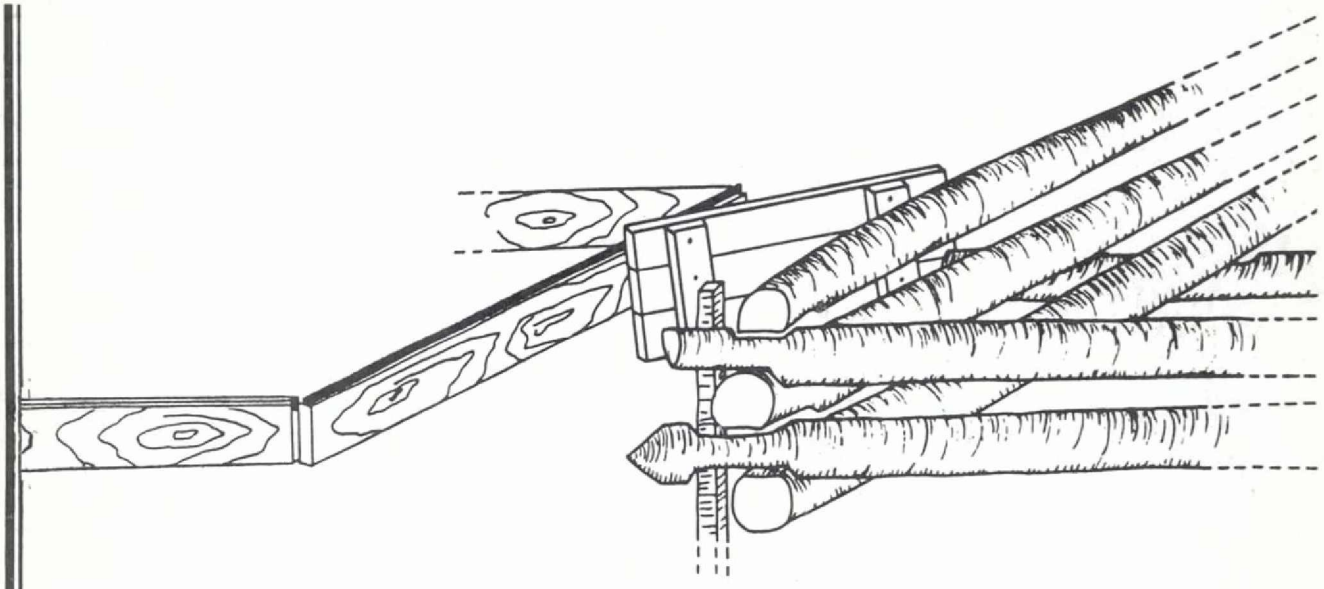
ARCHAEOLOGICAL MONITORING

THE SHEARSON LEHMAN/AMERICAN EXPRESS INFORMATION SERVICES CENTER

Washington Street Urban Renewal Area New York, New York



Prepared for:

The New York City Public Development Corporation

Prepared by:

The Cultural Resource Group
Louis Berger & Associates, Inc.

April 1985

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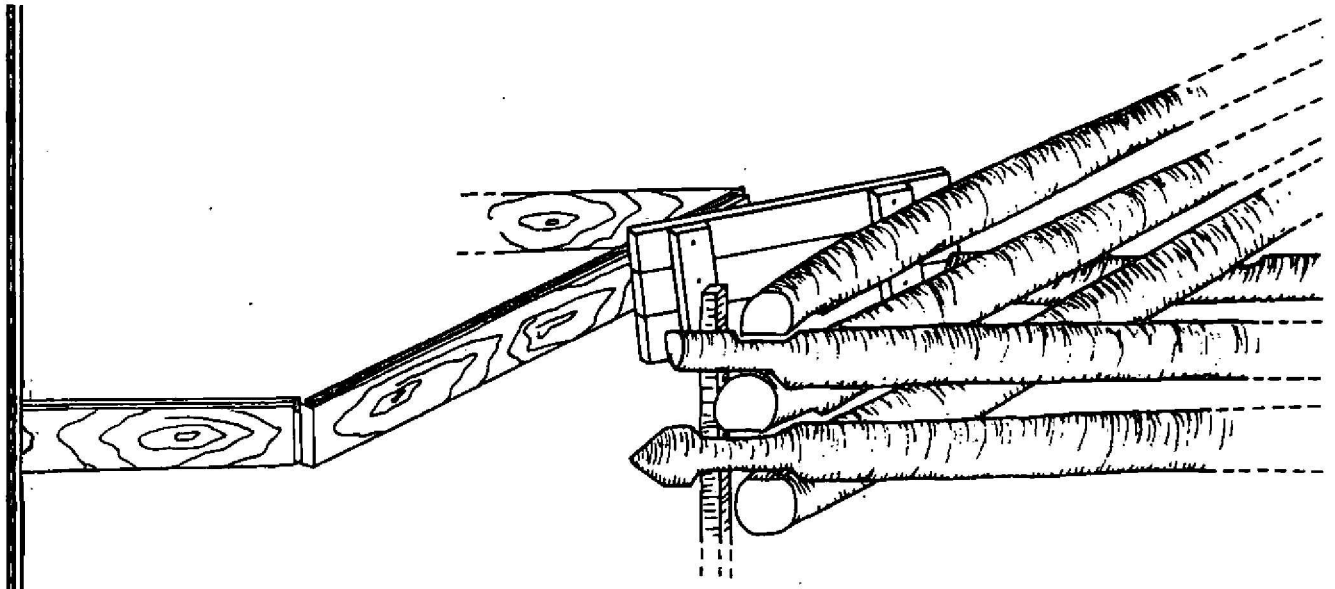

