars could be of minimum maintenance aluminum with a minimum of wire rigging, all to be fitted with halyards for flying the house flags of the various Salem merchants circa 1800. The patterns for these may be found in the painting collection of the Peabody Museum of Salem.



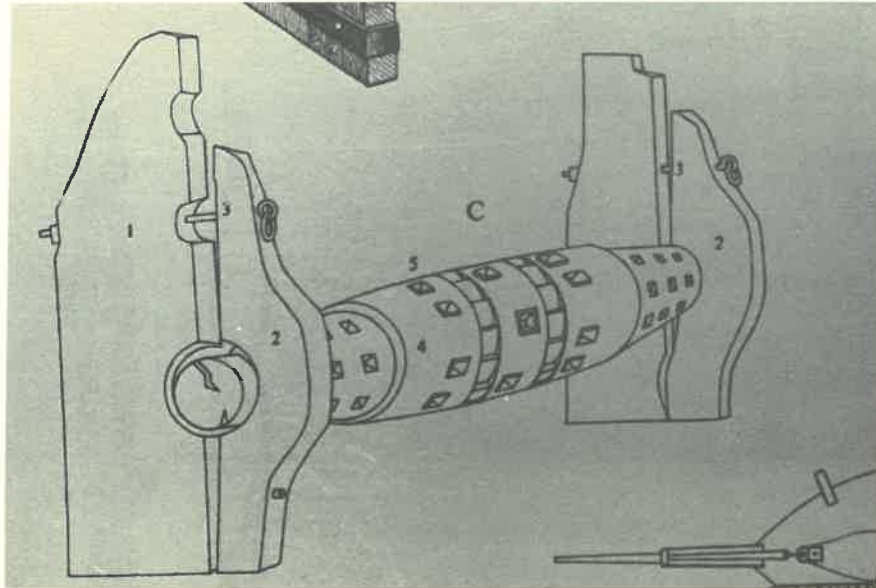
Side View



Front View

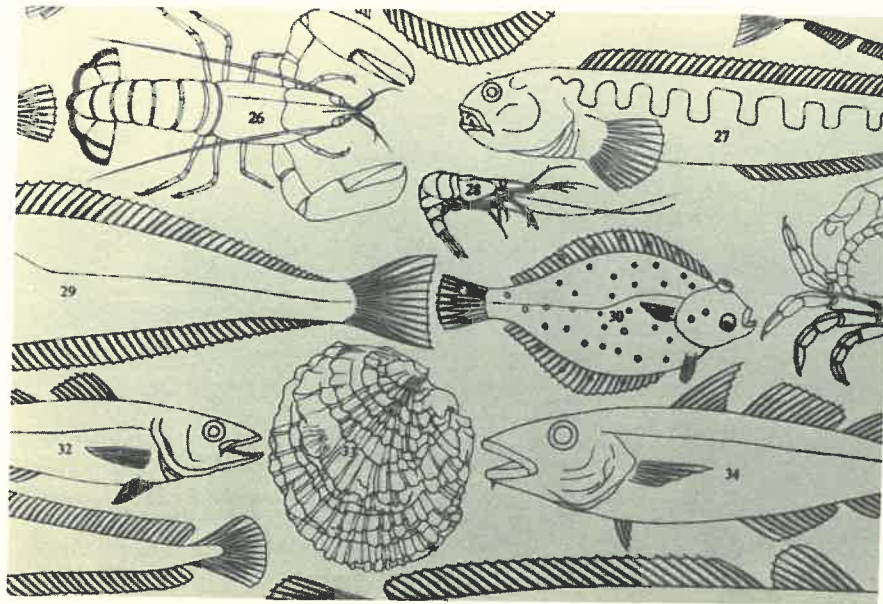
Caboose

Should an information booth be needed, a ships caboose (galley) might serve (the term comes from the Dutch Kombuis). Such a structure, about 7'-0" x 6'-6" x 6'-9", would have two Dutch doors, some small windows with sliding covers, and a smoke pipe; a fireplace could be arranged inside. Caboosees usually were self-contained units often carried on top of the ships main hatch, therefore they were the first things unloaded on reaching a port and the last things loaded before sailing. The caboose shown in the sketches may be seen on the Beaver II at Congress Street Bridge, Boston.

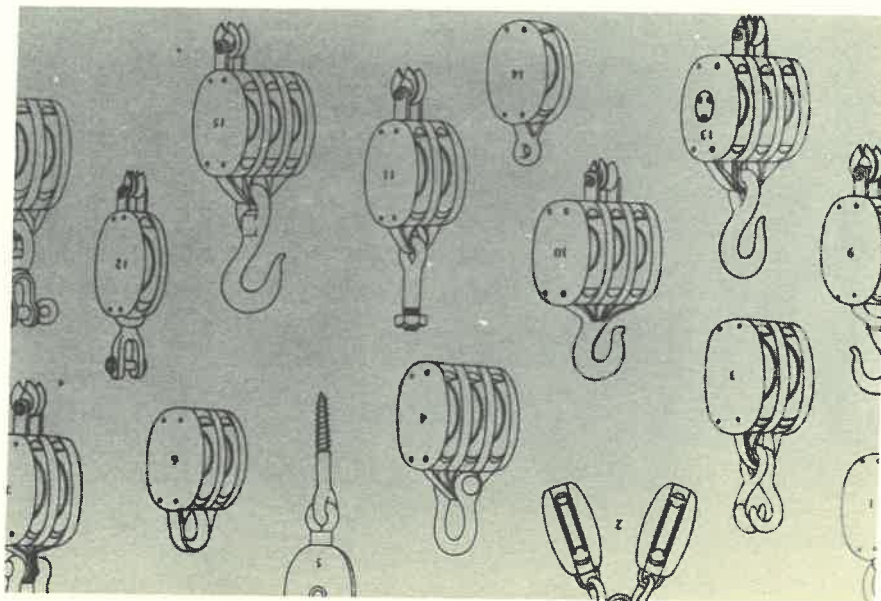


Log windlass, the typical machine for raising an anchor in the old sailing ship days. Suitably located it might serve as a bench or at least something to lean against. It could be fabricated of treated wood or of concrete.

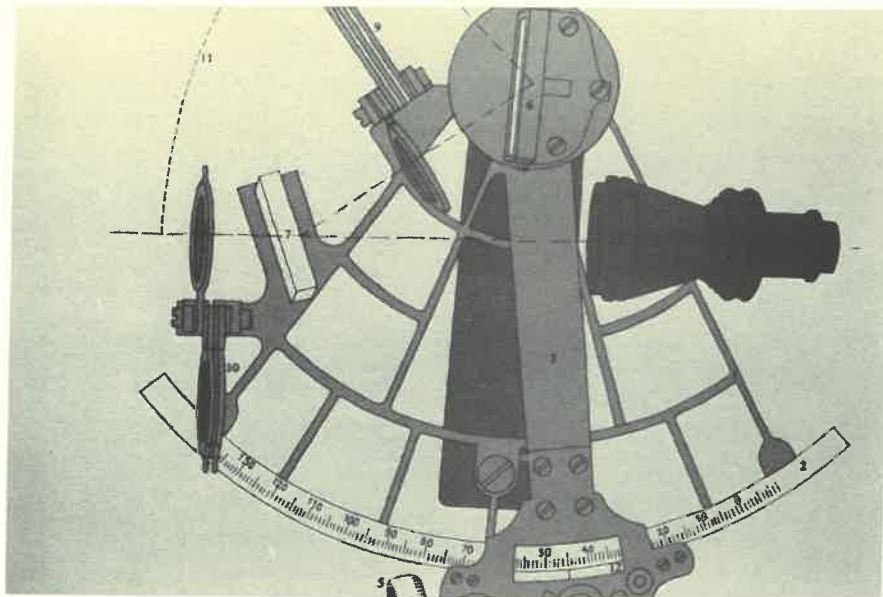
There would be two additional bitts, not shown in sketch, which could be carried up to support a belfrey if one is desired.



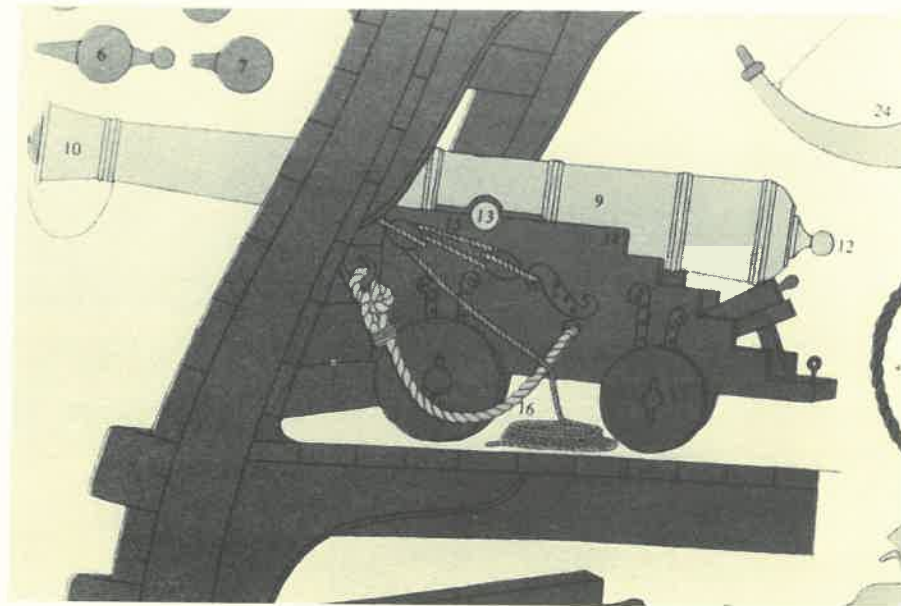
If space is available on outer walls, bas-reliefs of typical fin fish and shell fish landed by Salem fishermen might be suitable decorations, as well as being of some educational value. As in the case of the vessel profiles these could be of fiberglass or similar composition.



Old blocks were a common sight along waterfronts. If made of some non-perishable material a few of the larger ones could serve as low seats, at least for children. Very large blocks were used for heaving down (see discussion under Capstan) - a good example of one 34"x 20½" x 17" with three sheaves for 3" diameter rope is in Pilgrim Hall, Plymouth.

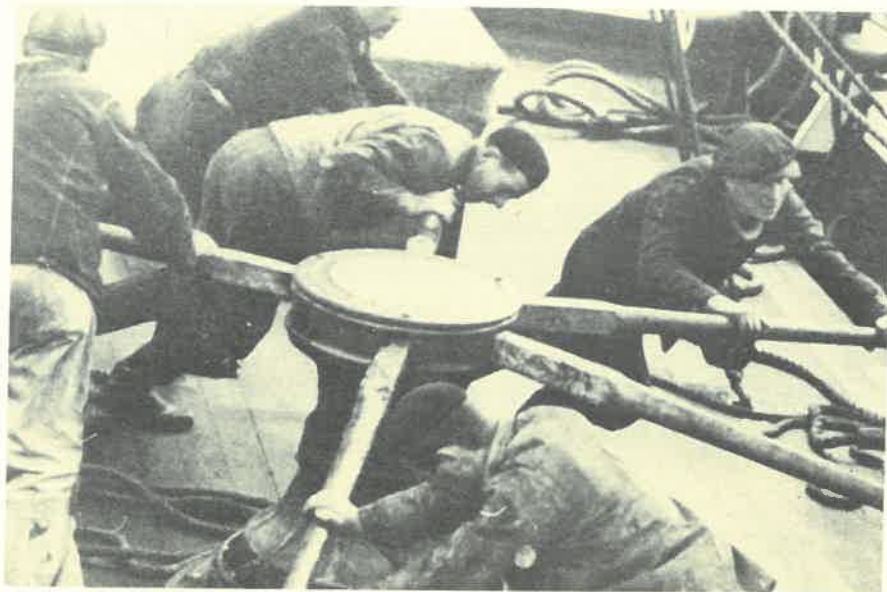


A large working model of an octant or sextant might be something for children to play with and at the same time learn the principles of determining latitude. A spotlight overhead could simulate the sun.

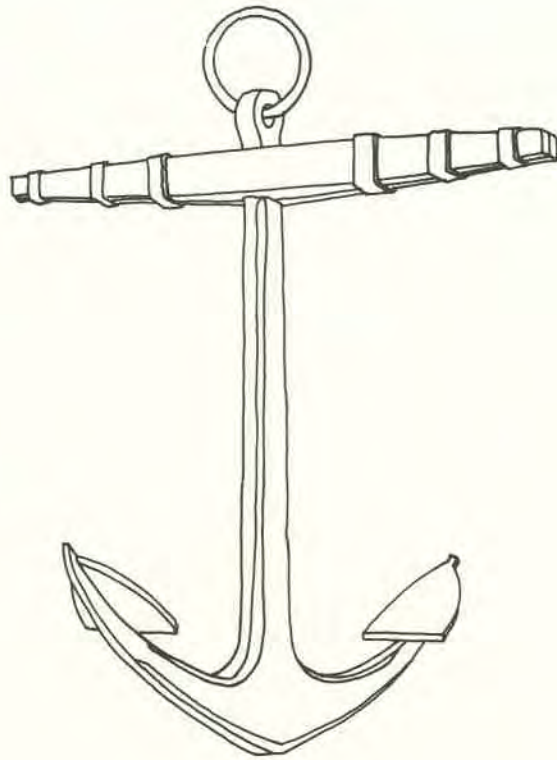


Guns have been typical waterfront accessories for years. The gun and carriage shown are 17th rather than early 19th century but they show the essential features. The carriages normally were of wood but it should be possible to simulate one in concrete or perhaps plasticized wood could be used.

In older days when muzzle loading guns wore out or became surplus, they often were stuck muzzle down along quays and wharves and used as mooring bollards.

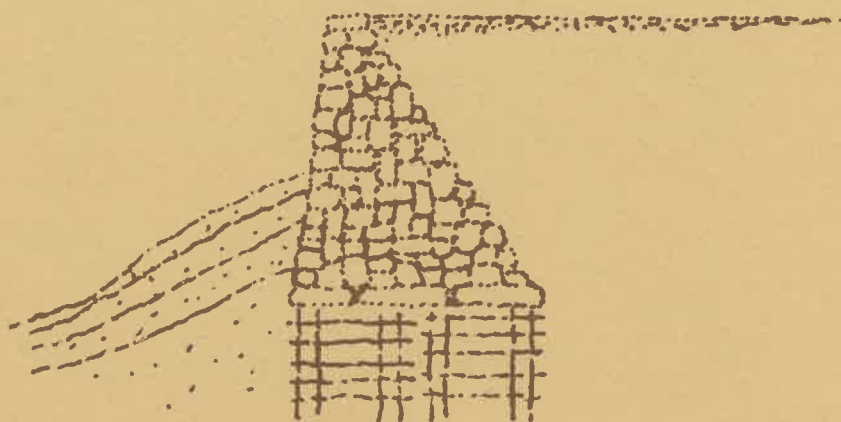


A capstan or two could always be found on a waterfront - it would be necessary to fabricate new ones from a drawing of the period, for they changed considerably through the years. On shipboard capstans were employed for hoisting sails, handling cargo, and, particularly on warships, for weighing anchor. Their shoreside use was in helping riggers while stepping masts, hauling vessels out of the water on greased ways, and in heaving down a ship so the bottom could be cleaned and perhaps copper sheathing nailed on.



Anchors always could be seen along the older waterfronts. At least one large and probably several smaller anchors of assorted sizes should be on the site. A good typical anchor is that displayed in front of the Peabody Museum of Salem. With present day welding equipment it is possible to fabricate a relatively light weight display anchor having the proper features of 1800 without the prohibitive cost of having to forge a true one. It might be possible to find some smaller anchors of the proper period but care must be taken not to use fisherman's anchors from the last quarter of the 19th century.

Existing Conditions



III. Existing Conditions

A. South River Channel

1. Bulkhead

The existing bulkhead along the South River Channel was visually inspected, surveyed, and structurally evaluated for its entire length within the project area. The findings of these investigations are summarized below; the detailed field notes are provided in the Appendix to this Report.

A Field inspection was made on the 19th of January, 1979 at low tide to determine the condition of the granite stone walls, the bulkhead and pier adjoining the Congress Street bridge, and the general mud level in the channel. Figure 10, Existing Conditions, is an inventory of physical features, land uses, and utilities in the project area. Figure 11 shows the profile of the wall and the mud level at approximately six feet from the edge of the wall.

Three criteria were used to determine whether or not the wall showed any signs of distress.

- (a) Settlement would be clearly evident by vertical misalignment of the cap stone on top of the wall.
- (b) Horizontal sliding or movement would be evident by bulges in mid-face and footing levels of the wall.
- (c) Tipping would be evident by a reduction in the batter of the front face.

A careful visual reconnaissance showed none of these deleterious movements. Massive stone walls, such as those used to hold back the Channel at the Derby-Peabody Link Area generally were built with a 1:8 or 1:10 batter. Measurements taken at points "C" and "D" showed this range of batter (Figure 10). In addition, careful inspection showed that the entire wall on both sides of the channel was in excellent condition. Particular attention was paid to those sections of the wall where there were heavy surcharges due to buildings being placed immediately behind and adjacent to the wall. And even here there was not the slightest sign of distress. All horizontal joints between individual stones were vertical and even. Except for erosion in isolated areas (at location "B", Figure 10 there is a 10" sewer outfall that has eroded the stonework for a distance of approximately 10' horizontally), the wall is as sound today as it was when much of it was built nearly 100 years ago.

The bulkhead and pier supported by timber piles, location "A" Figure 10, was the only area that was in poor condition and will require substantial repair work or replacement. Much of the apparent deterioration is in the timber fender piles which are not part of the wall structure. Deteriorated timber piles will be removed by cutting at the mudline. Pulling these piles could disturb the existing structure. The photographs which follow show typical segments of the South River Channel bulkhead.

FIGURE 10

EXISTING CONDITIONS

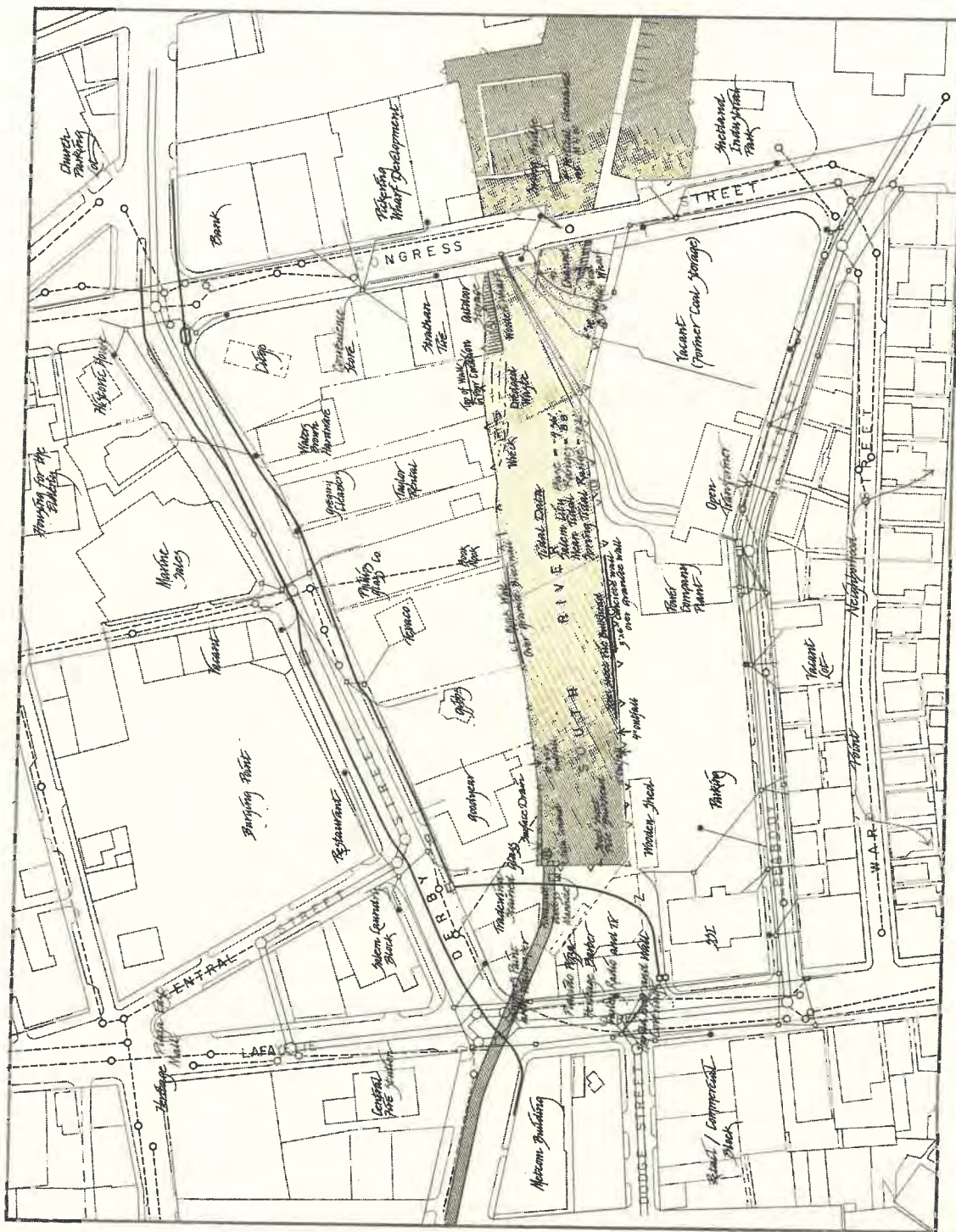
- ELECTRIC CONDUIT OR CABLE
- NEPCO CONDUIT
- STREET LAMP
- JUNCTION MANHOLE
- SANITARY SEWER
- STORM SEWER
- SEWER MANHOLE

Prepared for: City of Salem
 Project: South River Channel
 Date: 10/1/77
 Drawn by: [illegible]
 Checked by: [illegible]
 Approved by: [illegible]

SALEM SOUTH RIVER CHANNEL

SA

Salem, Oregon, Inc.
 400 Pacific Street, Suite 1000, Salem, Oregon 97301
 (503) 596-1111





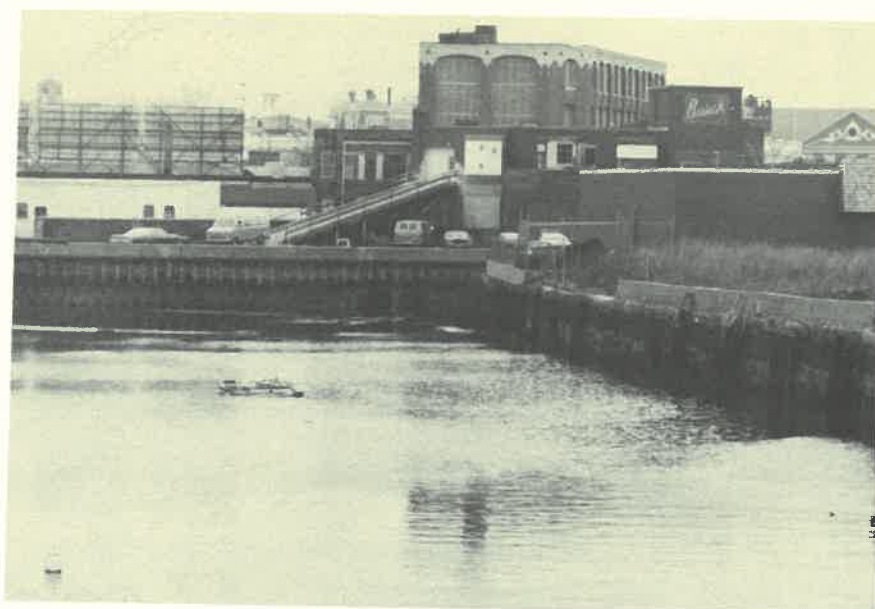
The South River Channel from the Congress Street Bridge. Wooden Wharf in foreground is used by lobstermen. Note steel sheet pile bulkhead (c. 1941) and twin conduits at far (west) end of channel.



Typical granite block bulkhead. Segment shown is on south side at Mass. Electric abandoned coal storage site.