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WASHINGTON STREET
URBAN RENEWAL AREA
NEW YORK, NEW YORK

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APRIL 1985

F O R E W O R D

This report presents the results of archaeological monitoring conducted at the Shearson Lehman/American Express project site in New York City between November 1984 and February 1985. The monitoring was designed to supplement the results of a full-scale archaeological testing program previously conducted at the site.

Monitoring of the Shearson Lehman/American Express project provided important archaeological information that would have been prohibitively expensive to obtain by traditional archaeological testing techniques. By being able to observe the entire area as it was being excavated, relationships between features examined during testing could be determined. Specialized construction techniques for wharves and buildings were examined, and the original shoreline in the project area was reconstructed with confidence. This latter point is especially important because the error in shoreline location that first appears on eighteenth century maps has been perpetuated to the present.

Principal Investigator for the project was Dr. Joan Geismar. The field monitoring phase of this project was conducted by Leonid Shmookler, assisted by Edward Morin. Dr. Joan Geismar and Leonid Shmookler wrote the report on the monitoring. Bonnie Bogumil produced the drawings and site plans in the report.

The Cultural Resource Group
John A. Hotopp, Ph.D.
Director

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A. INTRODUCTION

As part of the archaeological investigation of Site 1 of the Washington Street Urban Renewal Area on Manhattan's west side (Figure 1), the Cultural Resource Group of Louis Berger and Associates Inc. (LBA), conducted a monitoring program during the initial foundation excavations for the Shearson Lehman/American Express Information Services Center. The monitoring, which augmented six weeks of traditional archaeological investigations, yielded information about early-nineteenth century landfill and engineering techniques that otherwise would have been lost.

The observation period spanned the three months from November 18, 1984 to February 6, 1985. An archaeologist was on site during all foundation excavation activities that required monitoring. The total number of field days for the monitoring was 56. With the cooperation of the foundation contractors, HRH, Herbert Construction, and Delma Construction Companies, as well as the Shearson Lehman/American Express Company and the New York City Public Development Corporation (the lead agency for this project), a wealth of valuable archaeological data were recovered from a large area in a relatively short time.

Located on the two blocks bounded by West, Greenwich, Beach, and Hubert Streets, the building to be constructed on the site will rest on pilings below a cement slab basement floor. Preparation for these foundations included general grading and spot-excavations at piling clusters. The grading offered an extensive field of observation while the piling cluster locations provided "windows" to greater depths. In addition, deep excavations for sumps dug to control water on the site permitted additional observation points (Figure 2).

A consistent, systematic, and relatively uncomplicated method of data recording was accomplished by tying the archaeological data into a construction grid system devised for locating piling clusters and by establishing datum points from which rapid but accurate measurements could be taken.

The information provided in this monitoring report (which will be incorporated into a larger report on all archaeological work conducted within the project area) includes details about wharfing that was either observed or implied. Constructions were documented that were similar to those found in Manhattan's east side excavations at the Telco block (Rockman et al. 1983:37-82) and the Assay Site (Wall 1985:personal communication). These are remants of cobb-crib wharfs that are essentially four-sided log forms or cribs filled with rocks and stone rubble (Plate 1). It is a kind of wharf that has been documented archaeologically at medieval European port sites (Plate 2) and may have origins that extend back to ancient Rome or earlier (Geismar 1983; Huey 1984).