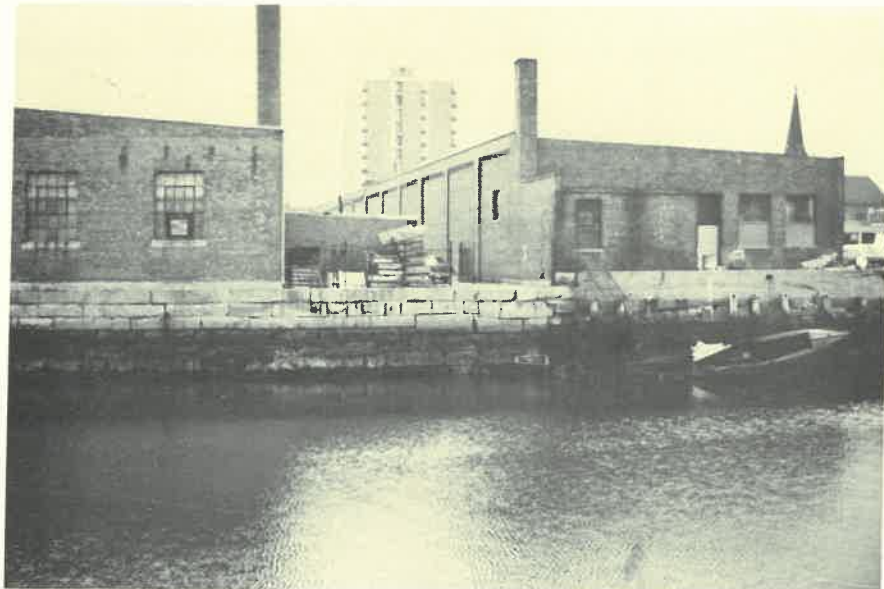
Bulkhead on south side of channel at Massachusetts Electric Company. Note concrete "safety" wall installed opposite garage entrance door and steel sheet fender piles in channel formerly used to tie up vessels away from granite wall.



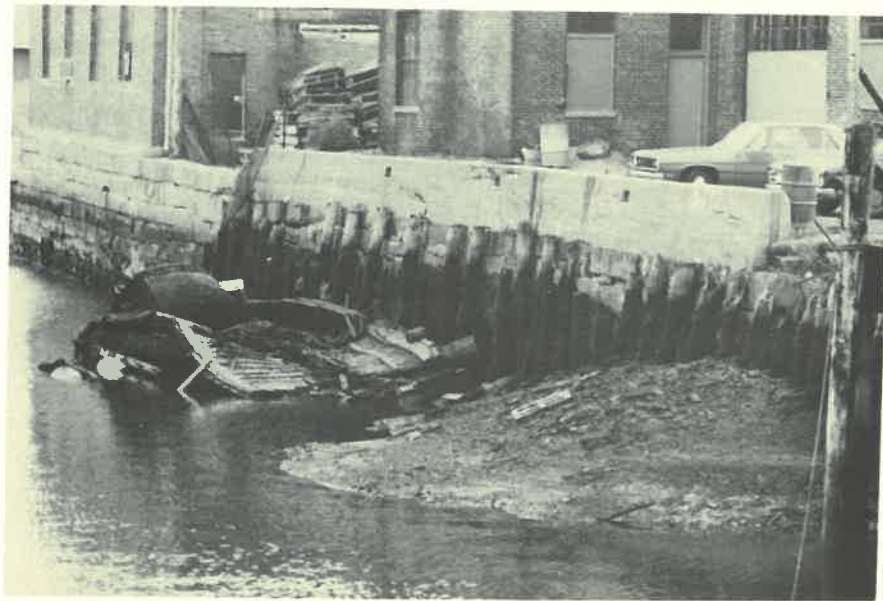
Steel sheet pile Bulkhead (c. 1941) and twin conduits at west end of South River Channel.



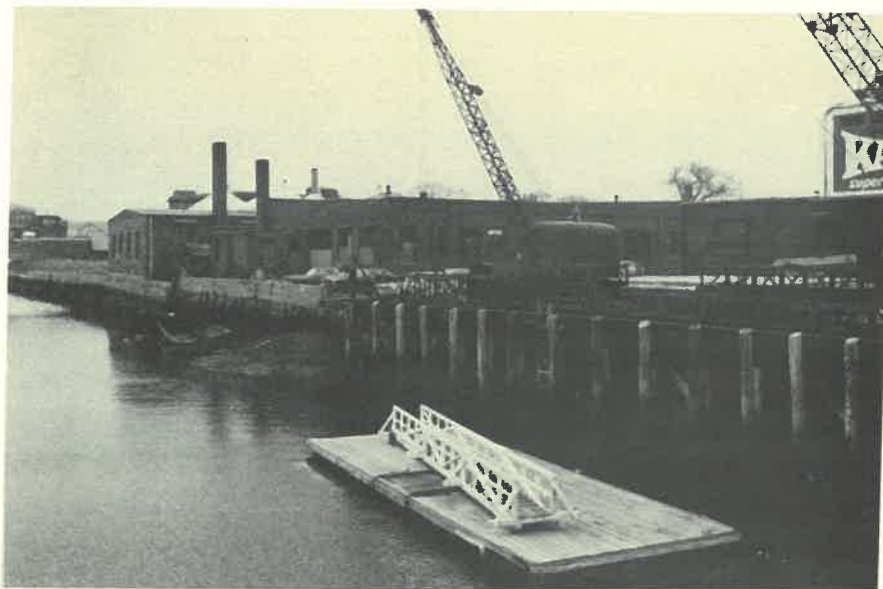
North bulkhead at rear of Derby Street Texaco Station. Note cement concrete header wall and "trueness" of joints in granite block wall despite heavy building surcharge.



The lack of distress in the granite block wall is apparent. Note true vertical and horizontal joints, lack of distress even where building surcharge is directly on wall.



North bulkhead at rear of Waters and Brown and Stratham Tire Company. Note wrecked boats and dredged soil piled at channel edge.



North Bulkhead, only section which is wooden wharf, alongside Stratham Tire Company on Congress Street.

2. Navigational Conditions

Use of the South River Channel as a shipping lane ended with the cessation of power generation at the Massachusetts Electric Plant on Peabody Street. The last of the coal colliers sailed out of the channel in the First World War. Since that time, maintenance of the channel for navigation has been minimal. The profile of the channel bottom as it exists today (sounded approximately six feet from the edge of the bulkhead) is shown on Figure 11. Drawings on file with the City indicate that application was last made to the state around 1910 to undertake maintenance dredging of the channel to provide 8 to 10 feet of depth at mean low water.

Navigation within the South River Channel is further limited by the Congress Street bridge. This structure was erected in 1916 as the replacement span for the Union Street bridge which had been destroyed in a hurricane around 1910. The Congress Street bridge is a swing bridge; that is, it opens for boats by means of a large pylon-mounted, electrically-driven gear mechanism. Nearly 65 years old, subjected to the stresses of many openings, and exposed to salt spray from the ocean, it is in poor to fair condition. The design of this bridge subjects the swing pinion to high wracking (torsional) stresses which contribute to the above condition. The bridge, which offers 40 feet of horizontal clearance with only four feet of vertical clearance available at mean high water when closed, is owned by the City but has been inspected by engineers for the Commonwealth because Congress Street, and hence the bridge, is designated a federal aid urban secondary arterial by the Federal Highway Administration. The last formal "courtesy" inspection performed by the Massachusetts Department of Public Works in 1975 contains these data about the Congress Street bridge:

Built in 1916

Rebuilt or major repair in 1948, 1964, 1968

Operable

Life expectancy, 7-10 years

Operating rating - unknown

Posted load limit - 15 tons

Overall rating - 3 (1 = worst, 9 = best)

Superstructure - fair to poor

Girders in need of paint

An unofficial comment offered by a DPW Engineer who has personally examined the bridge was, "If you had to open it two or three times a day, it would break down in short order".

The South River Channel lies on an east-west axis. It is very sheltered from open water and is considered to be a haven in times of severe storms and hurricanes. Its use by recreational boaters, is, however, very limited due to the necessity to give twenty-four hour's notice to the Harbor Master for opening the Congress Street bridge.

Average tidal fluctuations in the channel are approximately nine feet. During peak storms the water rises several additional feet (due to a combination of storm surge and low barometric pressure) At these times the bulkhead would be overtopped in several locations and localized flooding would occur. HUD-FIA reports a 100 year coastal flood level of elevation 11.0 ± NGVD. In recent years this level has been equated or exceeded several times. Flooding in areas of Salem during severe storms can be exacerbated by the fact that many of the city's storm drains discharge to the South River Channel conduit which, in turn, empties into the west end of the channel. At high tide, when channel depth is above these conduits, backwater can take place (there are tide gates to prevent water from the channel entering the twin conduits) within the drainage system.

B. On-Shore Area

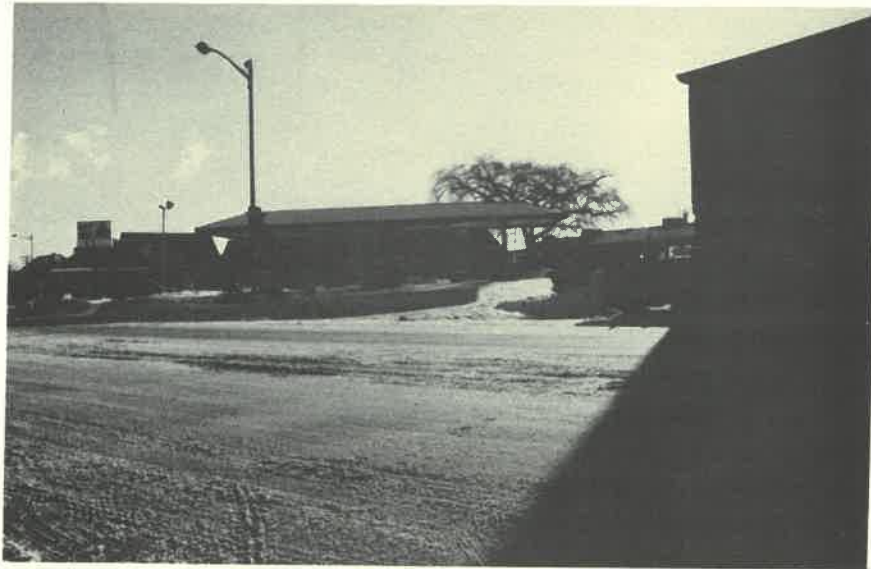
1. Land Use Activities

The 8.7 acres of land surrounding the remnants of the South River Channel are for the most part dedicated to land uses which can be broadly categorized into three types: public and private industry, retail/commercial, and auto-oriented retail. Following World War II, the City of Salem zoned the area along Derby Street north of the channel between Lafayette and Congress Streets for automobile uses. Over time, several car dealerships have occupied the block and, today, three gasoline service stations and two tire merchants are still active. The remaining buildings on Derby Street's south side house businesses which range from a candy store, glazier, and a book wholesaler to a prosperous hardware store and a rental equipment outlet.

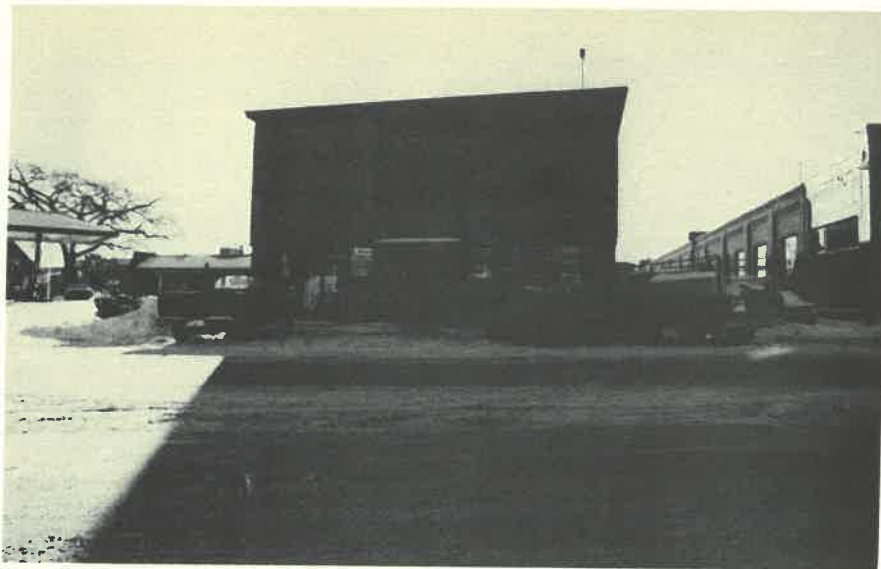
The buildings on the Derby Street block range in age from a newly constructed gasoline service station/convenience store to century old brick wharf buildings. Only three of the buildings remaining in this area still mirror the "saw-toothed" wharfscape which once dominated Salem's shoreline. The other buildings, the three service stations and the tire store, have no historic or "organic" relationship to their coastal location and the service businesses which they house could function equally well in other locations with similar exposure and convenience.

On the other hand, the hardware store, equipment rental building, and the neighboring building occupied by a glazier and the book wholesaler/candy outlet are reminiscent of the old wharfscape. The type of construction, color, height, and "vertical massing" of

these buildings (not necessarily their current uses) date back to the late 1700's and early 1800's when Salem was enjoying its heyday as a world port. The buildings on Derby Street's south side between Lafayette and Congress Streets are shown in the accompanying photographs. The land uses within the project area, the Derby-Peabody Link, are noted on Figure 10.



Service Station at corner of Derby and Congress Streets. Visible is the canopy over the gasoline pumps.



Waters and Brown Hardware. Note angle, and head-on parking in front of store.



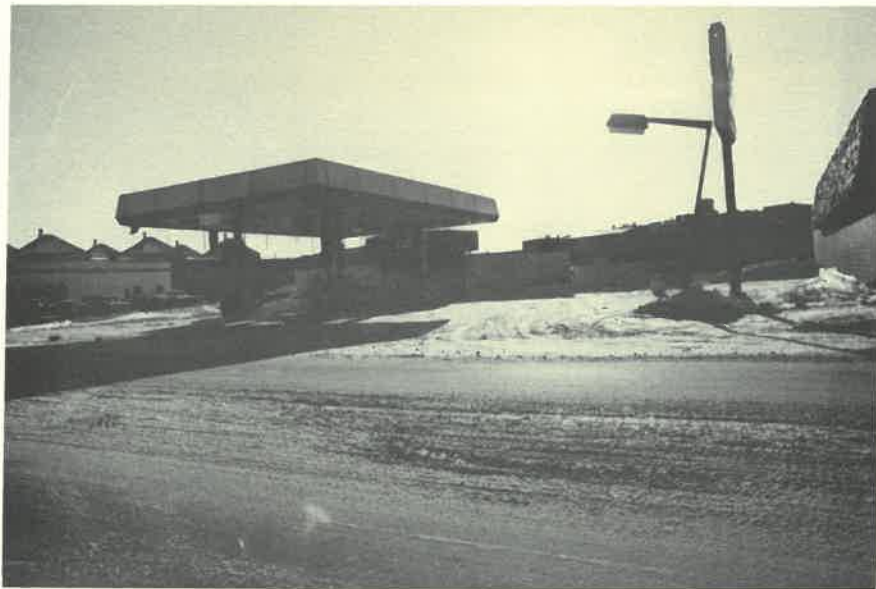
Taylor Rental Building. This wharf-like, one-story building extends nearly to the edge of the channel.



Glazier, warehouse, and candy outlet. Building's rear wall is north bulkhead line of channel.



Texaco Service Station. Note lack of curbing & sidewalk in this section of Derby Street.



Third service station on this block. Note, again, lack of curbing and sidewalk.



One of two tire stores within Derby-Peabody Link.



Former auto dealership is now space for a small business venture.

The Lafayette Street block face within the Derby-Peabody Link is occupied by five businesses all of which are located within one small block of buildings. Uses in this block range from a paint/wallpaper store and flooring store to a pizzeria, a barber shop and a TV/appliance store. These buildings are approximately 35 years of age having been erected following the most recent filling of the channel in 1941. Because of their relatively recent construction these buildings have no particular affinity to their waterfront location--they currently house businesses of a type which do equally well in other locations of comparable exposure and convenience of access. All of these buildings are sited away from the water's edge with the open lots to their rear used for parking and service access. The corner building with the curved facade is two stories in height whereas the adjoining structures are one story. The buildings are massed along the street not perpendicular to the road in the way of old wharf buildings. The Lafayette Street Buildings in the Derby-Peabody Link are shown in the following photographs -- their uses noted on Figure 10.



Former auto dealership houses paint and wallpaper store.



Driveway to service and parking at rear of block. Drive provides access to SSI's parking lots also.



Other family-owned businesses along Lafayette Street.

The Peabody Street side of the Derby-Peabody Link is the interface between the residential Point Neighborhood and the industrial edge along the south side of the South River Channel. Peabody Street is a narrow, one-way (eastbound) street characterized by multi-story brick residential buildings on the south side and a small, high technology firm (Semiconductor Services, Inc.) occupying a partially renovated mill building, the Massachusetts Electric Power Sub-Station, and vacant land on the north side. Buildings on both street faces are built directly on the right-of-way line. Yards and even stoops are non-existent. The condition of the residential structures varies, but at least one at the east end of the street is vacant and gutted.

The building occupied by SSI is a three-story brick building which sits almost on the sidewalk edge on the north side of Peabody Street. Parking lots are adjacent to the building on both the east and west sides. The west lot has a modest capacity, whereas the lot between SSI and Massachusetts Electric Company has excess capacity. A shed lying along the channel edge serves as a storage building for SSI.

The Massachusetts Electric Company Power Sub-Station occupies the north side of Peabody Street at mid-block. It, too, is a multi-story brick building with a large open transformer on its east side along Peabody Street. This unit, which resembles a structural space frame, is surrounded by a chain link fence for security and safety reasons. To the east of the transformer is a large open area of land formerly used for coal storage when power was generated at the station. A ramp, coal car tracks, and a coal chute which once occupied a portion of the site between the transformer and the channel have been removed. Beginning at the southeast corner of the Massachusetts Electric Building running along the north side of Peabody Street and the west side of Congress Street is a masonry wall topped with barbed wire eight feet in height. The buildings along Peabody Street are shown in the pictures which follow. The reader may orient himself by reference to Figure 10.



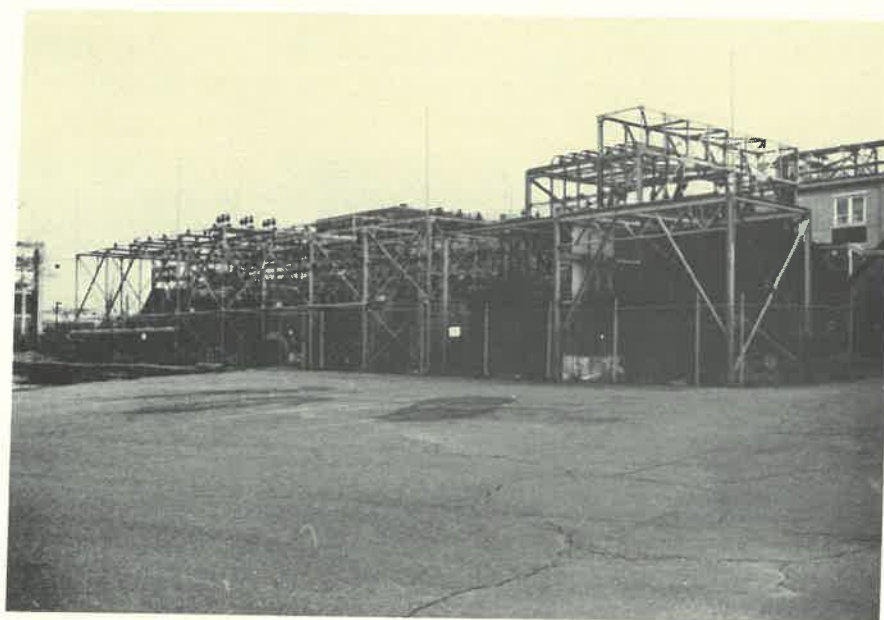
Computer service firm, SSI, at corner of Peabody and Lafayette Streets.



Brick apartment buildings typical of the construction along the south side of Peabody Street.



Massachusetts Electric Company office and transformer repair facility on Peabody Street.



Transformer at Massachusetts Electric Company site on Peabody Street.

Along Congress Street between Peabody Street and Derby Street there is but one building, that which is occupied by the Stratham Tire Company (the Citgo Gasoline Service Station/convenience store occupies the Derby Street/Congress Street corner). This building is a one-story brick structure its length running parallel to the channel. To the south of this building, the wooden wharf area is currently used as a storage site for construction equipment. To the north of Stratham Tire is a gravel parking lot for customers of the store and through which access to the parking area at the rear of Waters and Brown Hardware may be gained. The Stratham Tire Company building is shown in the following photographs. Figure 10 depicts the buildings relationship to other uses in the Derby-Peabody Link.

2. Traffic and Parking

Derby Street and Lafayette Street are major urban arterials which accomodate both local traffic movements internal to Salem and external through traffic flows. A traffic study published in June 1978 (3) indicated that the two-way peak hour traffic volume on Lafayette Street was approximately 1200 vehicles with Derby Street carrying approximately 1600 vehicles in the peak traffic hour.

Lafayette Street's intersection with Derby Street and the latter street's intersection with Congress Street were identified as handling "heavy but stable flows with moderate delays" during peak hour traffic loads. Both intersections were listed as elements in a recommended coordinated traffic signal system for the downtown. The Lafayette Street/Derby Street intersection was given a medium priority should the system be implemented in three stages. The Derby Street/Congress Street/Hawthorne Boulevard intersection was accorded a low priority. Parking occurs, albeit randomly, on both sides of both streets. The south side of Derby Street for the most part lacks a curb and is punctuated with numerous driveways, factors which exacerbate a pattern of parking which is uncontrolled.

Peabody Street is a "residential" street carrying local traffic and employees of SSI and Massachusetts Electric Company. Peabody Street is one-way eastbound with Ward Street, one-way westbound, completing the couplet. Parking is unmetered and uncontrolled. It occurs on both sides of the street further reducing the traffic capacity of the narrow roadway.

(3) A.M. Voorhees, "Central Salem Traffic Circulation and Parking Program", June, 1978.



One-story tire company building adjacent to the channel.



Stratham Tire Company parking lot. Driving through this lot gains access to rear of Waters and Brown Hardware.

Congress Street may be categorized as a local collector road which serves the Point Neighborhood and the massive industrial complex of Shetland Industries. Heavy trucks regularly use the roadway to and from the industrial complex. Parking is permitted on both sides of Congress Street between Peabody and Derby Streets. On-street parking has little effect on the capacity of this street since the narrow Congress Street bridge is the capacity limiting element.

Pedestrian movements in the Derby-Peabody Link area are difficult at best. The lack of signalization and crossing controls at the Derby/Lafayette and Derby/Congress Street intersections makes crossing these intersections by pedestrians a challenging task. The absence of curbing on the south side of Derby Street and the high traffic generating businesses in the area make pedestrian passage along the channel side of Derby Street very risky. Peabody Street, narrow and dirty and dark at night, is a formidable and threatening place for pedestrians.

3. Utilities

An examination of public utilities in the Derby-Peabody Link area was made in order that land use programming for the area would be cognizant of possible constraints to area development that might be introduced by the presence of utilities or utility corridors. Utilities in the Derby-Peabody Link area have been investigated and major services are located on Figure 10, Existing Conditions.

Only in two areas within the Derby-Peabody Link do major utility runs present a possible limitation to reuse of the area. At the west end of the channel, the South River is carried in a six foot high, 15 foot wide conduit which runs from near the northwest corner of the channel under the Sumner's Paint and Supply Building up Derby Street. Maintenance of this conduit and its tide gates requires an access manhole on the city-owned lot just behind the steel bulkhead.

Also in this area is a major power line conduit which swings in an arc from junction boxes at the Lafayette Street/SSI entrance drive across the South River conduit to junction manholes below the sidewalk at Derby Street.

At the east end of the channel near the Congress Street bridge, six submarine cables cross from the Massachusetts Electric Company transformer to the north abutment of the bridge. These cables were buried at approximately three feet below the channel bottom as it existed in the mid-1940's. If dredging of the channel is to occur, further investigation of these cables is needed to determine the available slack in these lines to permit deeper burial.

The remaining utilities which are of concern to future use of the area are the several outfalls (presumably stormwater discharges) which occur at intervals along both the north and south bulkheads (see Figure 10, Existing Conditions; and Figure 11 Bulkhead Profile). If active use of the channel is contemplated as part of revitalization efforts, consideration will need to be given to relocating or abandoning certain of these outfalls. In any case, the outfalls are the cause of deterioration of the bulkhead in at least two locations. Velocity attenuating measures applied to the outfalls may be necessary to alleviate recurrence of such problems after the damaged bulkhead is reconstructed.

4. Recreation Needs

The City of Salem has received from the Department of Housing and Urban Development (HUD) a \$1.3 million Urban Development Action Grant (UDAG) in order to initiate a program of public improvements in the Point Neighborhood* as the catalyst for some \$3 million of private investment.

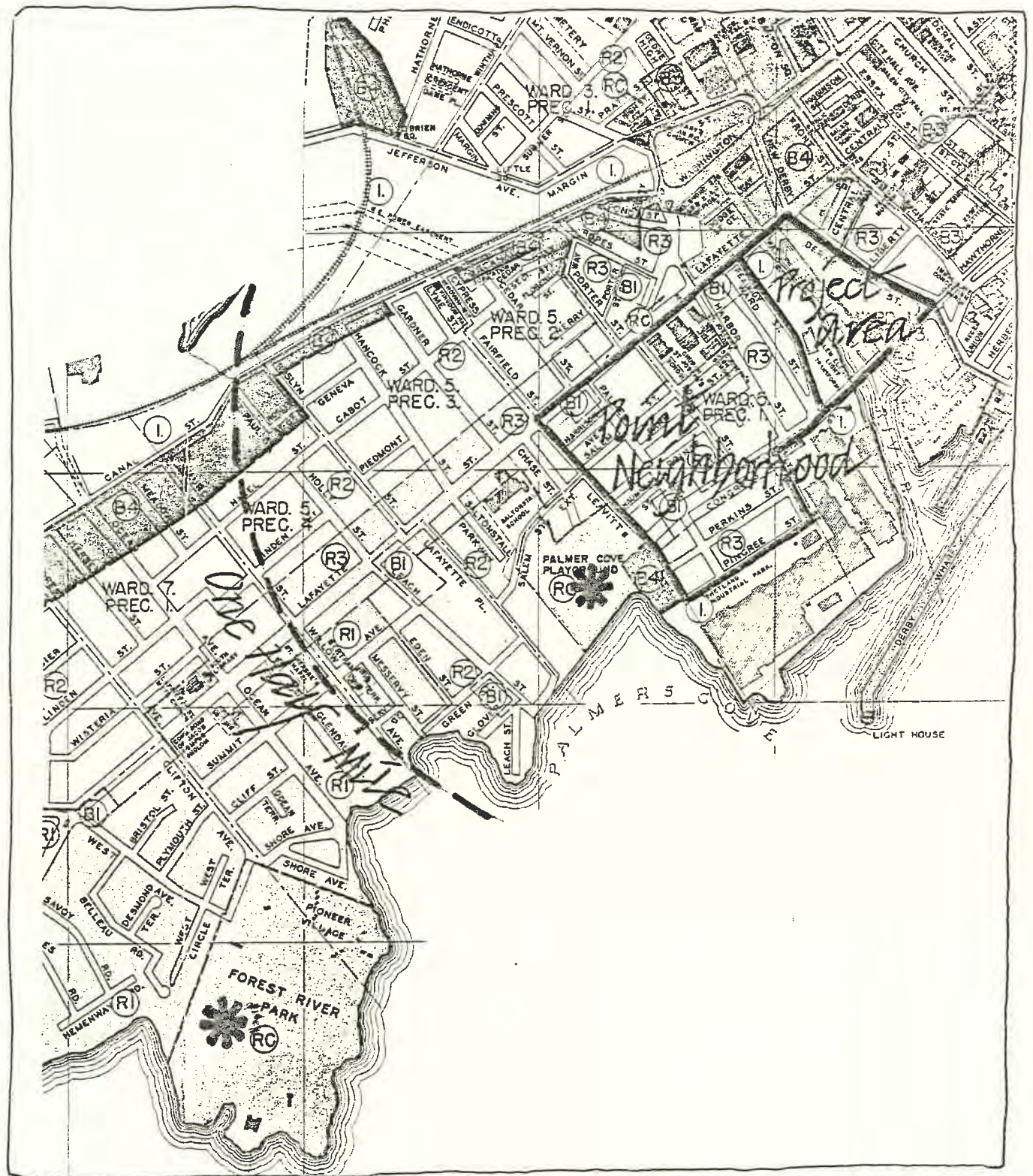
One recognized need of the geographically, economically, and ethnically isolated Point Neighborhood is for open space and recreation facilities. The UDAG Application made reference to the barrier effect of the Derby-Peabody Link: The City will "work from within and without to break down the physical and social barriers (i.e., through the redevelopment of the area surrounding the South River, the creation of a recreational facility linking the neighborhood with the downtown, and the provision of further employment opportunities)". In order to assist the City in programming recreational facilities for the target area and to convert the South River Channel area from a formidable barrier to a link, a recreation needs study was conducted. The principal findings of this study are summarized below.

The Point Neighborhood is typified by deteriorating mutli-family, absentee landlord housing. Deterioration is due partly to the increasing density of low-income families that populate a mill housing system which was not designed to accomodate automobiles. The high density population and narrow streets have combined to produce

*Total Grant \$1.3 million allocated as follows:

- . \$1.0M for housing
- . \$100,000 for community center
- . \$75,000 for public improvements
- . \$125,000 for administration

Additional public improvements funds of as much as \$200,000 will be appropriated from Community Development Funds.



Point Neighborhood / Recreation Areas

a serious parking problem in the neighborhood. Neighborhood problems are exacerbated by the physical bounds of the neighborhood that act as barriers to isolate the area from its surroundings and limit its integration into the "urban fabric".

This area of the city also has the highest proportion of minorities many of which are non-English speaking. In 1970 the Spanish speaking population of the neighborhood was 3.4%; by 1977 it had risen to between 35-45%. Along with being a low-income area, there is a high incidence of under-and-unemployment. The age/sex breakdown of the population of the Point Neighborhood is as follows:

<u>Pre-School</u>			<u>School Age</u>			<u>Other</u>			<u>Neighborhood Population</u>
<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>	
134	141	275	225	229	454	624	763	1387	2,116

The only park facility available to residents of the Point Neighborhood within a half mile radius of its center is located on the south side of the neighborhood off Leavitt Street. At this 6.5 acre playground, which is known as Palmer Cove Playground, the following facilities are available: Large swing frame, small swing frame, large slide, spring horses, merry-go-round, sun house, water bubbler, tennis court, backstop, baseball diamond, and a football field.

Each of the above mentioned facilities are singular in their availability at Palmer Cover. The photographs which follow illustrate the condition of the park facilities and grounds. Not apparent in these pictures is the prominence of rocks and broken glass throughout the park as well as litter concentrated in particular areas throughout the park.

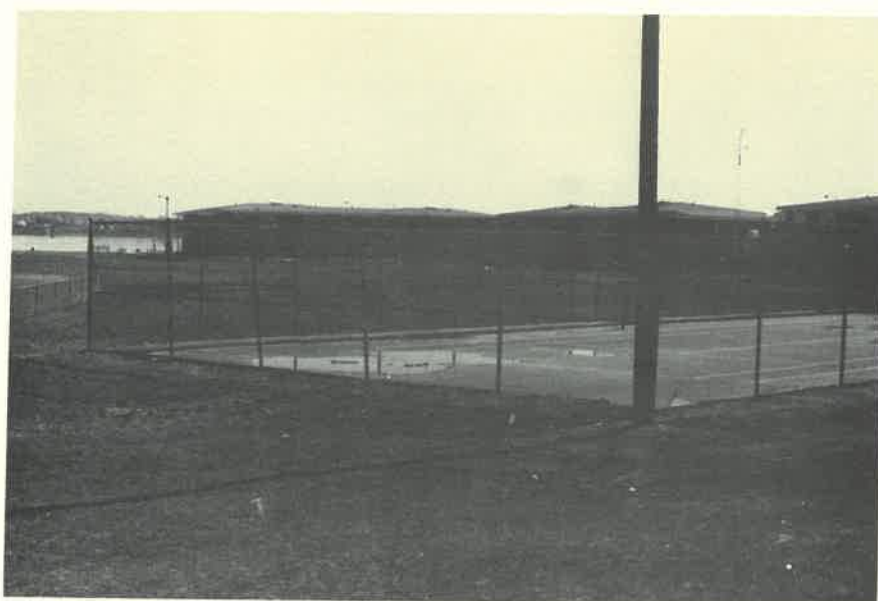
Palmer Cove has a wide variety of users: The Saltonstall School holds physical education classes on the playground; mothers walk young children in the park; older children play baseball, basketball, and football; and students from Salem State College utilize the park. Judging from the broken glass and rubble, the playground is a popular night-time "hang-out" for teenagers.

Palmer Cove Playground is intended to serve not only the residents of the Point Neighborhood, but also the residents of Ward 5 Precincts 2,3 and 4. The total population within a half radius of Palmer Cove Playground is approximately 4,000 people.

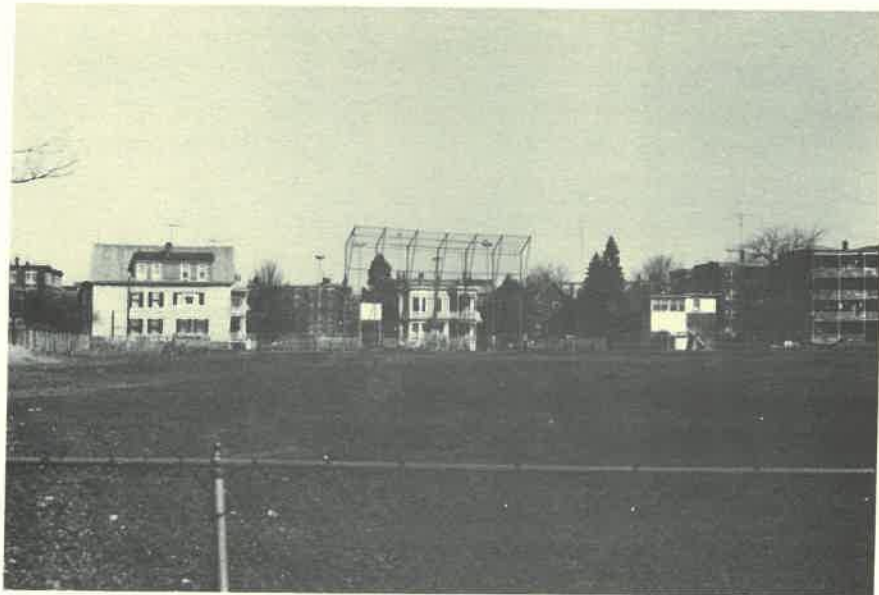
The residents of the Point Neighborhood do not perceive the Palmer Cove Playground as a neighborhood park. The high perimeter fence and the park's extensive use by non-neighborhood persons (league ball, college students, etc.) lead to the view playground is a city park not a neighborhood recreation area.



Looking northeast across Palmer Cove Playground from Salem Street Extension.



Tennis courts at Palmer Cove Playground.



Baseball diamond and backstop with basketball court just visible in rear along Leavitt Street.



Foot path at water's edge. Note swings in left center.

The only other recreational facilities available to residents of the Point Neighborhood are informal areas such as: The St. Joseph's Church parking lot and a privately-owned vacant lot on Prince Street which is partially planted with "victory" gardens and is also used for parking by residents. Neither of these lots has any play or recreation facilities.

Forest River Park is the only other park in the target area with recreational facilities (these include a swimming pool, tennis court and water slide). This park is of limited value to residents of the Point Neighborhood because it is some three-fourths of a mile distant. Its distance from the neighborhood presents access problems particularly for young children.

The National Park Recreation and Open Space Standards for neighborhood parks indicates that there should be a minimum of 2.5 acres of neighborhood recreation area per 1,000 persons with a total minimum of 5 acres and a maximum of 20 acres. Parks in this size range are designed to serve from 2,000 to 10,000 people within 1/2 mile of their location. The Palmer Cove Playground is inadequate to serve the Point Neighborhood and surrounding area with a total population of some 4,000 people. The following is a list of planning standards for neighborhood parks and special recreational facilities.

SPACE STANDARDS FOR NEIGHBORHOOD PARKS

Suggested space standards for various units within the park. The minimum size: five acres.

<u>Facility or Unit</u>	<u>Area in Acres</u>	
	<u>Park Adjoining School</u>	<u>Separate Park</u>
Play apparatus area-preschool	.25	.25
Play apparatus area-older children	.25	.25
Paved multi-purpose courts	.50	.50
Recreation center building	*	.25
Sports field	*	5.00
Senior Citizens area	.50	.50
Quiet areas & outdoor classroom	1.00	1.00
Open or "free play" area	.50	.50
Family picnic area	1.00	1.00
Off-street parking	*	2.30**
Subtotal	<u>4.00</u>	<u>11.55</u>
Landscaping (buffer and special areas)	2.50	3.00
Undesignated space (10%)	.65	1.45
Total	<u>7.15 acres</u>	<u>16.00 acres</u>

*Provided by elementary school

**Based on 25 cars @ 400 sq. ft. per car.

Source: NPS, "National Park Recreation and Open Space Standards"

STANDARDS FOR SPECIAL FACILITIES

The following standards are recommended for individual recreation facilities:

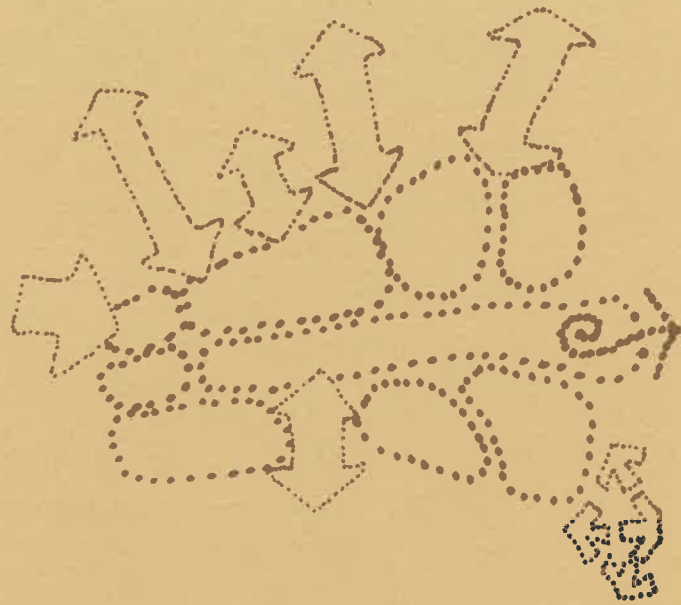
<u>Facility (outdoor)</u>	<u>Standard/100 people</u>	<u>Comment</u>
Baseball Diamonds	1 per 6,000	Regulation 90'
Softball Diamonds (and/or youth diamonds)	1 per 3,000	
Tennis Courts	1 per 2,000	(Best in battery of 4)
Basketball Courts	1 per 500	
Swimming Pools-25 meter	1 per 10,000	Based on 15 sq. ft. of water for each 3% of pop.
Swimming Pools-50 meter	1 per 20,000	"
Skating Rinks (artificial)	1 per 30,000	
Neighborhood Centers	1 per 10,000	
Community Centers	1 per 25,000	
Outdoor Theaters (non-commercial)	1 per 20,000	
Shooting Ranges	1 per 50,000	Complete complex incl. high power, small-bore, trap and skeet, field archery, etc.
Golf Courses (18 hole)	1 per 25,000	

Note: All of the above mentioned facilities are desirable in small communities, even though their population may actually be less than the standard. Every effort should be made to light all facilities for night use, thus extending their utility.

Source: NPS, "National Park Recreation and Open Space Standards"

Based on the planning standards mentioned above, an analysis of the Point Neighborhood's recreation needs points to a deficiency of basketball courts, multi-purpose play areas, as well as a distinct lack of pre-school and senior citizens areas.

Planning Analysis



IV. Planning Analysis

Macroscale

The next step in the progression toward a consensus in the revitalization efforts for the Derby-Peabody Link was to evaluate the area in the context of its sub-region -- that is, how does the link relate to nearby activity nodes and open spaces and, in what way do these relationships afford opportunities to realize planning objectives for this area? Also in this evaluation consideration was given to the natural and man-made features of the target area to the extent that they served to limit opportunities for integrating the area into the City. The tangible result of this evaluation was an "Opportunities and Constraints" map which graphically depicts the area's positive relationships to other regions of the City and also identifies potential constraints which might limit opportunities to capitalize on these relationships (Figure 13).

Opportunities

By viewing the project area in its sub-regional context, the merit of its designation as a "link" becomes apparent. The Derby-Peabody block presents opportunities to function as a major pedestrian link in at least three locations. From the mall of Heritage Plaza East down the Central Street corridor, the Derby-Peabody Block could serve to link the downtown retail area with the long-forgotten waterfront of the South River Channel. With the proper visual clue to the presence of the water, pedestrians, residents and tourists alike, could be lured to the waterfront.

The Salem Common is less than three blocks north of Derby Street. The wide, median divided Hawthorne Boulevard corridor presents a unique opportunity to link this major public open space (and the adjacent Derby Street Historic District) once again with the waterfront.

Less obvious is the Derby-Peabody area's potential relationship with the Point Neighborhood. Removal of some of the barriers along Peabody Street and direct access to the water's edge via a pedestrian walkway could help "link up" this isolated neighborhood with the rest of Salem. Because of Peabody Street's role as a local residential street, an opportunity exists to convert it to a play street restricting traffic to residents and essential travel only.

Secondary linkage opportunities exist along Liberty Place, where pedestrians can readily walk to and from the Peabody Museum and Essex Institute, and where the elderly from the Charter Street Tower can easily walk to the water's edge. The opportunity exists to at least visually relink the Burying Point with its former water's edge location by means of dedicated public open space south of Derby Street opposite this cemetery.

The Derby-Peabody block, indeed, could potentially become a "hub" connecting the various activity nodes which surround it by radial links which utilize, for the most part, existing streets.

Closely allied with its potential role as a pedestrian link is the block's potential to enhance Salem's historic image. Certainly Salem exists because of the water, but within the downtown there remain only isolated locations where one is reminded of Salem's historic bond with the sea. By opening up the existing "view corridors" in the downtown which focus on the Derby-Peabody Link there exists an excellent opportunity to restore a sense of the fundamental role that the sea played in the evolution of the city. Central Street affords a potentially excellent view of the channel area from the mall. Similarly, the heavily utilized Derby Street corridor presents an opportunity, with the removal of existing barriers, to recapture long views of the waterfront for both the pedestrian and motorist alike.

Yet another opportunity presented by a major investment in the Derby-Peabody Link is the chance to reclaim the channel itself for public use. To be able to "circumnavigate" this channel on foot and/or to fish or sail from floats within the channel are only two of the possibilities for returning this water amenity to the public.

Much has been said of the isolation and lack of open space within the Point Neighborhood. Development of a portion of the Derby-Peabody area for recreational facilities and public open space could help to both alleviate the need for such facilities and to integrate the neighborhood into the social mainstream of Salem.

Further opportunities which the area offers include the potential to provide supplementary parking space for the admittedly "under-parked" Pickering Wharf Development, a chance to recondition buildings reflective of the 1700's wharf-scape to uses which are compatible with the waterfront, and the possibility of introducing new and complementary retail activities which could lend a sense of "place" to the area while also functioning as a stepping stone to lure the shopper between the downtown shops and those at Pickering Wharf.

Constraints

Acting as constraints or potential limitations to these re-use opportunities for the Derby-Peabody block are several characteristics of the project area itself as well as certain features in the surrounding area. The existing buildings, and more importantly the businesses which occupy them, are the most severe and defensible constraints to revitalization of the area. For this reason, each building within the block has been shown on Figure 13. Business relocation costs, building and land acquisition costs, and possible demolition costs combine to make each building within the block a constraint to revitalization to a lesser or greater degree, depending on the magnitude of and/or the necessity for incurring such costs in order to realize planning objectives for the area.

Secondly, there is the issue of tax revenues realized from these buildings and the multiplier effect that they have in the local economy. Removal or displacement of productive land uses should only be undertaken when out-weighed by the net, long-term benefits to the public. This is a decision of the city and its residents.

One constraint, the Massachusetts Electric Company facilities, is a de facto limitation to revitalization of the block. Despite its visual problems and barrier influence on the Point Neighborhood, the costs associated with the "taking" of this facility would be prohibitive. It is simply a "given" within the revitalization scheme; this facility must remain although much could be done to enhance its presence.

A second category of constraints or limitations to revitalization opportunities is utilities. Utility runs, be they sewer, water, storm sewer, gas, electric or telephone, are expensive to relocate, abandon, or replace. In all instances utilities should be planned around unless the public benefit to be realized by relocating a utility clearly outweighs the costs.

Utilities in the Derby-Peabody Link area are shown on Figure 10, Existing Conditions. They are not shown on Figure 13, Opportunities and Constraints, because of the scale limitations of this drawing.

The one key area where utility corridors restrict the development potential of the target area is to the landside of the west end of the channel. Here a major power cable runs below ground between a junction manhole on Lafayette Street at the SSI Entrance Drive to another junction manhole on Derby Street opposite the Salem Laundry building. Also, this area is the location of the twin conduits which carry the remnants of the South River. Maintenance access to the tide gates in these conduits is gained from a large manhole at the west end of the channel.

The third category of constraints to revitalization of the Derby-Peabody Link area are the roads surrounding the block. All but Peabody Street are broad, heavily trafficked corridors which merge in large, formidable, unsignalized intersections. The most severe limitation imposed by the road system is the Congress Street bridge. Because of its current condition and dubious life-span this bridge may constrain plans for a boating program for the inner channel.

The last category of development constraints is the needs and rights of other activities in the city. For example, opportunities for an expanded boating program in the inner channel which hinge upon the removal of the Congress Street bridge are constrained by the needs of the Shetland Industrial Complex for goods movement, and employee access.

The Pickering Wharf development also exerts pressures on re-use plans for the Derby-Peabody Link area in the form of a

parking demand. The substantial public commitment and large private investment which this development represents warrants priority consideration in planning for the adjacent area.

Microscale

Subsequent to the planning analysis of the Derby-Peabody Link as it relates to other activity nodes and open spaces in the downtown, the block itself was analyzed in detail as the first step in the process of programming changes for the area. In planner's terms this analysis determined "hard" areas - areas with existing viable and compatible uses or where acquisition costs would be prohibitive, and "soft" areas - areas where incompatible, flexible or marginal uses are present thereby making them vulnerable to change either through the introduction of new activities or the conversion of existing uses. The criteria used in delineating these areas may be expressed as questions which the planners asked of themselves and others knowledgeable about the area and the city as a whole:

1. Is an on-going use or group of uses desirable along the waterfront? Is a waterfront location necessary to the business or to its operation?
2. Could the site of a particular use, or a group of uses, better serve the public interest as a new use?
3. Are the potential logistics, direct or indirect costs, of acquisition prohibitive or counter-productive to the public interest?
4. Does the site of one land use or group of uses relate to the entire downtown in such a way that its acquisition or conversion to another activity would better serve the public interest?
5. Does one land use or group of uses relate to another land use or group of uses in the block such that they may act in tandem? - That is, if one use is to change should the other.
6. Is a desirable use operating in an incompatible building? Conversely is a compatible structure being put to an incompatible use?

The result of this analysis is a map of the Derby-Peabody Link sub-divided into planning elements, A-J (Figure 14). The land use characteristics of each element are generally annotated with "soft" and "hard" areas identified as follows:

- . Element A is a "soft" area; it consists of uses which are incompatible with the waterfront (That is, the answer to both questions in criterion 1 above is,

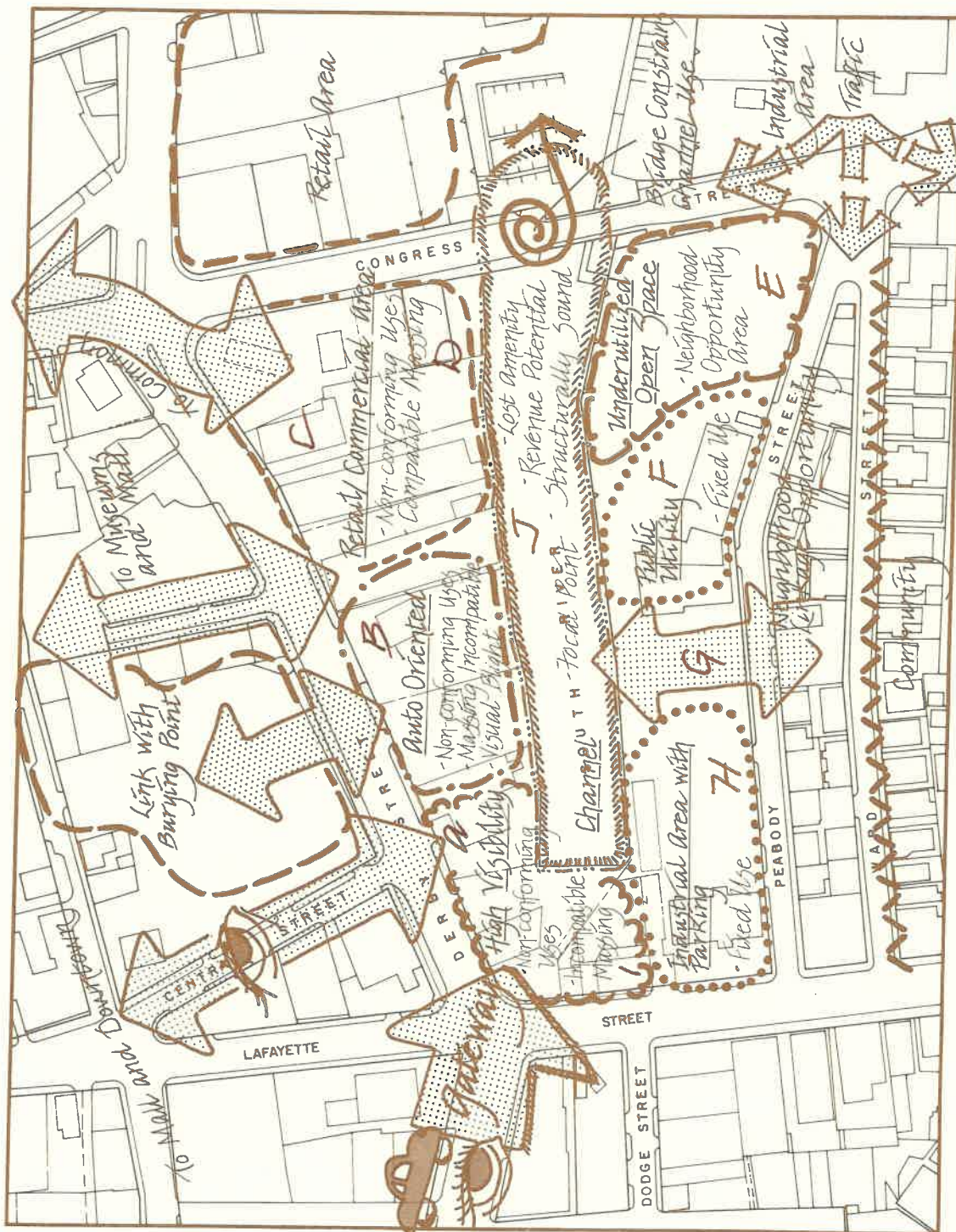
FIGURE 14

Land Use Analysis

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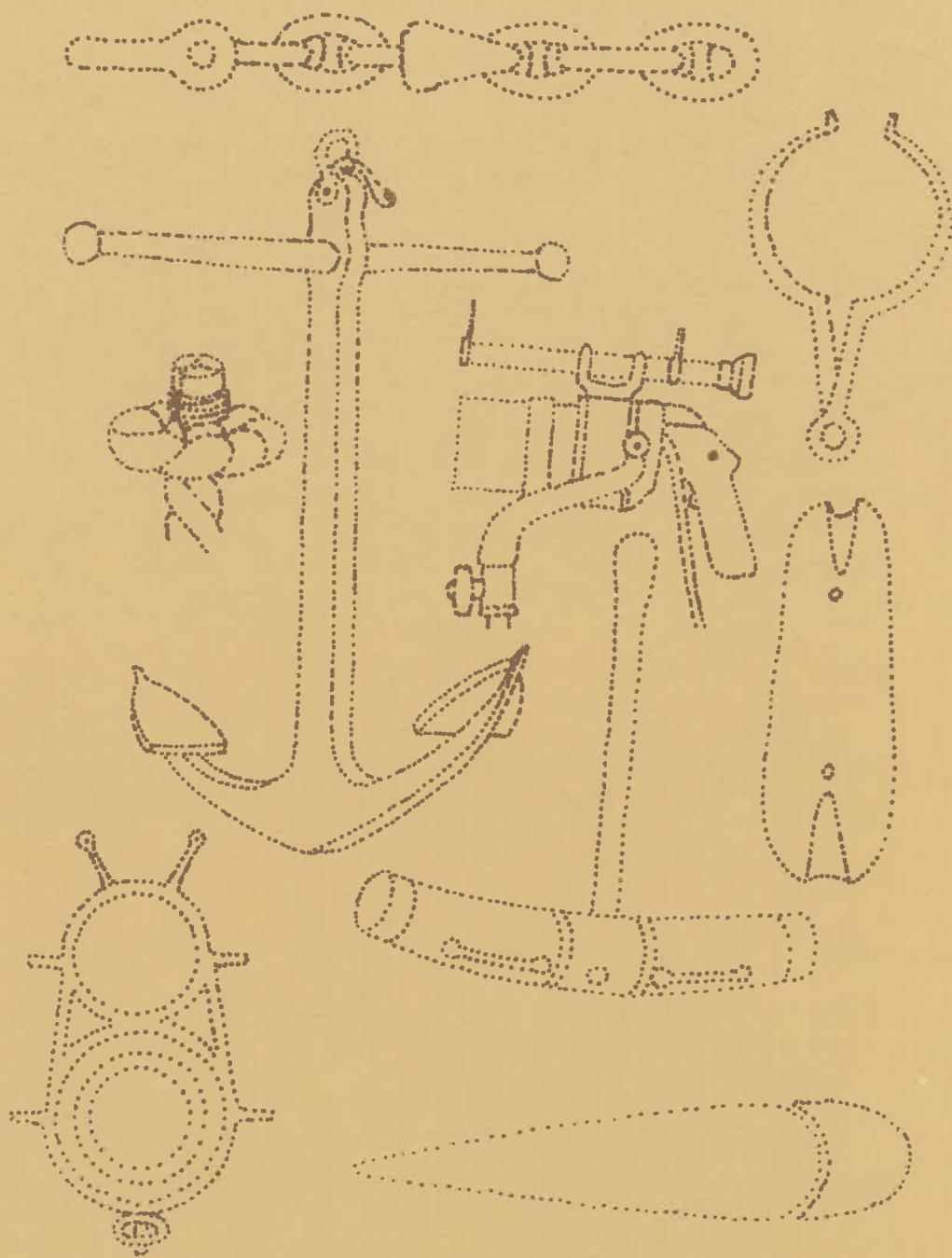
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Planning - Architecture - Engineering
Landscape Architecture
Interior Design - Construction Management



no.)). Much of the land and buildings in this area are underutilized. Because of the visual importance of this corner it appears that the public interest would be better served by conversion to another use.

- . Element B is also a "soft" area. It, too, consists of non-water related uses in buildings which are architecturally incompatible with their site. The important view corridor down Central Street and the area's focal relationship via the view corridor at Element A makes this area a key area for change.
- . Element C is an area which is both hard and soft. It consists of one and two-story, brick, wharf buildings whose architectural massing and ties to the waterfront are compatible. However, many of the businesses which occupy these buildings, although some may be very viable financially, are not desirable along the waterfront. The acquisition and perhaps demolition costs of these buildings could add markedly to project costs.
- . Element D is a soft area. Neither the building, the land or the uses to which they are being put relate positively to the waterfront. The area also has important synergistic relationships to Element C, on site, and to the Pickering Wharf Development, off-site. If Element C is to see a change of use, or if the private sector commitment to Pickering Wharf is to be supported, it would seem wise to convert the area, Element D, to other uses.
- . Element E is a soft area. This area, once a coal storage site for Massachusetts Electric Company, is no longer utilized by the utility. Outright acquisition or the introduction of structure land use may not be possible due to the potential, long-term future needs of the utility. However, because of the area's proximity to the Point Neighborhood, its greatest potential is for use as a neighborhood recreational amenity.
- . Element F is a hard area. The costs of relocating this major public utility would be prohibitive, counter-productive to the public interest.
- . Element G is a soft area. This corridor has important linkage relationship to the Point Neighborhood. Its current underutilization suggests that the public interest would be better served were this area to see a change in use, one which minimized the barrier effect which characterizes the North side of Peabody Street.

Alternatives Development



SECTION V - DESIGN ALTERNATIVES

To better evaluate the many programming alternatives for Nathaniel Bowditch Park, it was necessary to subdivide the site into specific activity elements. These activities have been coordinated with the previously discussed planning elements (A through J) to maximize the use potential for each segment.

These activities are for: Element A - Gateway, Element B - Feature Park, Elements C and D - Retail and Parking Node, Element E - Open Recreation Space, Element G - Neighborhood Link, Element I - Parking Activity Node and Element J - Boating Program. Elements F & H - Massachusetts Electric Company and SSI Industries, respectively, are fixed land uses which already exist on the site and are not to be included within the park boundaries. The program concept for each park element is shown on Figure 15.

The criteria used in delegating these various activities to their appropriate segment was a synthesis of professional planning judgment and client and community input. The combination of these significant viewpoints has provided the City with a Recommended Plan for this park which respects the many needs of a vital and growing community. Alternative plans for solutions to the program concept for each element were explored in depth. The alternatives considered for each planning element are described generally below:

Element A - Gateway

The concept of a gateway to the Nathaniel Bowditch Park was approached in two ways: as a passive open lawn area serving as a link between two intense activity nodes (the downtown mall and the park itself), and as a "visual clue" to the wharfscape theme in the Park. (Because of its close relationship with Element I these two areas are shown together on the figures referenced.)

1. As a lawn area, the gateway provides an opening view in the corridor along Derby Street drawing approaching motorists to glimpse the activity along the reclaimed waterfront as well as the masts and spars in the wharfscape area. For pedestrians, the open space acts as a passive orientation zone providing a backdrop for the many activities occurring in the park itself (Figure 16).
2. As a visual clue to the thematic park, the gateway serves to introduce both motorists and pedestrians to the wharf concept by placing a rigged vessel in an open lawn space, simulating a boat in the channel (prior to 1941, this area was part of the channel). The masts and spars, reaching 70-100' in the air, announce to both pedestrian and motorist the nautical character of the Bowditch Park and serve as a reminder of Salem's maritime history (Figure 17).
3. A third alternative examines the possibility of retaining the corner buildings. This, in effect, reduces the gateway concept to a pedestrian orientation zone which would act as a

- Element H like Element F is a hard area. The business which occupies this building is an important employer of persons living in the Point Neighborhood. The financial commitment in the building made by the current owners would make acquisition costs high.
- Element I is much like Element A - the area is soft. Although certain uses in this portion of the block are not necessarily incompatible with the waterfront, they occupy buildings the design and massing of which is not compatible with their location. These buildings, unlike the long brick buildings on Derby Street are of relatively recent construction (post 1941) with little historic connection to the channel.
- Element J is a soft area. This important water amenity is highly underutilized. Its restoration as a public facility is clearly in the public interest. It offers opportunities for the City to recapture waterfront and to enhance its maritime image.

It is important to recognize that a use's conformance with planning and/or urban design criteria is but one side of a two-sided coin in terms of the wisdom of making land use changes. The other side of the coin, equally important to the public interest are the revenue and economic multiplier factors related to the activity. Some of the concerns which stem to these issues are:

- How many local persons does the business employ?
- What is the tax revenue realized by the City from the business?
- Is the business such that it attracts patrons whose spending within the City is multiplied (for example do out-of-towners who come to Salem because of a particular land use activity also spend money in local hotels and restaurants)?
- Is there a symbiotic relationship of one business with another -- if one is removed will the other survive?
- How will business acquisitions/relocations be perceived by the business community as a whole? How will future investment potentials be affected?

These and related concerns are among the items which must be evaluated by the City when it is decided to implement or forego specific changes in the Derby-Peabody Link.

Program Concept

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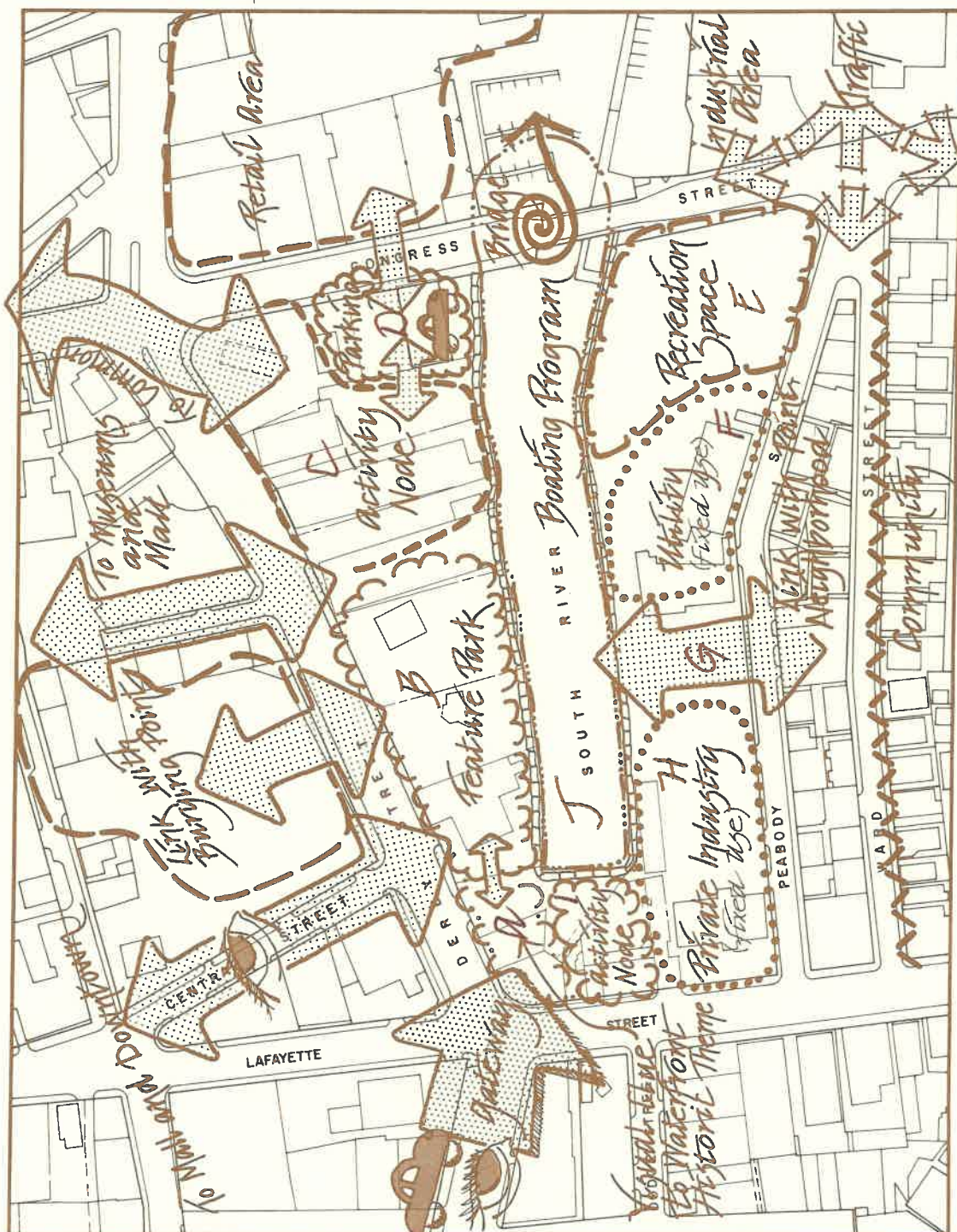


FIGURE 16

Element A & I
Alternative 1

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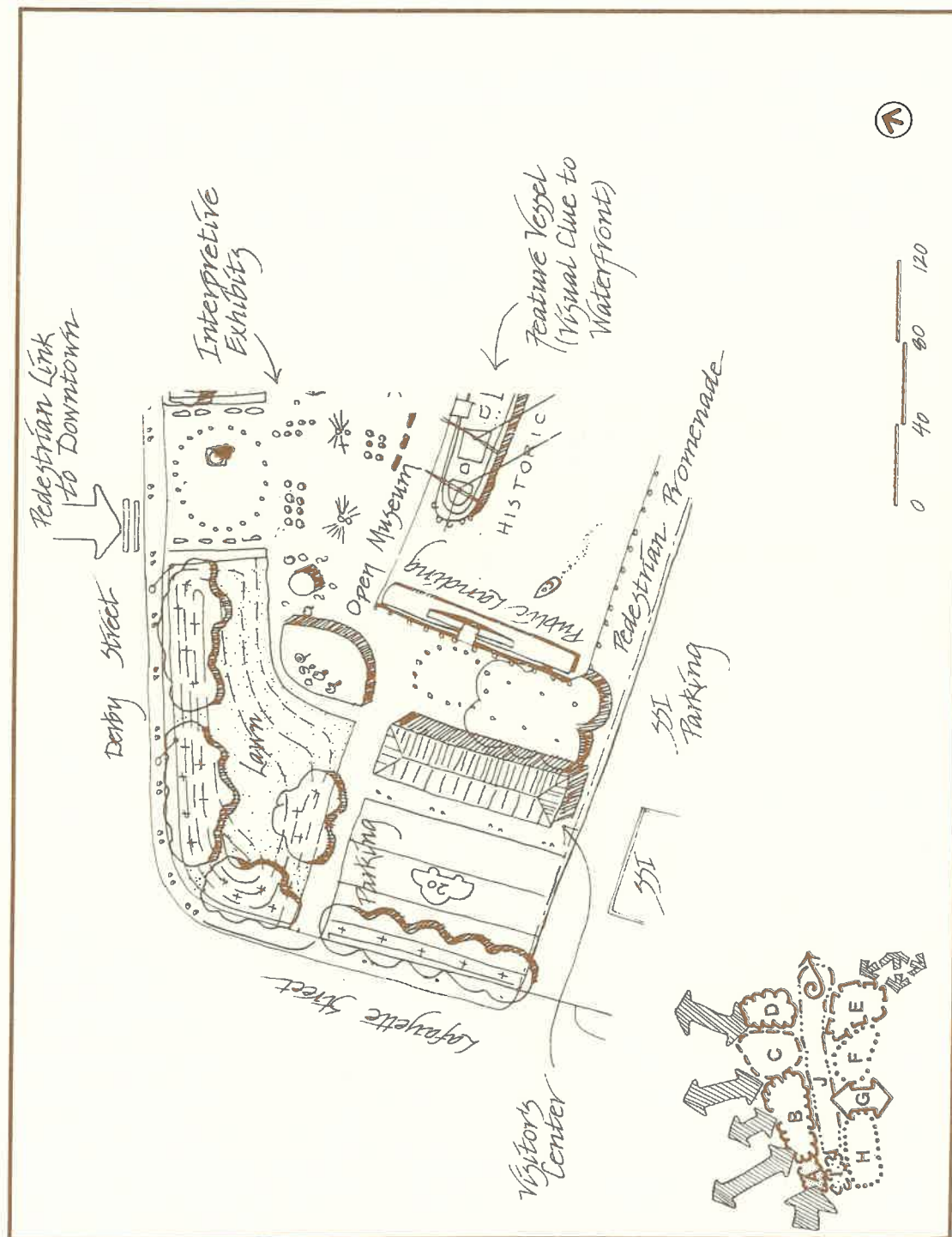
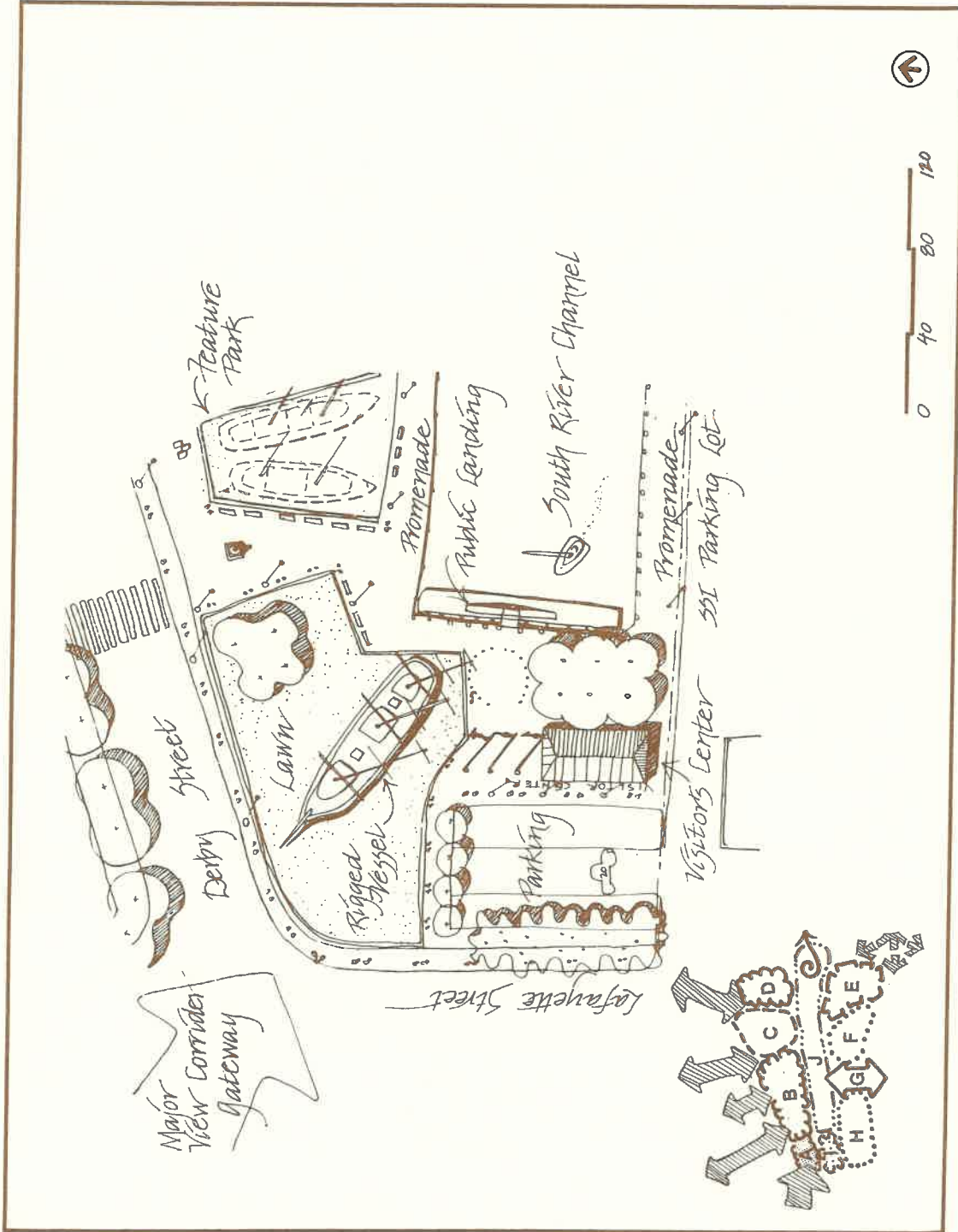


FIGURE 17

Element A&I
Alternative 2

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receiving area for the pedestrian traffic along Central Street to the park. Motorists' view into the park would be substantially obscured by these buildings and the space would be a weaker statement of entry to the park (Figure 18).

Element B - Feature Park

In order to better explain Bowditch and his role in Salem's maritime history, the concept of a theme park was developed, to be articulated in either a contemporary or an historical manner. In either case, it was felt that artifacts illustrating Salem's heyday in the maritime trade at the turn of the nineteenth century would be appropriate to both the biography of Nathaniel Bowditch and to the explanation of the era in which he lived.

1. As a contemporary park, the nautical exhibits would be displayed in an open plaza adjacent to the gateway area, immediately introducing visitors to the many examples of Salem's as well as Bowditch's crafts. The plaza would also serve as a stage for the display of a vessel under construction, so that visitors could better understand the size and complexity of a typical vessel from this period (Figure 19).
2. As a thematic, historical park, the concept of a "wharfscape" would illustrate the former wharf outlines on this land along the channel in 1806, the year Bowditch completed his survey of Salem Harbor. By differentiations in paving and texture, it would be possible to recreate the feeling of the wharf activities as well as the size of the vessels "docked" alongside by reproducing cargo and artifacts along the wharfs and masts and spars on the "vessels". A visitor could easily begin to feel the drama and excitement which prevailed at the water's edge in Salem's heyday (Figure 20).

Element C & D - Retail Activity Node and Parking

While it is often desirable to begin a new project with a clean slate, it is rarely economically advantageous in urban areas. The cost of acquiring properties and then demolishing them is, many times, prohibitive. Furthermore, this practice can be fiscally damaging to the tax structure of a city. Thus, one finds restoration and renovation being actively pursued in many older urban centers. While a large number of facilities within the park site are incompatible both in use and in physical appearance, the three brick buildings along Derby Street near Congress Street are most reminiscent of the old wharf storage facilities found in earlier times (Figure 21). Thus, historically as well as aesthetically, these buildings are compatible with the wharfscape concept. The decision regarding which of the three buildings will remain becomes one of economics as well as one of urban design.

1. Retaining all three buildings and converting them to small retail shops as was done at Boston's Quincy Market, raises the question of market demands. Would these shops compete with

FIGURE 18

Element A & I
Alternative 3

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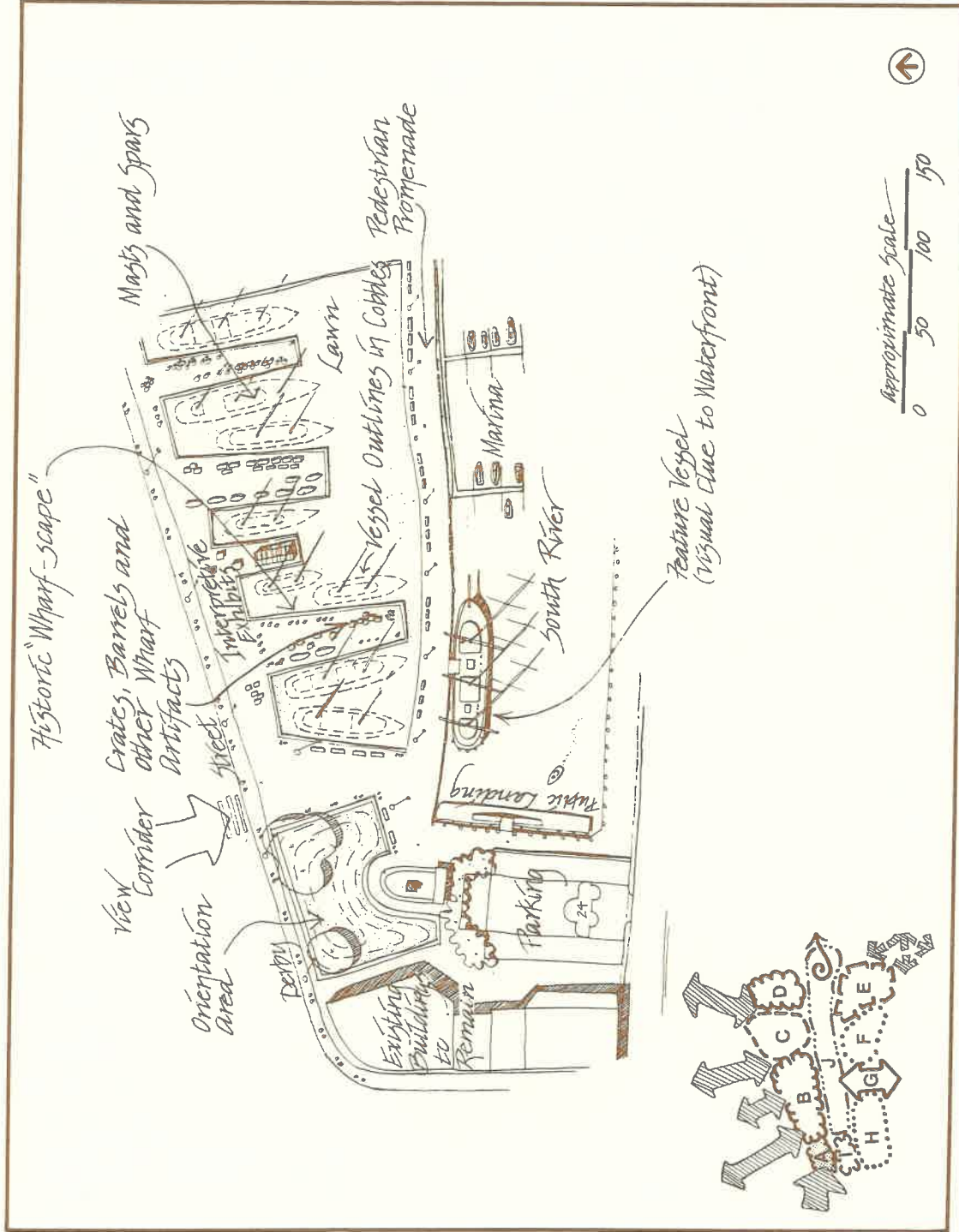


FIGURE 19

Element B
Alternative 1

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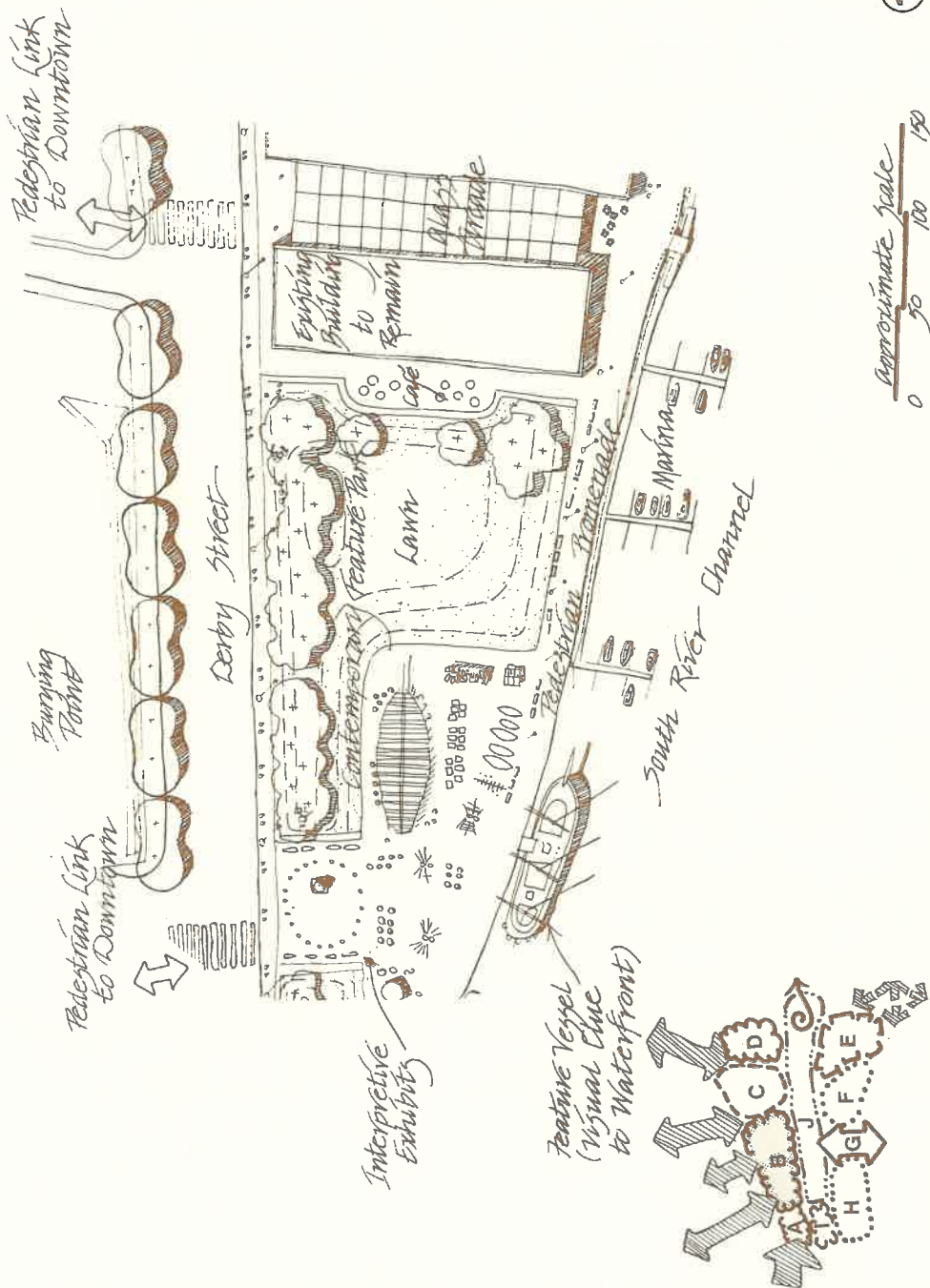
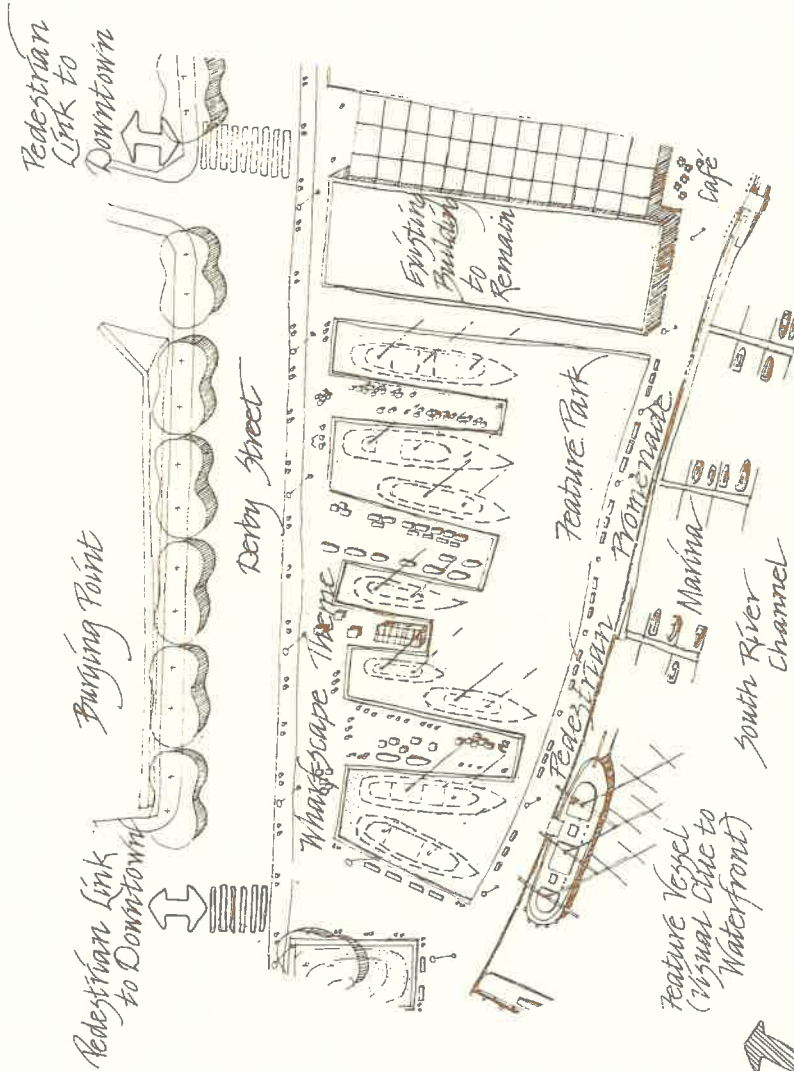


FIGURE 20

Element B
Alternative 2

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Approximate Scale
0 50 100 150



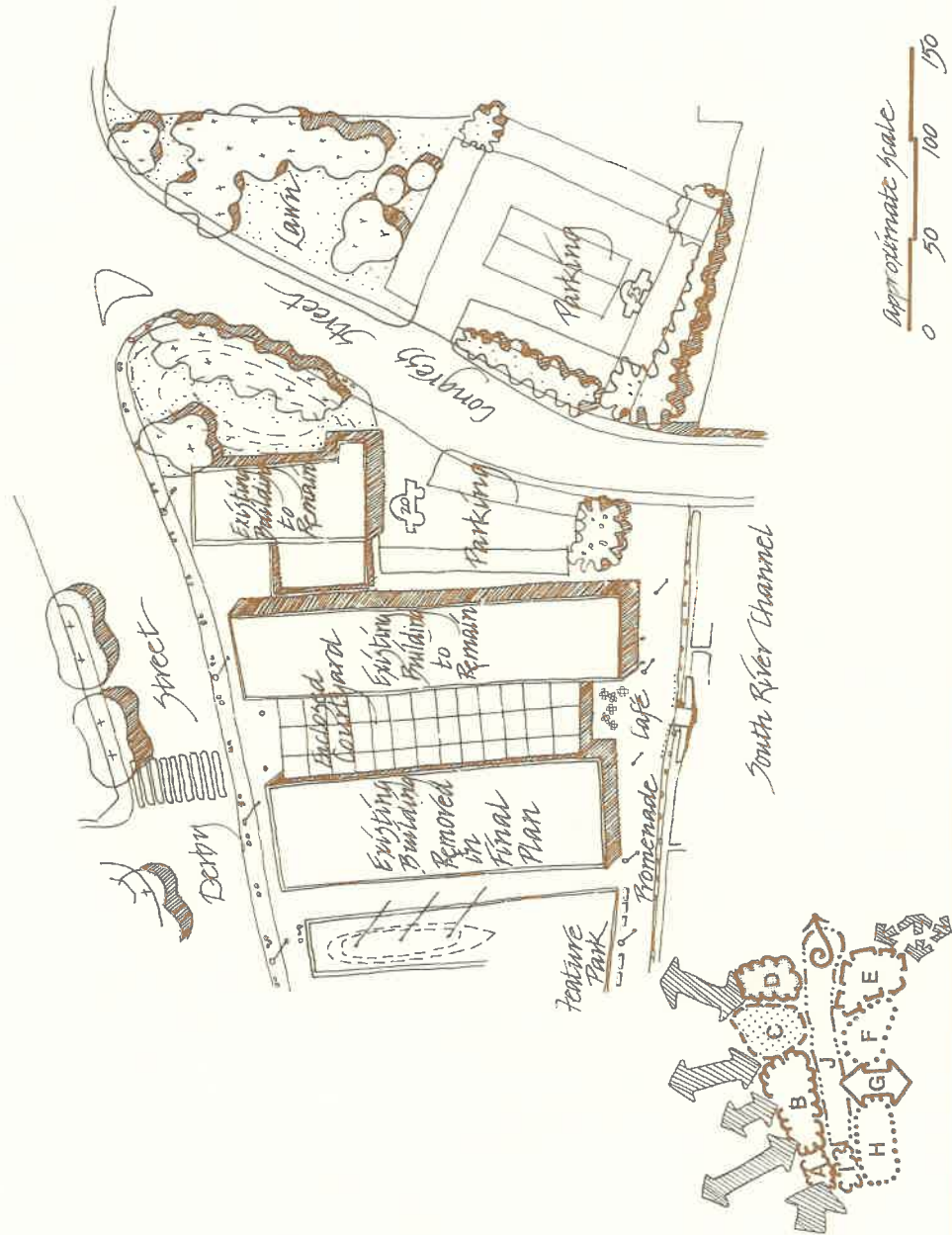
FIGURE 21

Element C & D

Alternative 1

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the new Pickering Wharf development across the street or would they be complementary to it? Could the market sustain this new commercial input? Furthermore, would the increased retail activity create a parking problem for an already parking-deficient zone? With these thoughts in mind, that the design, economic, and "spinoff" implications of removing structures along the Derby Street edge be evaluated.

2. Looking beyond the project boundaries, one finds that Liberty Place, a logical pedestrian route to the Park, falls in the direct line of sight of the westernmost of the three buildings under discussion. Removing this building opens up views to the water from as far up as Charter Street, providing another "visual clue" to the park activity and waterfront (Figure 21).
3. Removing the easternmost building, smaller in size than the other two, also allows penetration into the site, but not from as critical an area. Furthermore, the open space it creates, which would be primarily conducive to parking, creates a hazardous traffic situation being located too close to the Derby/Congress Street intersection (Figure 22).

Element E - Open Recreation Space

The needs of the adjacent community have been identified in the recreational needs study and were incorporated in the resultant programming for the Nathaniel Bowditch Park. Primarily, there is a serious lack of vacant open space for youngsters in the adjacent community. The large open parcel east of the Massachusetts Electric Company is the only site which is large enough to accommodate these recreational needs (Figure 23). This area can serve a multi-purpose function, providing an open field for such activities as softball, touch football, jogging and informal play.

The bridge realignment studies show alternative ways in which this area could be enlarged (see Element J - Boating Program).

Element G - Neighborhood Link

Incorporating both community and visitor needs is crucial to the success of Nathaniel Bowditch Park. Ready access from the Point Neighborhood to the park must be provided in order to actively promote community participation in park activities.

1. Incorporating a tot lot within the park itself encourages neighborhood interaction with other Salem residents while also providing a safe and attractive play facility for the community. The neighborhood link to the park is physically strengthened by supplying an activity element to this connection (Figure 24).
2. The vacant lot across from the project boundary at Peabody Street is not technically within the scope of work. However, due to its location directly across from the Neighborhood Link to the park, it is an important community-related element which

FIGURE 22

Element C&D
Alternative 2

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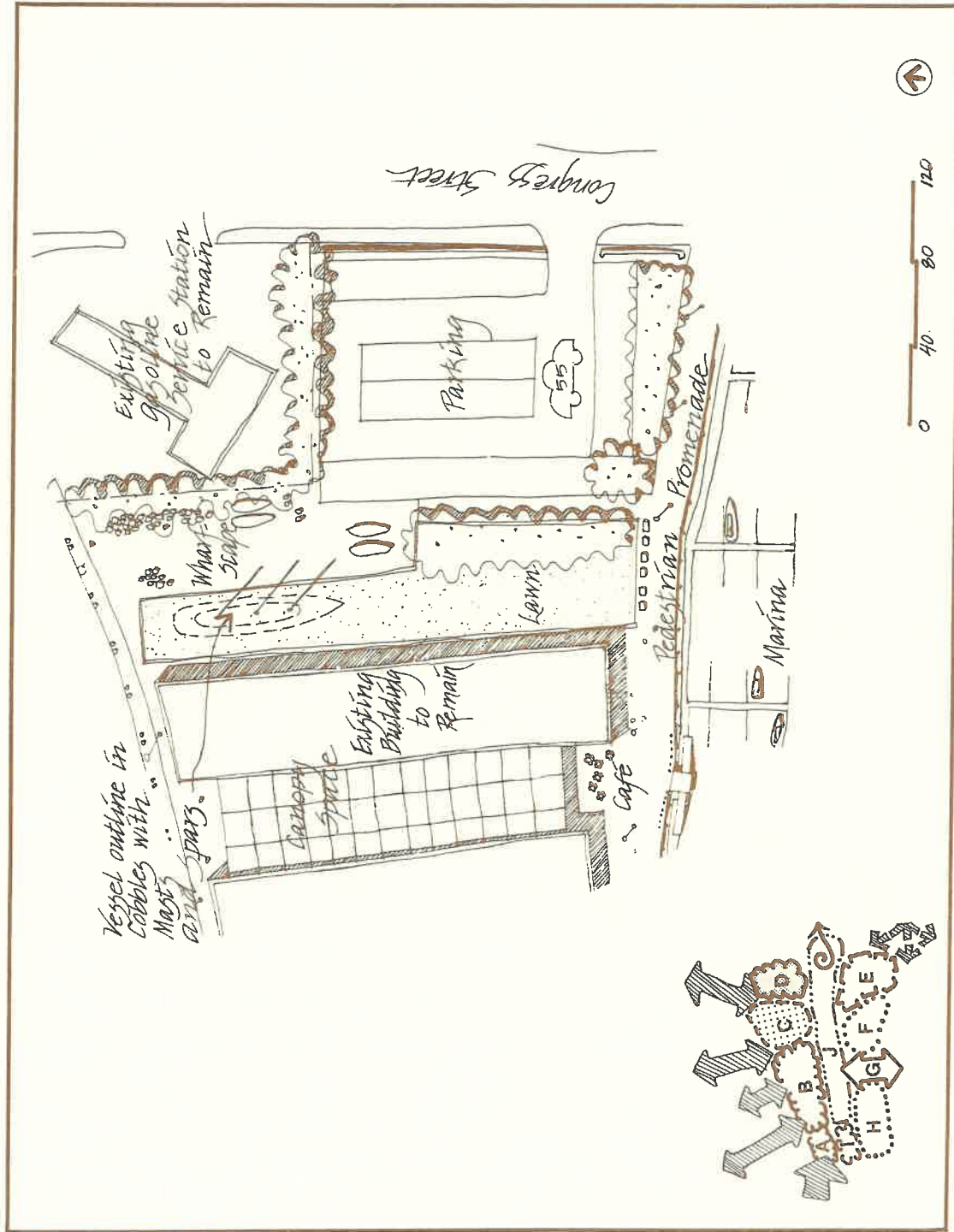
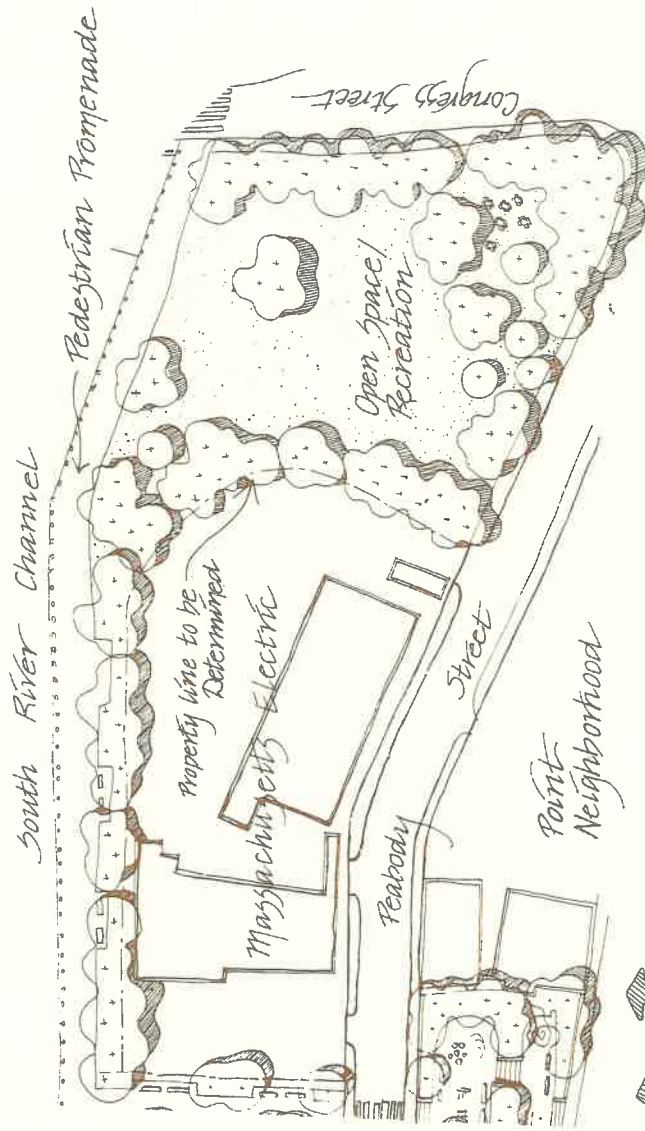


FIGURE 23

Element E
Alternative 1

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Approximate scale
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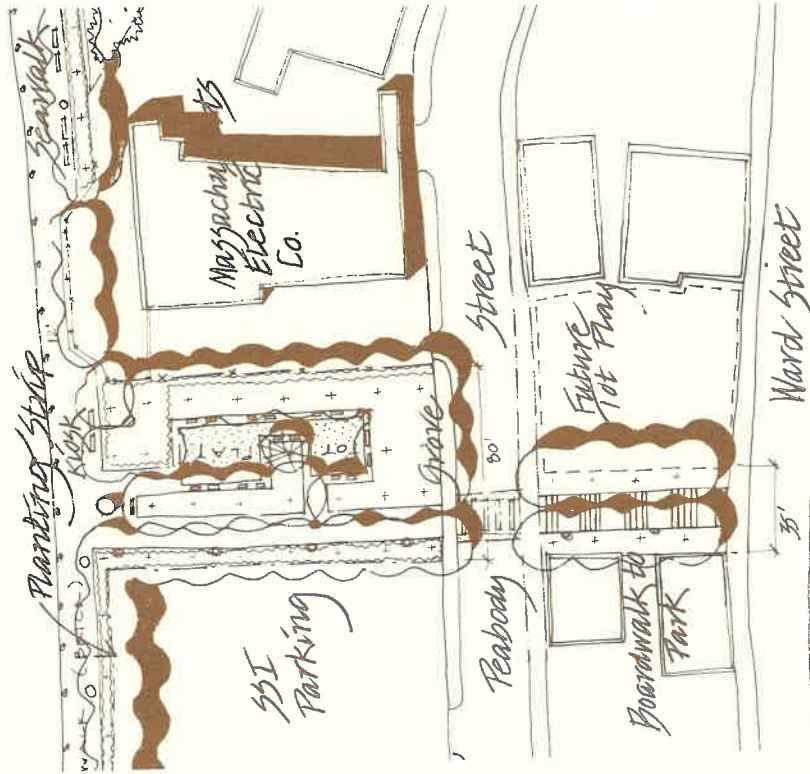


FIGURE 24

Element **G**
Alternative **1**

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has tremendous potential for strengthening that link. It is felt that this site should be upgraded to encourage community access to the park. (Figure 25 shows how this lot might be developed as both a link to the park and as a tot play facility for the residents of the Point Neighborhood.) This site could provide an ideal area for smaller children's activities, being convenient to the residents and removed from trafficked areas.

Element I - Parking Activity Node

This area is directly related to the Gateway (Element A); the success of the park relies upon this high visibility corner which provides the visitor with a view to the water and to the many activities within the park itself. Originally, it was thought that this location would be suitable for a visitors' center and a small parking lot. However, it was later decided that the Riley Plaza orientation facilities were ample to accommodate visitor needs and that the park would only need to provide information kiosks and, if needed, a small orientation center for the "wharfscape park". In selecting an alternative for this node, the acquisition of the buildings on Lafayette Street was examined.

1. The first alternative (Figure 18) advocates existing buildings. While a small parking facility and orientation center could be provided with the buildings remaining, the critical view corridors along Lafayette and Derby Streets would be blocked by structures which would obscure views into the park and to the water.
2. The second alternative (Figures 16 & 17) shows how the gateway concept can be maximized through the removal of all structures. Parking is provided adjacent to the SSI access road thus eliminating further curb cuts on Lafayette Street. The entire corner becomes an imageability zone for the park itself, accommodating both pedestrian and vehicular needs.

Element J - Boating Program

The type and size of boating program available in the South River Channel is dependent upon the status of the Congress Street bridge. Due to the bridge's need for frequent repairs, alternatives were presented which examined the implications of moving the bridge or eliminating it completely.

1. Maintaining the bridge in its present status implies that a less ambitious boating program must be pursued. Due to the problems of vessel clearance at mean high water, as well as the maintenance problems associated with frequent bridge openings and closings, the South River Channel could better accommodate smaller power boats. If larger sailing vessels were allowed to moor in the channel, traffic and goods movement to Shetland Industrial Park would be interrupted each time the bridge was opened and closed (Figure 26).

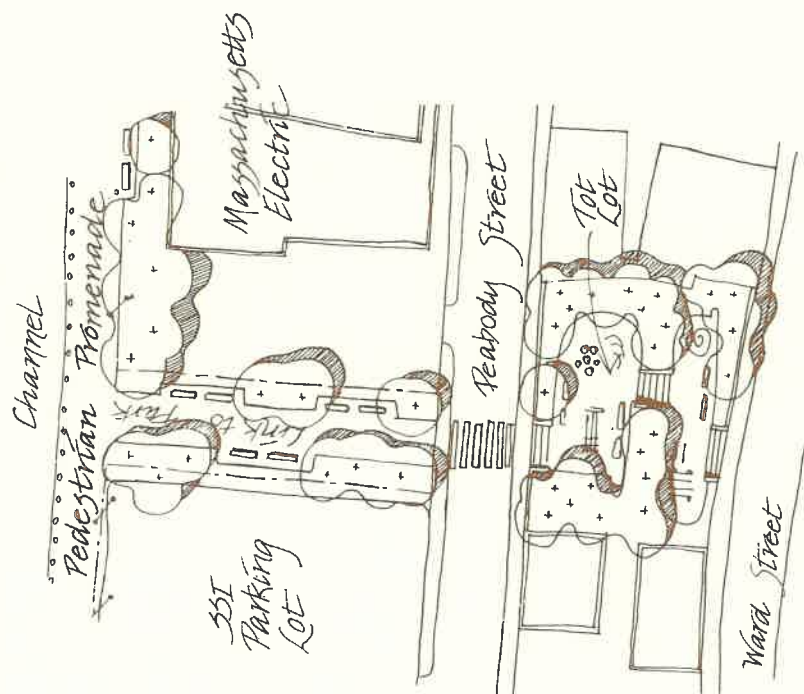
FIGURE 25

Element G

Alternative 2

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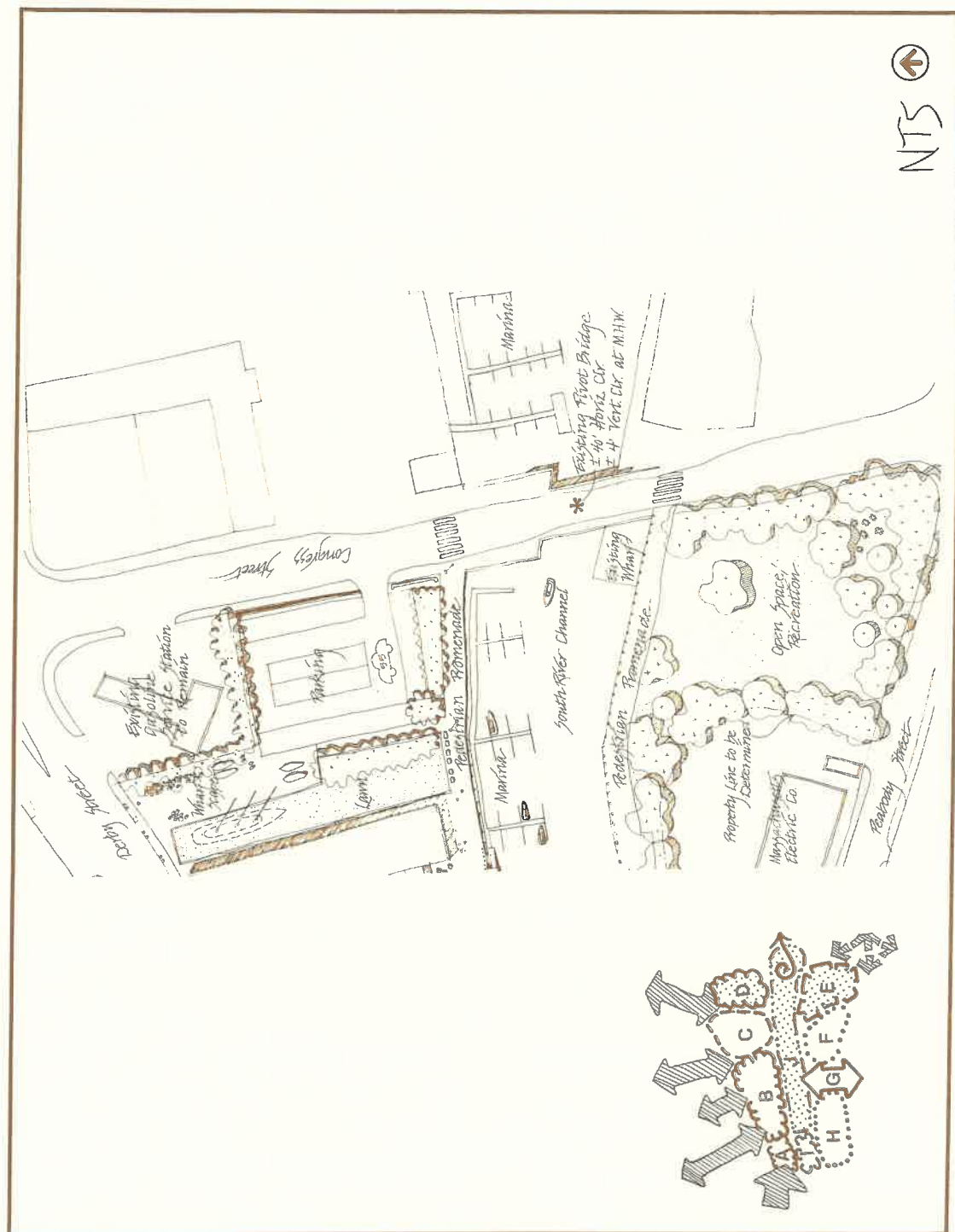


Point Neighborhood



Element	DJE
Alternative 1	

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2. Relocating the bridge and its approaches allows the vertical clearance to be increased, permitting larger vessels easy access to and from the channel basin (Figure 27). This allows for a more ambitious boating program to be pursued. The traffic problem created with frequent openings and closings would be eliminated and the basin could be enlarged east of the new bridge by altering the existing bulkhead. For the pedestrian, a new bridge would allow the sea walk to continue uninterrupted, passing below the bridge rather than at grade, thus avoiding the traffic hazards inherent in crossing busy Congress Street.

The implications for Elements C, D, and E are as follows:
Elements C & D - with the bridge relocated, Gibbs Gas Station, located at the Derby/Congress Street intersection, could be acquired through eminent domain and removed; parking at the Pickering Wharf development could be increased; Element E - the recreation area would be bisected, decreasing the open space available for activities such as softball or touch football. This alternative is both expensive and time consuming to implement.

3. Removing the bridge and its approaches entirely (Fig. 28) allows for a maximized boating facility in the South River. The Channel can be expanded and the problem of vessel clearances eliminated. Furthermore, parking at Pickering Wharf can be greatly expanded and the park would be directly connected to Pickering Wharf. The sea walk could be a continuous experience from the Maritime National Park to Nathaniel Bowditch Park. The recreation space adjacent to Massachusetts Electric Company would be significantly enlarged, opening up more land to fulfill community recreational needs. However, the traffic impact on the Point Neighborhood would be detrimental to the community. Also, there is question as to the maintenance of public safety in the neighborhood as fire apparatus would have to negotiate narrow streets with randomly parked vehicles to get directly to the Stetland Industries Complex.

Parking

With parking spaces at a premium in the immediate vicinity of the park, a minimum parking allotment of 125 cars was included in the park program. These spaces were then allocated to various sites within the park according to adjacent land uses and park activities.

Parking was provided adjacent to the Gateway to provide spaces for visitors to the park. This area can accommodate only 27 cars. In reviewing possible locations for the additional parking needs, two solutions appear reasonable: The off-site vacant lot across from the Peabody Street entrance to the park (Element G) and the building site across from the Liberty Place pedestrian link and view corridor (Figure 3).

1. By locating spaces within the center of the park as is shown in Figure 3, they may be used by either park visitors, boat owners, or shoppers. Providing space adjacent to the retail activity

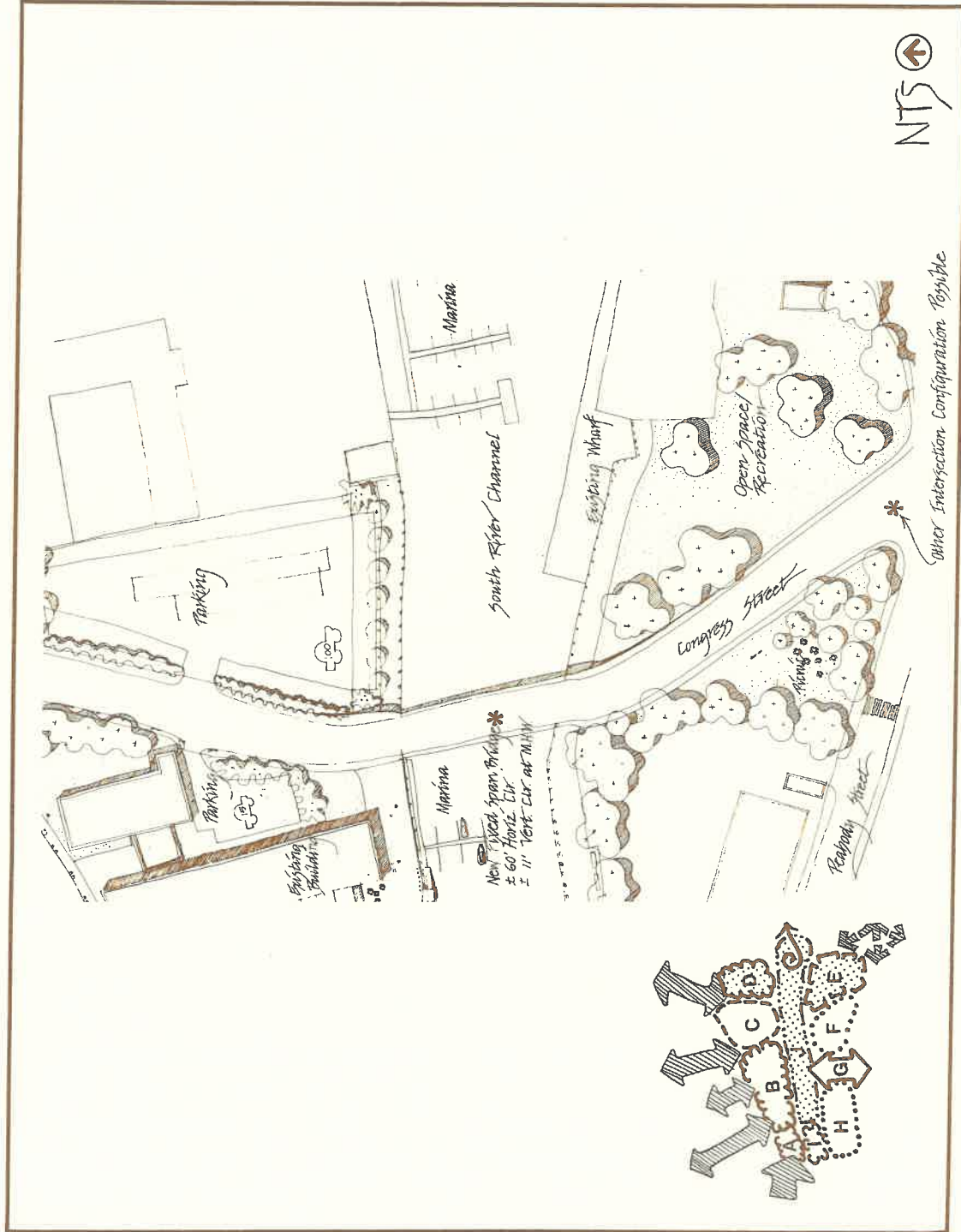
FIGURE 27

Element DJE

Alternative 2

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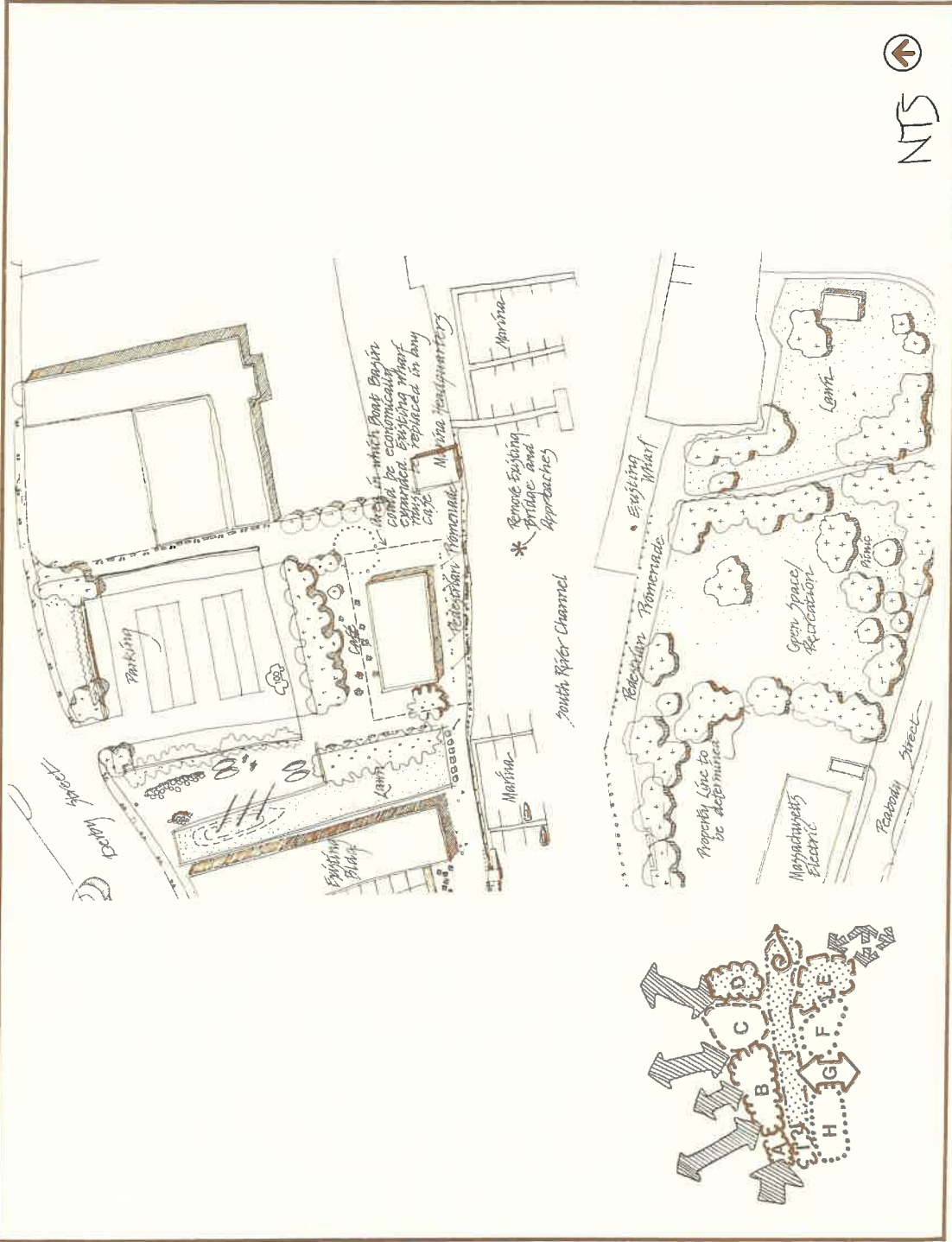
NTS

FIGURE 28

Element DJE
Alternative 3

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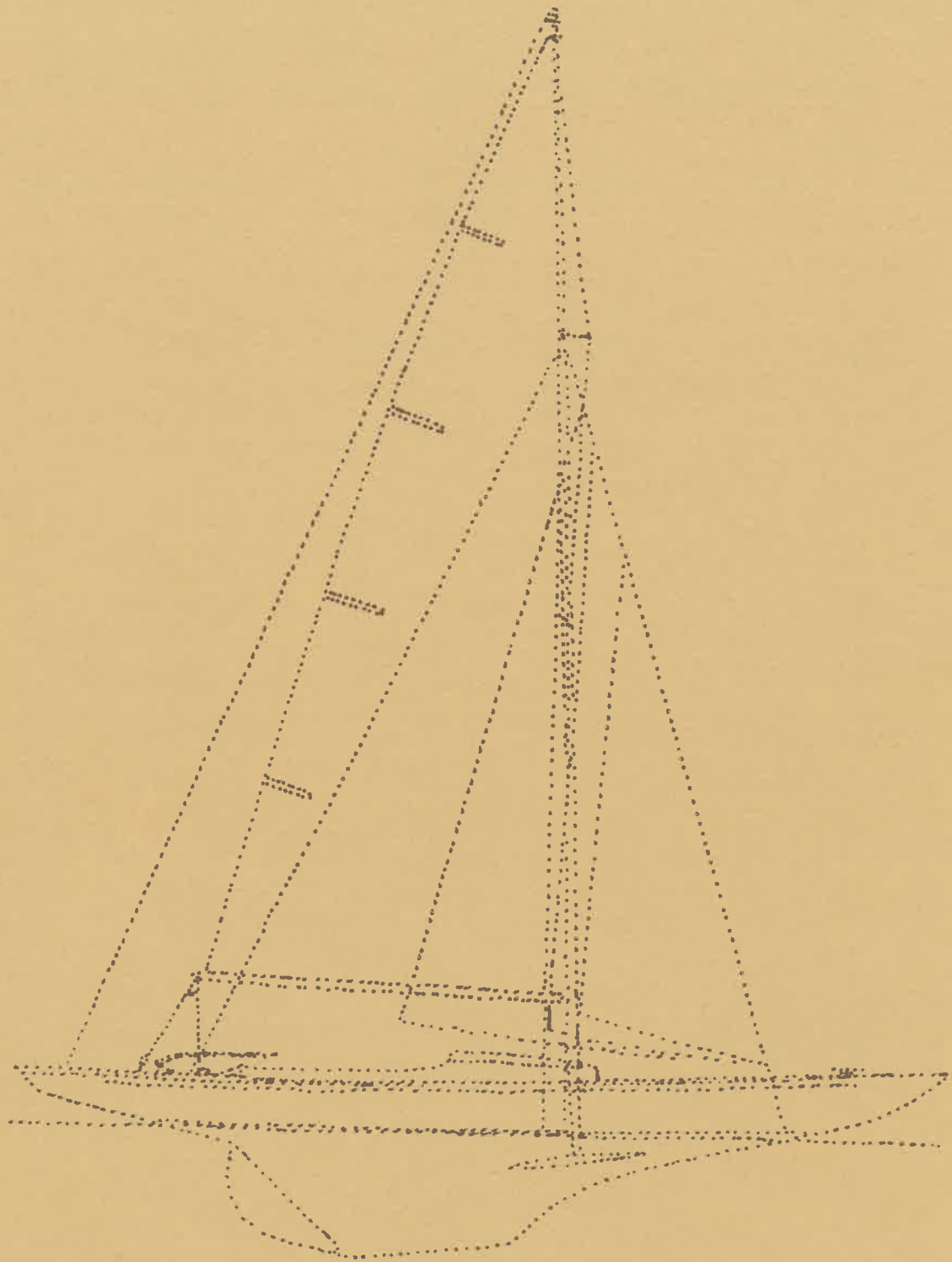
SALEM SOUTH RIVER CHANNEL



node within the park further enhances the viability of that retail core.

2. Providing a parking facility in the Point Neighborhood (Figure 3), serves the needs of the community and allows cars to be removed from Peabody Street, thus opening up that street to pedestrian improvements.

Appendix



SALEM - CHRONOLOGY

- 19 Jan. 1979 - Field Investigations
 - . Land Use
 - . Preliminary Bulkhead Inspection
- 9 Feb. 1979 - Field Investigations
 - . Bulkhead Profile
 - . Utilities
 - . Channel Soundings
- 15 Feb. 1979 - Public Meeting - St. Joseph's Church
- 23 Feb. 1979 - Work Session at SA
 - . Planning Department
 - . William A. Baker
- 2 Mar. 1979 - Meeting at One Salem Green
 - . Historic Salem, Inc.
 - . Salem Marine Society
- 8 Mar. 1979 - Meeting
 - . Salem Recreation Department
- 14 Mar. 1979 - Meeting at One Salem Green
 - . Design Review Board
 - . Salem Park Commission
 - . Waterways Advisory Board
 - . Property Owners: 281 and 283 Derby Street
 - . Massachusetts Electric Company

- 20 Mar. 1979 - Meeting at One Salem Green
 . Salem Planning Department
 . National Park Service
 . Pickering Wharf
 .
- 27 Mar. 1979 - Meeting
 . Waterways Advisory Board - Central Fire Station
 . Public Meeting - One Salem Green
- 3 Apr. 1979 - Meeting at One Salem Green
 . Planning Department
- 9 Apr. 1979 - Meeting at One Salem Green
 . Planning Department
- 17 Apr. 1979 - Meeting at SA
 . Planning Department
- 24 Apr. 1979 - Meeting at SA
 . Planning Department
- 22 Apr. 1979 - Meeting at SA
 . Planning Department

BULKHEAD
STABILITY
CALCULATIONS

Calculations were performed on two prototypical wall sections in order to confirm the safe stability of the bulkhead walls in the South River Channel.

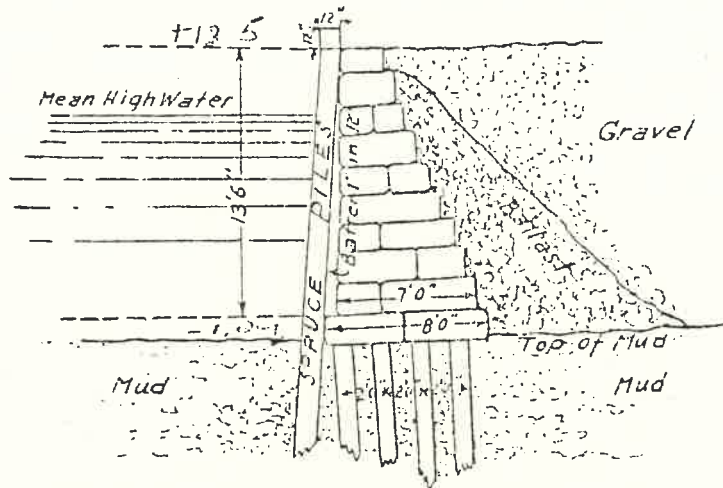
While the calculations show factors of safety varying from 1.22 to 3.06, it should be understood that these walls have been standing for nearly a century and have withstood the test of time.

The two prototypical sections used for the analysis are probably as critical as any that are available in the existing sketches and details. While one loading condition shows a factor of safety below the acceptable factor of 1.5, any further investigation or extensive study is not warranted. These walls were built in an empirical manner; if they failed during construction, they were immediately rebuilt wider and stronger. This inconsistent method of construction precludes any exact knowledge of size and shape at any specific point, the type of construction used on one section would not necessarily be the same a few feet away. Since there are no signs of distress along most of the wall, it reasonable to assume that the calculations verify safe stable conditions (see appendix).

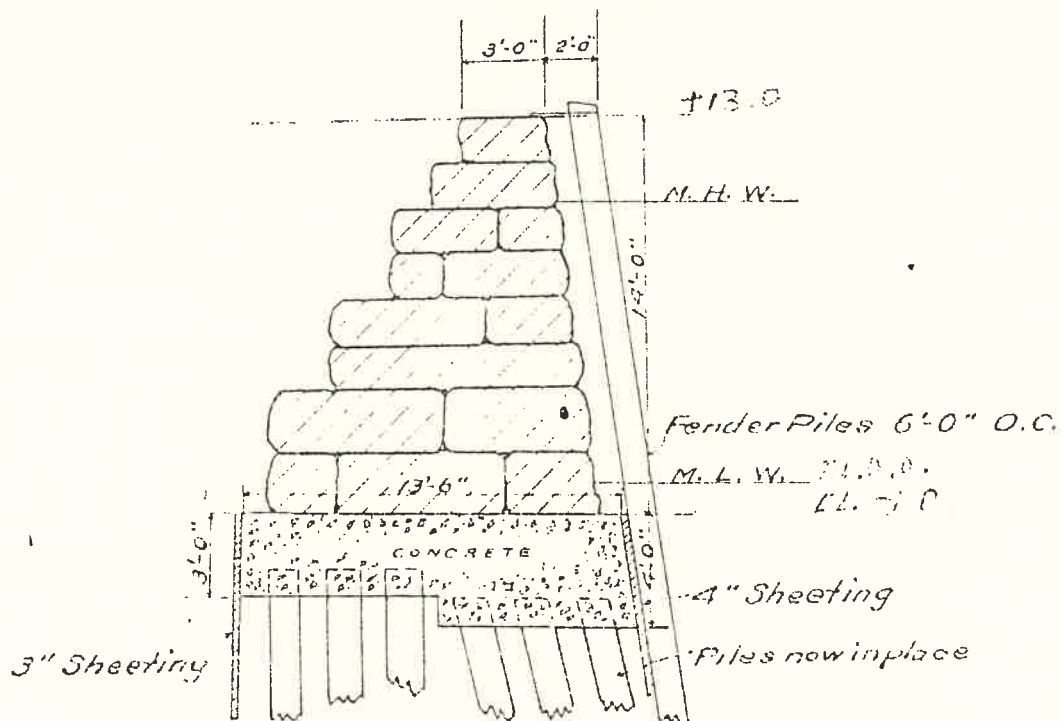
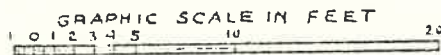
Figure 12 shows a cross-section of a typical "gravity" bulkhead and how these old walls may be readily and safely integrated into a modernized waterfront. The photograph below is of a painting which depicts the installation of stone-filled timber cribs in pier construction. These same cribs were used as the foundation for granite block bulkheads.



Pier is built as wooden cribs are floated into place between piles and filled with stone brought in wagons.

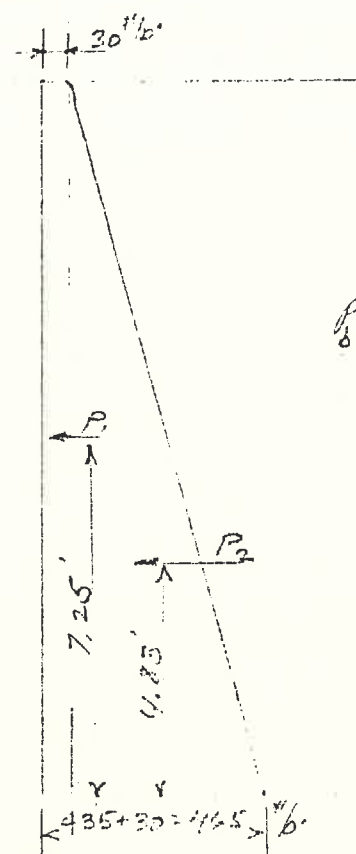
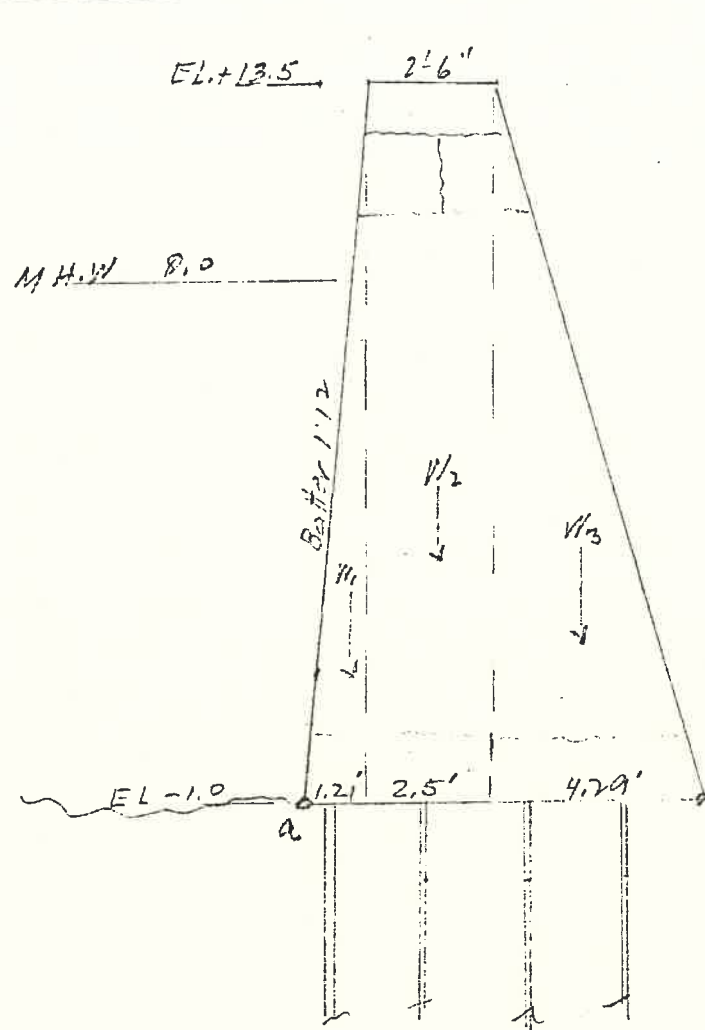


SECTION OF PROPOSED WALL "A-B"
Scale 4 ft. to an inch



CROSS SECTION OF SEA WALL
Scale $\frac{1}{4}'' = 1'$

SECTION A-B



$$P_1 = 30 \times 14.5 = 435$$

$$\left. \begin{aligned} P_1 &= 30 \times 14.5 = 435 \\ P_2 &= 435 \times \frac{14.5}{2} = 3154 \end{aligned} \right\} \Sigma = 3589$$

$$\Sigma W = \frac{2.5 + 8.0}{2} \times 14.5 (150 - 62.5) = 6661 \text{ (Buoyant wt.)}$$

	Buoyant	Dry	
$W_1 = 1.21 \times 14.5 / 2 \times 87.5$	768	1317	} 11,419
$W_2 = 2.5 \times 14.5 \times 82.5$	3172	5438	
$W_3 = 4.29 \times 14.5 / 2 \times 82.5$	2721	4664	

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By

Overturning Effect. (With Surcharge & Buoyancy)

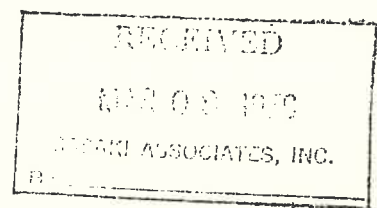
$$\begin{aligned}
 O.M. &= 435 \times 7.25 = 3154' \\
 3154 \times 4.83 &= 15,234 \\
 &= 18,388'
 \end{aligned}$$

$$\begin{aligned}
 R.M. &= 768 \times 0.81 = 622' \\
 3172 \times 2.46 &= 7803 \\
 2721 \times 5.14 &= 13,986 \\
 &= 22,411'
 \end{aligned}$$

$$F.S. = \frac{22,411}{18,388} = 1.22$$

Overturning Effect (No Surcharge & Buoyancy)

$$F.S. = \frac{22,411}{15,234} = 1.47$$

Overturning Effect (With Surcharge & No Buoyancy - H.L.W @ 0.0)

$$\begin{aligned}
 R.M. &= 1317 \times 0.81 = 1067' \\
 5438 \times 2.46 &= 13,377' \\
 4664 \times 5.14 &= 23,973' \\
 &= 38,417'
 \end{aligned}$$

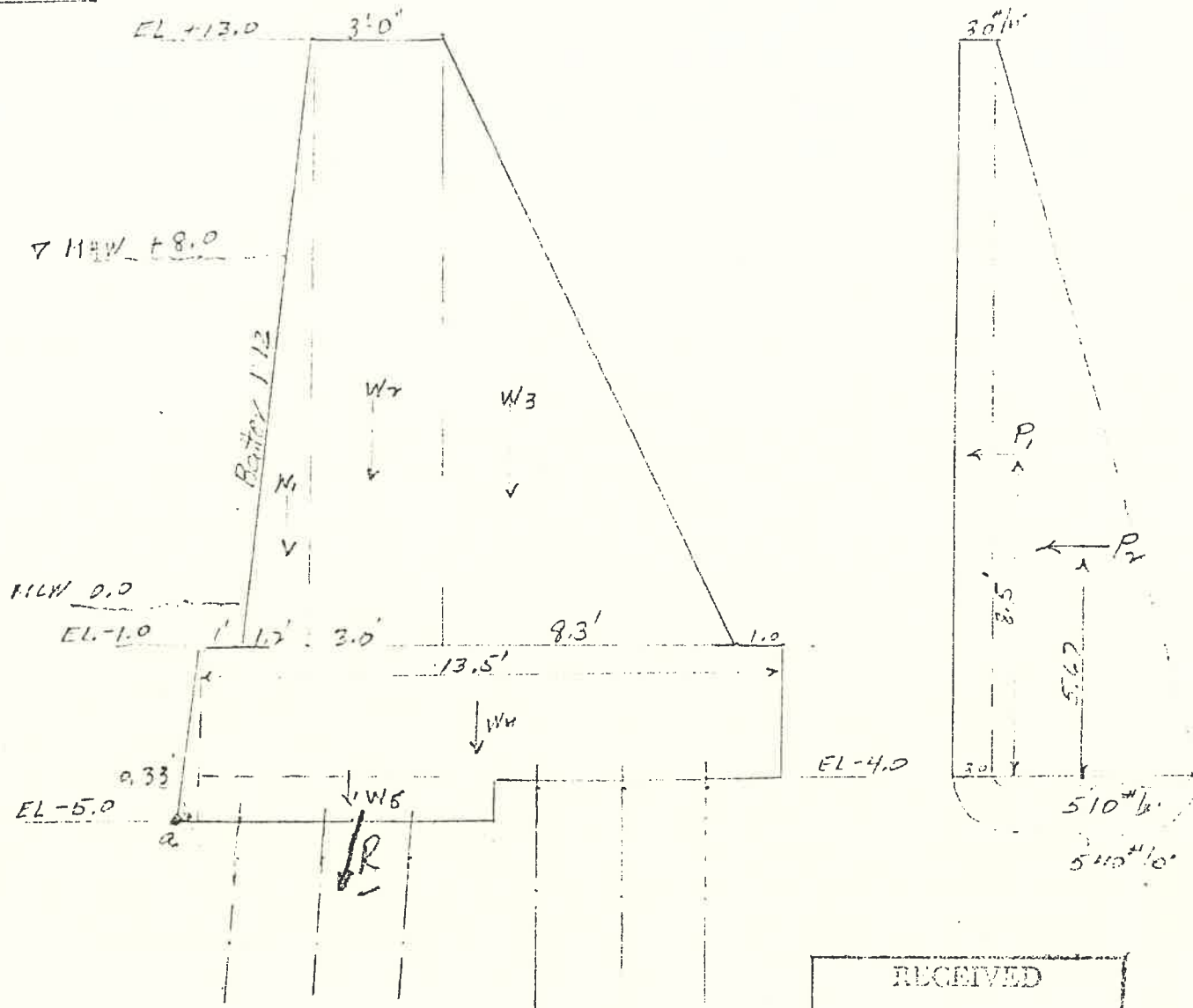
$$F.S. = \frac{38,417}{18,388} = 2.09$$

Sliding Effect

$$H = 3154 \div 4 \text{ piles} \times 2.0 \text{ Spa.} = 1577' / \text{pile}$$

Note: Since soil under wall and fill behind wall are fully consolidated, the above safety factors are within range of safety. See attached memorandum.

Sea Wall



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$$P_1 = 30 \times 17.0 = 510 \text{ #}$$

$$P_2 = 510 \times \frac{17.0}{2} = 4335 \text{ #}$$

	Buoyant		Dry
$W_1 = 14 \times \frac{1.2}{2} \times 87.5$	$= 735$	$\times \frac{150}{87.5}$	$= 1260$
$W_2 = 3.0 \times 14 \times 87.5$	$= 3675$	"	$= 6299$
$W_3 = 8.3 \times 14 \times 87.5$	$= 5084$	"	$= 8714$
$W_4 = 13.5 \times 3.0 \times 87.5$	$= 3544$	"	$= 6074$
$W_5 = 7.0 \times 1 \times 87.5$	$= 613$	"	$= 1051$
$\Sigma W = 13651 \text{ #}$			23398 #

PROJECT NO. SA 2266SASAKI ASSOCIATES
64 PLEASANT STREET
WATERTOWN, MA 02172SHEET NO. 4 OF 5TITLE Salmon Brook River ChannelDATE 5/15/79
BY D. CarverOverturning effect with barge loads & buoyancy.

$$O.M. = 510 \times 8.5 = 4335$$

$$4335 \times 5.67 = \frac{24,579}{28.91 + 1''}$$

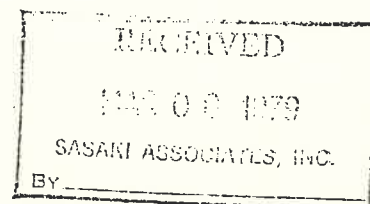
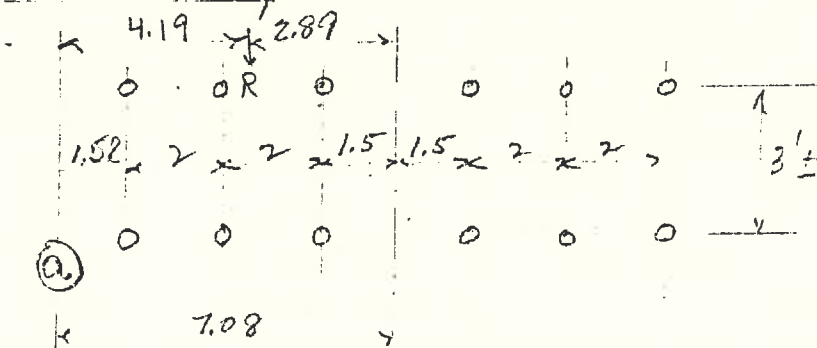
$$R.M. = \begin{array}{rcl} 735 \times 2.13 & = & 1566 \\ 3675 \times 4.03 & = & 14810 \\ 5284 \times 8.33 & = & 42350 \\ 3544 \times 7.08 & = & 25092 \\ 613 \times 3.71 & = & 2274 \end{array}$$

$$\underline{86092''}$$

$$F.S. = \frac{86,092}{28,914} = 3.06$$

Center of Gravity

$$\bar{X} = \frac{\Sigma M}{\Sigma W} = \frac{86,092 - 28,914}{13,651} = 4.19'$$

Pile Loading

$$I_{cg} = 2[1.5^2 + 3.5^2 + 5.5^2] = 89.54''$$

At 3' Spacing

$$Pile Load = \frac{(13,651 \times 2.89) 5.5 \times 3}{89.5} + \frac{13,651 \times 3}{6}$$

$$= 7273'' + 6826 = 14,100''/pile$$

= 7^T loading o.k.

Horizontal Shear

$$H = 4845 \times 3 = 14,535^{\#}$$

$$H_{\text{per pile}} = \frac{14,535}{6} = 2,422^{\text{K}}/\text{pile} \text{ (Neglecting Batter)}$$

Including Batter

$$h_{\text{pile}} = \frac{14,100}{12} = 1175^{\#} = 1175 \rightarrow (\text{outside row})$$

$$h_{\text{pile}} = 7273 \times \frac{3.5}{5.5} = 4628 + 6826$$

$$= \frac{11,454}{12} = 954 \rightarrow$$

$$h_{\text{pile}} = 7273 \times \frac{1.5}{5.5} = 1984 + 6826$$

$$= \frac{8809}{12} = 734 \rightarrow$$

$$\text{Total hor. reaction} = 2863$$

$$\text{Net Hor. rel.} = \frac{14,535 - 2863}{6} = \frac{11,672}{6} = 1945^{\#}/\text{pile}$$

O.K. for consolidated subsurface.

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BY

BIOGRAPHY
OF
NATHANIEL
BOWDITCH

Nathaniel Bowditch

BY HAROLD BOWDITCH

TO astronomers and mathematicians Nathaniel Bowditch is known as the translator and annotator of LaPlace's *Mécanique Céleste* and the writer of many papers which appeared in the *Memoirs* of the American Academy of Arts and Sciences and elsewhere. To those who follow the sea his name is known as the author of the *New American Practical Navigator* (1802) which revolutionized the art of navigation. To the rest of mankind his name is scarcely known at all; yet he was a practical surveyor and cartographer, an expert on insurance, one of the first of the professional trustees, and the leader of a small group of men who saved Harvard College from financial disaster.

Born in Salem in 1773 of very poor parents, his formal education was limited to about five years. His father, Habakkuk Bowditch, was by trade a cooper, and then became a coastwise trader, sailing between Salem and the West Indies. He did not own a house in Salem, but at the time that Nathaniel, his fourth child, was born, he was living in a house which stood on the road which was later named Brown Street. At a later date the house was moved to the back of the lot and turned round, and at one time it was pretty thoroughly built over; it stands today, at No. 2 Kimball Court, as the birthplace of Nathaniel Bowditch. I was once assured by a man who saw me photographing the house that 'Nathaniel Bowditch built that house and was born in it'—surely a unique distinction.

On the nineteenth of April in 1775, when Nathaniel was two years old, Habakkuk Bowditch lost his sloop *Polly* on Anguilla Reef in the Lesser Antilles; this misfortune, other losses caused by the Revolution, and his failure to collect debts owing to him, ruined Habakkuk, and at about this time he moved his family to a tiny cottage in 'Salem Village' or Danvers, still standing, though considerably altered, on what is now Wilson Square, Peabody. Across the road from this cottage stood an old dame-school where Nathaniel received his first instruction, probably not going far beyond reading and writing, with perhaps elementary arithmetic.

When Nathaniel was about six years old, and one of six children, the family moved back into Salem, and the next year (1780) he was entered at Master Watson's school on Union Street. The story is told of his wanting to study mathematics and being told by Master Watson that he was too young; when he persisted, the master put him a problem which he felt sure was beyond his powers. The boy solved it, and the master accused him of having been helped by an older boy; when he denied this, and stuck to his denial, the master was about to whip him for lying when an elder brother saved his skin by testifying that Nathaniel was already good at mathematics and had studied at home. This injustice rankled for many years, and Nathaniel longed for some chance to get even with Master Watson, which shows at least that he put a high value on his personal integrity, though perhaps less on Christian charity—for the teacher's reaction to the statements of an unknown little boy from Danvers was no doubt based on experience with other small boys.

Habakkuk's fortunes had fallen to so low an ebb by about 1783 that Nathaniel was withdrawn from school, after only three years or so, to help his father in the cooper's shop. At some time in his career Habakkuk Bowditch became intemperate; one may surmise that it was during his misfortunes at the period of the Revolution, and this fact of course made a bad matter worse. After about two years helping his father in the shop Nathaniel was given a few months of instruction in book-keeping by Michael Walsh, and this ended his formal schooling: the dame-school until he was six, three years with John Watson, and a few months with Michael Walsh.

In or about 1785, when he was about twelve years old, Nathaniel was apprenticed to Ropes & Hodges, ship-chandlers, and when they went out of business about five years later, he continued his apprenticeship with Samuel Curwen Ward, ship-chandler and grocer. It was probably when he reached his majority, which would be March 1794, that his apprenticeship terminated.

During this term he attracted the attention of the Reverend William Bentley and the Reverend John Prince, both of whom did him many deeds of kindness and helped him on his scientific path. This was the great period of his informal, or self-education. He was given access to the Philosophical Library until he was old enough to become a member, for the books were kept in the Reverend Doctor Prince's house. They formed a notable collection, said to be the finest scientific library north of Philadelphia, a reputation largely founded on the fortunate circumstance that the library of Richard Kirwan, an Irish man of science, had been captured during the

Revolution by a Beverly privateer and added to the Philosophical Library. Through the kindness of one of his employers, John Ropes, young Bowditch was given the run of the library of his father, the late Judge Nathaniel Ropes. From all of the books Bowditch, unable to buy books for himself, made long manuscript extracts in 'commonplace books' which formed the nucleus of his own mathematical library. The Reverend Doctor Bentley secured for him, on permanent loan, a copy of Newton's *Principia*, and encouraged him to teach himself enough Latin to read the book. This he did, beginning the study of Latin on the fourth of January 1790, when he was not quite seventeen; by 1793 he had read the book, found an error in it, and had had his ears slapped down by Professor Webber of Harvard for his presumption. It was a number of years before he summoned resolution to publish the error. During his term of apprenticeship he learned to read French with a certain Francis Jordy, a German who came to Salem in April 1792. Later in his life he picked up some knowledge of Spanish and German. His method was to read the Bible in the foreign tongue, and the English Bible took the place of dictionary. His familiarity with foreign tongues, in reading rather than in speaking, opened the scientific literature of the continent to him, and proved a great advantage; for the mathematicians of England knew little and cared less about the work of the mathematicians of the continent, and the reverse was also true; but Bowditch, reading both, attained an advantageous position of general mathematical knowledge.

While still an apprentice Bowditch had picked up some knowledge of surveying. It happened that one of his employers and another man owned in common an irregular piece of land which they wished to divide, and Bowditch made the survey. The other owner was not satisfied, thinking that the young surveyor must have favored his employer, and called in a professional surveyor. Great was the joy of the young amateur when the professional man accorded to his employer more and to the other owner less than the shares which he had calculated.

The government had ordered surveys of all the towns, and Captain John Gibaut undertook the work for Salem. The Reverend Doctor Bentley interested himself in young Bowditch's behalf and got for him the post of assistant. The work began in the late summer of 1794, which must have been after the termination of Bowditch's apprenticeship, and Doctor Bentley went on a number of the trips. Captain Gibaut's health was not good and he eventually went to Gloucester, so that his survey remained incomplete. In February 1795 Doctor Bentley says in his diary 'Employed myself in providing the Plan of the Town, which has been miserably left

by the young men employed upon it,' and in August 1797, 'Mr. Gibaut & Bowditch have engaged to perfect upon a small scale the whole map of the town, & are now employed upon the business.' His interest continued, and in March 1800 he writes: 'Prepared the Topography of Salem & sent it on to Eliot of Boston in 5 sheets. It is quite in an unprepared Stage & entirely detached from the History'—a history which never appeared in print. Captain Gibaut died in Gloucester in August 1805.

In January 1795 Bowditch began the first of his five voyages. Since there has been a thoroughly confused and erroneous account published in the *Essex Institute Historical Collections*, LXX (1934), in which the writer misquotes the *Memoir* written by Bowditch's eldest son Nathaniel Ingersoll Bowditch and attributes to him the confusion which was in his own mind, it may be of interest to summarize them here.

I	Ship	Captain	Salem	11 Jan. 1795	Ile de Bourbon	Captain's clerk
	<i>Henry</i> .	Prince.	Salem	11 Jan. 1796	& Ile de France	& nominal 2d mate.
II	Ship	Captain	Salem.	15 Mar. 1796	Lisbon, Madeira,	Supercargo.
	<i>Astrea</i> .	Prince	Salem.	22 May 1797	Anjer, Manila.	
III	Ship	Captain	Salem	21 Aug. 1798	Cadiz, Alicante.	Supercargo.
	<i>Astrea</i>	Prince	Salem	6 Apr. 1799		
IV	Ship	Captain	Boston	23 Jul. 1799	Batavia, Manila.	Supercargo.
	<i>Astrea</i>	Prince	Salem	15 Sep. 1800		
V	Ship	Captain	Beverly	21 Nov. 1802	Sumatra, Ile	Master and
	<i>Putnam</i>	Bowditch	Salem	25 Dec. 1803	de France.	Supercargo.

There is no evidence that Bowditch was drawn to the sea by the yearning which influences most boys in seaport towns; rather, the life at sea gave him the opportunity to work on his mathematics and to put his deductions to a practical test. In fact, when he became master himself he left the navigation to his mate unless the situation called for the presence of the captain on the deck.

Edmund M. Blunt of Newburyport was a publisher of nautical books, and apparently Bowditch's reputation as a mathematician had reached him, for in 1799 he published the first American edition of John Hamilton Moore's *New Practical Navigator*, 'corrected by A Skillful Mathematician and Navigator' whose name does not appear on the title-page; in the second edition (1800—and perhaps also in the first) Nathaniel Bowditch is named in the preface as having done the work. The number of errors which Bowditch found was over eight thousand, the most serious being an error of 23' in the declination because Moore made the mistake of reckoning the year 1800 as a leap year.

Bowditch's ability was promptly recognized by his being elected a fellow of the American Academy of Arts and Sciences in 1799, at the early age of twenty-six. In his work Nathaniel Bowditch was helped by his next-younger brother William. He was reckoned quite as able a mathematician as Nathaniel, but is unknown except through Nathaniel's acknowledgment of his aid, for he died at twenty-three, in 1799. There was also a third brother, Samuel, who exhibited unusual mathematical ability, but he also died young, aged sixteen, in 1794. Had they lived these three would have formed a striking galaxy of mathematical talent. Where this talent came from it is impossible to say, for it is shown in none of the ancestors of this group of brothers.

Two editions of Moore's book, corrected by Bowditch, having appeared, and so much new material having been added, it seemed right to bring out the next under Bowditch's name, and in 1802 appeared the first edition of the *New American Practical Navigator* by Nathaniel Bowditch. Before publication it was submitted to the East India Marine Society of Salem, and their commendatory report is printed following the title-page. The publisher says 'that he was preparing to bring out a third edition of Moore's work, but that he was induced to relinquish Moore's treatise for the present more correct and perfect work, furnished by Mr. Bowditch.' The book had instant recognition, and Harvard College bestowed on the young author the honorary degree of Master of Arts on the next Commencement Day, 25 August 1802. An interesting story is told in connection with this event. It appears that Bowditch was on shipboard in Boston on that day, and windbound. For what purpose is not known; he had returned from his fourth voyage in September 1800, and did not start on his fifth until November 1802; possibly he was taking a coastwise trip in order to try out his new book under actual sailing conditions. Being windbound, and knowing nobody in Boston, it occurred to him to go to Cambridge to see the commencement exercises. He had had no notification that he was to receive a degree, and as the exercises were conducted in Latin he thought that he might have been mistaken until someone congratulated him on his new honor. It gave him deep gratification and probably went far toward interesting him in the welfare of the college in later days.

The Marquis de LaPlace's *Mécanique Céleste* was now the latest work on astronomy; the first volume appeared in 1800, and Bowditch got a copy of it from France soon after his return from his fourth voyage, in September 1800. It occurred to Bowditch to translate it for the benefit of English-speaking astronomers; as there were very few who could read and under-

stand it, this would be purely a labor of love. He took the book with him on his fifth voyage, and on the first of November 1803, while still at sea, he wrote his first note on it. In addition to making a translation he added copious notes, so that in the end his work was double the size of the original. This undertaking must have become almost an obsession with him; he declined pecuniary help because he did not wish to have anyone say that he had been responsible for making publication possible; he even declined the offer of the American Academy to bring it out, and yet he was not in a position to do so himself. It was not until 1814 that Bowditch began the translation; but it was not until a number of years later, when he had a better salary, that he could afford to publish his translation, and from then on it went on steadily until by the time of his death in 1838 he had translated the four volumes of the great work. The fifth volume, which came out a number of years after the fourth, has not been translated.

Bowditch's return from his fifth and last voyage, on Christmas Day 1803, has been considerably dramatized. Nathaniel I. Bowditch, in the *Memoir* of his father (1839) says:

In his last voyage, Dr. Bowditch arrived off the coast in mid-winter, and in the height of a violent north-east snow-storm. He had been unable to get an observation for a day or two, and felt very anxious and uneasy at the dangerous situation of the vessel. At the close of the afternoon of December 25, he came on deck, and took the whole management of the ship into his own hands. Feeling very confident where the vessel was, he kept his eyes directed towards the light on Baker's Island, at the entrance of Salem harbor. Fortunately, in the interval between two gusts of wind, the fall of snow became less dense than before, and he thus obtained a glimpse of the light of which he was in search. It was seen by but one other person, and in the next instant all was again impenetrable darkness. Confirmed, however, in his previous convictions, he now kept on the same course, entered the harbor, and finally anchored in safety. He immediately went on shore, and the owners were very much alarmed at his sudden appearance, on such a tempestuous night, and at first could hardly be persuaded that he had not been wrecked.

In a footnote he adds:

Upon this occasion, he had given his orders with the same decision and preciseness as if he saw all the objects around, and thus inspired the sailors with the confidence which he felt himself. One of them, who was twenty years older than his captain, exclaimed, 'Our old man goes ahead as if it was noon-day.'

A good deal has been made of this dramatic episode by various writers (including myself). Let us examine Bowditch's own journal of this voyage, preserved at the Peabody Museum in Salem. The journal is as usual

written across both pages of the book; here I shall copy what is written about the last five days in two columns, one following the other.

1803 Dec.	Courses	Dist.	Latitude		Longitude		Winds
			Acc.	Obs.	Acc.	Obs.	
			North	North	West	West	
20	S b E	16	42.29	42.20	65.31		NW b W
21	SW	22	42.8	41.25	65.51		NW light & variable
22	N81W	27	41.49	41.52	65.59		NE to NW
23	N38W	23	42.10	42.7*	65.58		NW to N. WSW. W b N.
24	W18N	89	42.38	42.35#	67.53		W. SE. ESE. W.
25							NE.

* single alt. of sun.
double alt.

- 20 Begin with brisk breeze; passing clouds. A 8 p. M. quite moderate. At mid-night hard gale sprung up from W. Heavy sea, snow, hail &c.
- 21 A 8 A. M saw a tide rip, sounded, had 20 fath. decreased from that to 15 & 10, wore ship. Found we had been drifted near the shoal of George's.
- 22 Weather and winds as on the two preced' days.
- 23 Sounding on George's 25 fath. sand. At the same time spoke the Brig Albion Packet John Dogget who told us Cape Ann was 80 leag. dis.
- 24 Begins gentle breeze & pleas. Middle brisk breeze, thick rainy weather. Latter part moderate to foggy.
- 25 All this day very foggy, at 4 p. M cleared up a little (running . . . in the Lat. of Baker's Island) Saw Eastern Point of Cape Ann: at 7 p. M. came to anchor in Salem.

The dotted line in the parenthesis represents a word illegible to me.

I am no sailor; but my interpretation is that on the twenty-third, with a westerly wind, he was off George's Shoal beating in and got his position by one observation and by speaking another vessel; on the twenty-fourth the wind was variable and light, and he got two observations; then the weather broke, with higher wind and rain, later becoming foggy. On the twenty-fifth the wind was northeast with continuing fog but no mention of snow, and Eastern Point was seen during the afternoon. Until 1831 there was no lighthouse on Eastern Point, but there was a beacon; presumably what is meant is such a beacon—a large ball erected on a mast—as was on Baker's Island from 1791 to 1798 when the light-house was built there. Having sighted Eastern Point he would know where to find Baker's Island and Salem harbor. To do this in a fog is no mean feat in itself, one may suppose; but how did it become so exaggerated in the account in the *Memoir*? The clue probably lies in the footnote; apparently Nathaniel I. Bowditch got the account from the sailor whose words are quoted; he remembered the snow-storm of the twentieth, and confused it, thirty-five

years later at the age of eighty-five, with the foggy night of the twenty-fifth. The incident¹ shows, at least, that Bowditch was himself a practical navigator under difficult conditions.

Shortly after the above return from Sumatra, Bowditch was elected president of the Essex Fire and Marine Insurance Company, a position which he held until his removal to Boston in 1829. During the War of 1812 he was responsible for the bulletins of marine news which were posted at the offices of the Insurance Company.

During the summer of 1804 Bowditch again turned his attention to surveying Salem harbor, and in this year he visited the White Mountains with a party which included the Reverend Manasseh Cutler and Professor W. D. Peck of Harvard, and computed the height of Mount Washington. Captain Gibaut had retired to Gloucester (where he died the next year) and Bowditch borrowed the papers from Doctor Bentley, and then made his own survey. He had given up the idea of a detailed plan of the town of Salem and confined his attention to the harbors of Salem, Marblehead, Beverly and Manchester. In the summer of 1805 it may be presumed that he continued the survey, as he did in the summer of 1806; his chart, copyrighted 27 June 1806, was published in September of that year. Doctor Bentley, in his diary, has a good deal to say about it, and does not hesitate to accuse Bowditch of plagiarizing Gibaut's work. In the booklet which accompanied the chart Bowditch gives full credit to Gibaut, and explains that his survey was independent and made with superior instruments and under more favorable conditions. Bentley's attitude towards his erstwhile pupil was founded on a number of factors. In the first place, Bowditch was a Federalist and Bentley a Republican, and in those days politics ran high. In the second, Bowditch moved to another part of the town at just that time, left Bentley's church, and joined the First Church under Doctor Prince, who had been, along with Bentley, his early benefactor. This change Bentley chose to attribute to politics; perhaps it was, in part, for Bentley's sermons may well have had a political bias which was distasteful to Bowditch. Thirdly, and I think most important of all, was Bentley's neglect by Harvard College. His was an outstanding intellect; his knowledge of many subjects—science, literature, languages—was broad and deep; he was a Harvard graduate who had made a name for himself, and certainly he if anyone should have had an honorary degree from his alma mater. Harvard, however, was Federalist in politics; it was quick to recognize Bowditch's ability, but totally ignored Bentley who

¹ It is also possible that a destructive north-easter which visited Salem in October 1804 added to the confusion and the tale.

had at one time been Bowditch's teacher. Hence, no doubt, the slurs on Bowditch's ability and reputation which are to be found in the diary. A complete rupture between the two old friends existed for many years, but it was finally healed by Bowditch who took to Bentley's residence a man who wanted an introduction to him. By the irony of fate it fell to Bowditch to announce to Bentley that Harvard College had at last granted him an honorary degree in 1819. Bentley records that 'Dr. B. said, prepare to die, for Degrees are usually forerunners as they are given to the Aged when their course is finished. Alluding to the degrees given to persons advanced in life.' Doctor Bentley was then sixty years old, Bowditch forty-six. Four months later Doctor Bentley dropped dead, and Bowditch must have remembered his ill-timed pleasantry with some discomfort.

Apparently Bowditch's chart is as good today as it was one hundred and thirty years ago, for James Walter Goldthwait, professor of Geology at Dartmouth College, checked a number of Bowditch's figures in 1935 and found that they tallied exactly.

In 1806 Bowditch declined an appointment to a professorship at Harvard. His reasons may have been partly an unwillingness to leave Salem; but it is known that he was so diffident about speaking in public that he would not even give the toasts at a society meeting. Similiar offers from the University in Charlottesville (later the University of Virginia) in 1818 and from the Public Military School at West Point in 1820 were likewise declined. And yet he was a good teacher; he had the gift of simplification so that he could make an abstruse subject clear to those who were ignorant of it. This is shown by the fact that he taught navigation to so many sailors on his five voyages that it was said that the statement that 'I have sailed with Bowditch' would get a man an officer's berth. About to start on his fourth voyage he wrote to his future wife from Boston, 22 July 1799:

It was with the greatest difficulty we obtained our complement of men, & a curious set of them we have, on the list are Tinkers, Tailors, Barbers, Country schoolmasters, one old Greenwich Pensioner, a few negroes, mullatoes, Spaniards &c &c &c but they will do well enough when properly disciplined.

It is clear that the men who 'sailed with Bowditch' were not in the first instance picked crews.

Bowditch's connection with Harvard College began in 1810 when he was elected an Overseer; this office he resigned in 1826 when he was elected to the Corporation. In 1816 the college made him an honorary Doctor of Laws. His services to the college will be spoken of presently in their proper chronological order.

In 1817 Mrs. Eliza Wetmore (later Mrs. Daniel Appleton White) and her brothers Samuel and Joseph Orne established the Orne Fund in memory of their deceased brother Charles Henry Orne, for the support of the ministers of the First Church in Salem, and the following trustees were appointed: Jonathan Hodges, Nathaniel Bowditch and George Cleveland. This is said to mark the beginning of professional trusteeship. Before that time men who had money in trust merely added it to what they had from other sources, and if financial disaster overtook them the money in trust shared the common fate of their funds. Jonathan Hodges had been Bowditch's first employer; he was a merchant, and treasurer of the town of Salem. His niece was Nathaniel Bowditch's second wife, and she was a warm friend of Mrs. Wetmore who was 'Aunt Wetmore' to the Bowditch children. Nathaniel Bowditch was the president of the Essex Fire and Marine Insurance Company in Salem. George Cleveland was the president of the Salem Commercial Insurance Company and the son-in-law of Jonathan Hodges. It sounds like a close corporation with Hodges as the point of focus. Perhaps Bowditch's experience as supercargo gave rise to the idea that each trust should be kept rigidly independent of every other—a set of water-tight compartments as it were—so that a loss or a gain in one could not affect another. At all events, this must have been how supercargoes managed their finances, for on any voyage a considerable part of the cargo was made up of independent 'adventures' entrusted to the supercargo to dispose of at the best advantage. Bowditch's own first adventure was a box of shoes which he sold in Ile de France; a later one was compasses which found a ready market in Manila. In the hands of able and honest men of business a trust fund would prosper, and such has been the history of the Orne Fund.

As early as 1818 Bowditch was offered the presidency of an insurance company in Boston, but declined, on the ground of his unwillingness to leave the town of his birth. Later he was asked to become the actuary of the Massachusetts Hospital Life Insurance Company and the president of the Commercial Insurance Company (Fire and Marine), both in Boston, and for a long time declined again. The amount of his proposed salary was raised again and again, and finally he saw that his acceptance would mean that by careful management he would be in a position to publish the translation of the *Mécanique Céleste* on which he had been engaged since 1814. On 31 January 1823 he accepted both offices and prepared to move to Boston. In April he visited New York and Philadelphia, presumably to study the methods followed there; in July he sold his house in Salem; in August he resigned the presidency of the Essex Fire and Marine Insur-

ance Company, was tendered a complimentary dinner (he made the condition that he would not be called upon to speak), and shortly thereafter he moved his family to Boston. His management developed the small, new company into one of the largest in the country of its time.

In June 1826 Bowditch was elected to the Corporation of Harvard College and it was not long before he made his influence felt. The president of the college, John Thornton Kirkland, was a cultivated scholar, kindly, paternal, popular and beloved; but his business habits were so slack that the members of the Corporation found retrenchment imperatively necessary. When these were voted, President Kirkland agreed, and then blandly ignored them or engendered opposition from the faculty. It is clear that he and Bowditch had diametrically opposite natures, and after some blunt criticism on Bowditch's part the president suddenly and unexpectedly resigned. Bowditch himself has recorded that Mrs. Kirkland² was responsible for spreading the false report that Bowditch had publicly insulted the president at a meeting of the Corporation, and Cambridge and Boston seethed with indignation. The president resigned, with a grant from the college which paid his indebtedness but left him no pension (his wife was well off); the treasurer and steward resigned; Ebenezer Francis, an exceptionally able business man, was induced to take the treasurership for a limited time and made the sole condition that he should receive no salary. Teaching hours were lengthened; certain teachers were eliminated; salaries were reduced; scholarships were lessened; and term bills were collected when due. The whole financial structure was reorganized, and the college, which had been drifting on a lee shore, found itself in the hands of a practical navigator who knew how to handle the ropes—at the temporary cost of his popularity but the enduring gain of the community.

In person Bowditch was small and his health was always poor. As a child he suffered from malnutrition, and at the age of thirty-five he developed what was no doubt pulmonary tuberculosis. His cure was a buggy-ride which lasted all summer, circumnavigating the state of Massachusetts, with dips into Rhode Island, Connecticut, New York and New Hampshire to see interesting people. It proved effective. In middle life he fell unconscious and was carried home, and guarded himself from future attacks by regular exercise of the most methodical sort. Temperamentally

² Morison speaks of Mrs. Kirkland as a 'strong-minded Cabot' but she was more than that. Her parents were George Cabot and Elizabeth Higginson. George Cabot was the son of Joseph Cabot and Elizabeth Higginson; Mrs. George Cabot was the daughter of Hester Cabot and John Higginson. Joseph Cabot and Hester Cabot were brother and sister; John Higginson and Elizabeth Higginson the elder were also brother and sister. George Cabot and his wife were thus double first cousins and Mrs. Kirkland was their daughter. In equine circles it amounts just about to a double Hambletonian-Wilkes cross.

he was active and nervous, quick to reprove when he thought that there was need, equally quick to apologize if he found that he had been over-hasty; absolutely honest in thought and deed and expecting the same in others. Samuel Eliot Morison³ has described him as 'a self-made man, who had suffered privation in youth, deprived of a classical or a college education, but a keen scientist and acute business man, fearless, tactless, and inflexible.'

³ *Three Centuries of Harvard* (Cambridge: Harvard University Press, 1935), p. 220.

COST
ESTIMATE

Sasaki Associates, Inc., 64 Pleasant Street, Watertown, Massachusetts 02172 • (617) 926-3300 Telex 92-1471

JOB Salem - South River Channel
Element A COST ESTIMATE STATUS Preliminary DATE 4/26/79 BY CGS

[illegible]

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JOB ELEMENT B

COST ESTIMATE STATUS

Preliminary DATE 4/26/79 BY CGS

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Sasaki Associates, Inc., 64 Pleasant Street, Watertown, Massachusetts 02172 (617) 926-3300 Telex 92-2471
SAKH-SOUTH RIVER Channel
JOB ELEMENT D COST ESTIMATE STATUS Preliminary DATE 4/26/79 BY CGS

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- South River Channel

COST ESTIMATE STATUS Preliminary DATE 4/26/79 BY CGS

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Sasaki Associates, Inc., 64 Pleasant Street, Watertown, Massachusetts 02172 • (617) 926-3300 Telex 92-2471

Sasaki Associates, Inc., 64 Pleasant Street, Watertown, Massachusetts 02152 (617) 940-3300 ext. 412
 Salem-South River Channel
 JOB Element G COST ESTIMATE STATUS Preliminary DATE 4/26/79 BY CGS

[illegible]

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SALEM SOUTH
JOB ELEMENT I

COST ESTIMATE STATUS Preliminary DATE 4/26/17 BY LGJ

ITEM	QUANTITY	UNIT	UNIT COST	ITEM TOTAL	SUB TOTAL	REMARKS
						INCLUDES IRRIGATION & EARTHWORK
COBBLE LANE	5275	SF	10.	52,750		
ASPHALT PAVING	5574	SF	2.5	13,935		
BRICK WALKWAY	1080	SF	10	10,800		INCLUDES IRRIGATION & EARTHWORK
BRICK WALL	340	LF	70	23,800		
SHRUBS	65	LF	50	3250		
HISTORIC LIGHTS	2	EA	2500	5000		INSTALLED
BOLLARDS	8	EA	600	4800		GRANITE
					114,335	

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JOB ELEMENT IV

COST ESTIMATE STATUS Preliminary DATE 4/26/79 BY CGS

ITEM	QUANTITY	UNIT	UNIT COST	ITEM TOTAL	SUB TOTAL	REMARKS
Brick Walkway	35039	LF	#10	\$250,590		INCLUDES IRRIGATION & EARTHWORK
Benches	28	EA	#500	14,000		
Bollards w/Lights	39	EA	1000	39,000		GRANITE INSTALLED
BOLLARDS	42	EA	#600	25,200		GRANITE
CHAIN	1630	LF	50	\$81,500		
Deciduous Trees	10	EA	800	8,000		
Crows Nest Landing	2020	SF	#25	\$50,500		
Public Landing	1355	SF	#25	\$33,875		
Crows Nest	1	LS		\$8,000		
Channel/Dredge	19,304	CY	#8	\$154,432		
Rip Rap (Channel Sides)	1849	CY	#30	\$55,470		
Docks	10180	SF	#25	\$254,500		
Bulkhead Repairs	#150	LF	#1,500	\$225,000		
Timber Piles Misc. Structure Removal	—	—	—	100,000		
NAUTICAL Lights	11	EA	2000	22,000		INSTALLED
Shrubs	225	LF	50	11,250		
DOCK GATE & FENCE	1	LS	10,000	10,000		WROUGHT IRON.
					1,443,117	