In addition, monitoring provided unprecedented information about the fastening and joinings of wharf-logs (see Appendix A). It

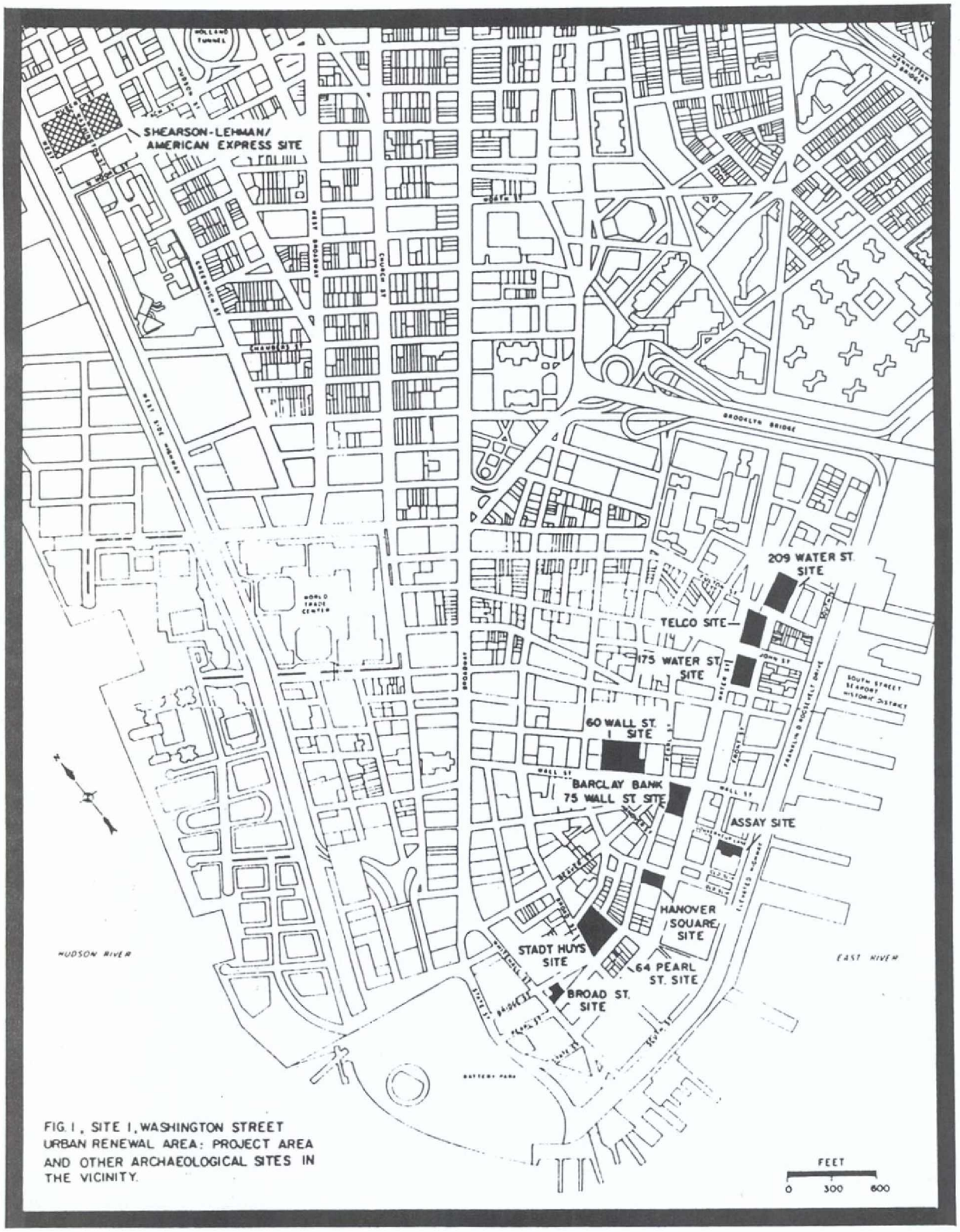
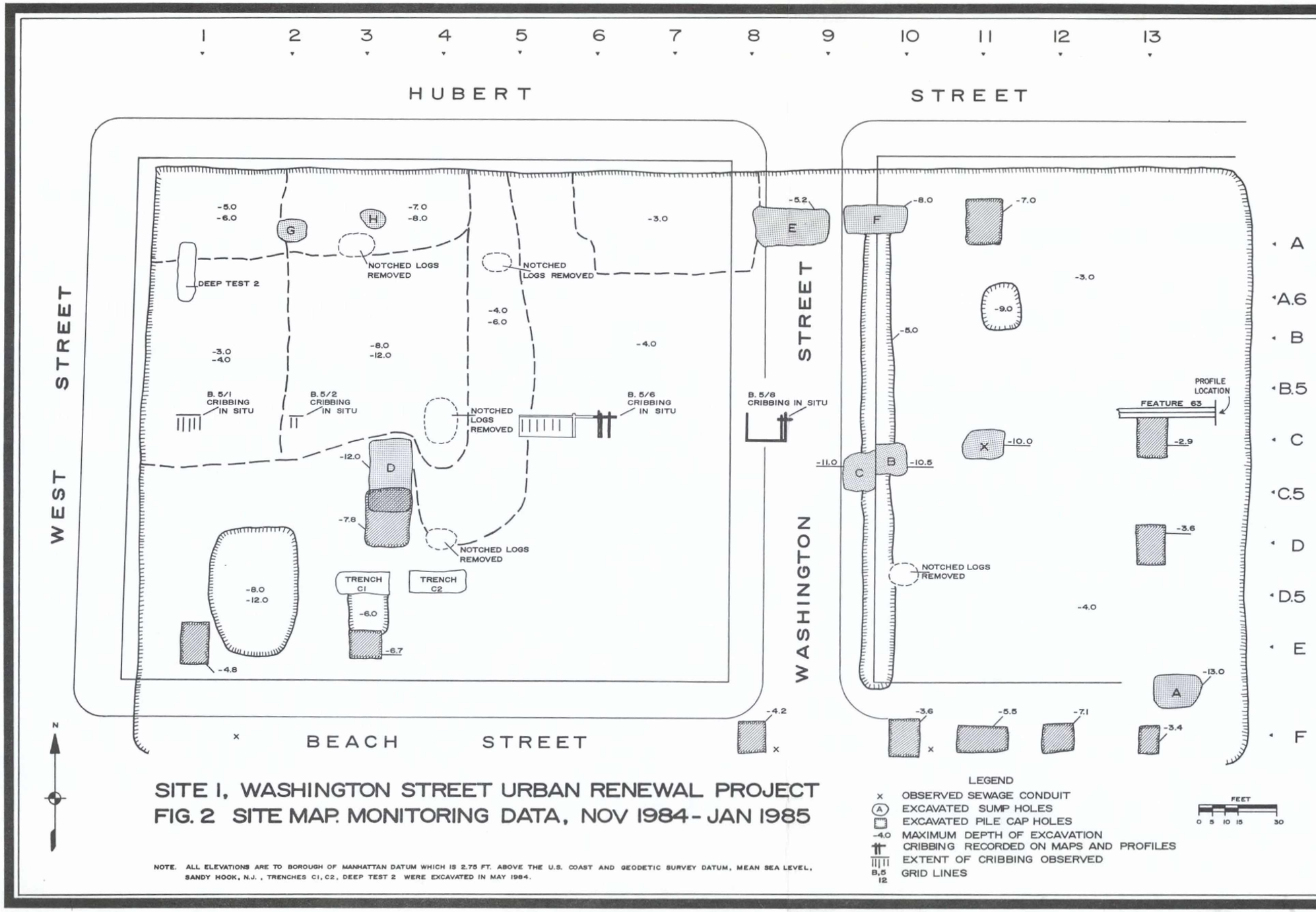


FIG. I, SITE I, WASHINGTON STREET URBAN RENEWAL AREA: PROJECT AREA AND OTHER ARCHAEOLOGICAL SITES IN THE VICINITY.



SITE I, WASHINGTON STREET URBAN RENEWAL PROJECT
FIG. 2 SITE MAP. MONITORING DATA, NOV 1984 - JAN 1985

NOTE. ALL ELEVATIONS ARE TO BOROUGH OF MANHATTAN DATUM WHICH IS 2.75 FT. ABOVE THE U.S. COAST AND GEODETIC SURVEY DATUM, MEAN SEA LEVEL, SANDY HOOK, N.J., TRENCHES C1, C2, DEEP TEST 2 WERE EXCAVATED IN MAY 1984.

LEGEND

- × OBSERVED SEWAGE CONDUIT
- (A) EXCAVATED SUMP HOLES
- EXCAVATED PILE CAP HOLES
- -4.0 MAXIMUM DEPTH OF EXCAVATION
- CRIBBING RECORDED ON MAPS AND PROFILES
- EXTENT OF CRIBBING OBSERVED
- B,5 / 12 GRID LINES

FEET
0 5 10 15 30

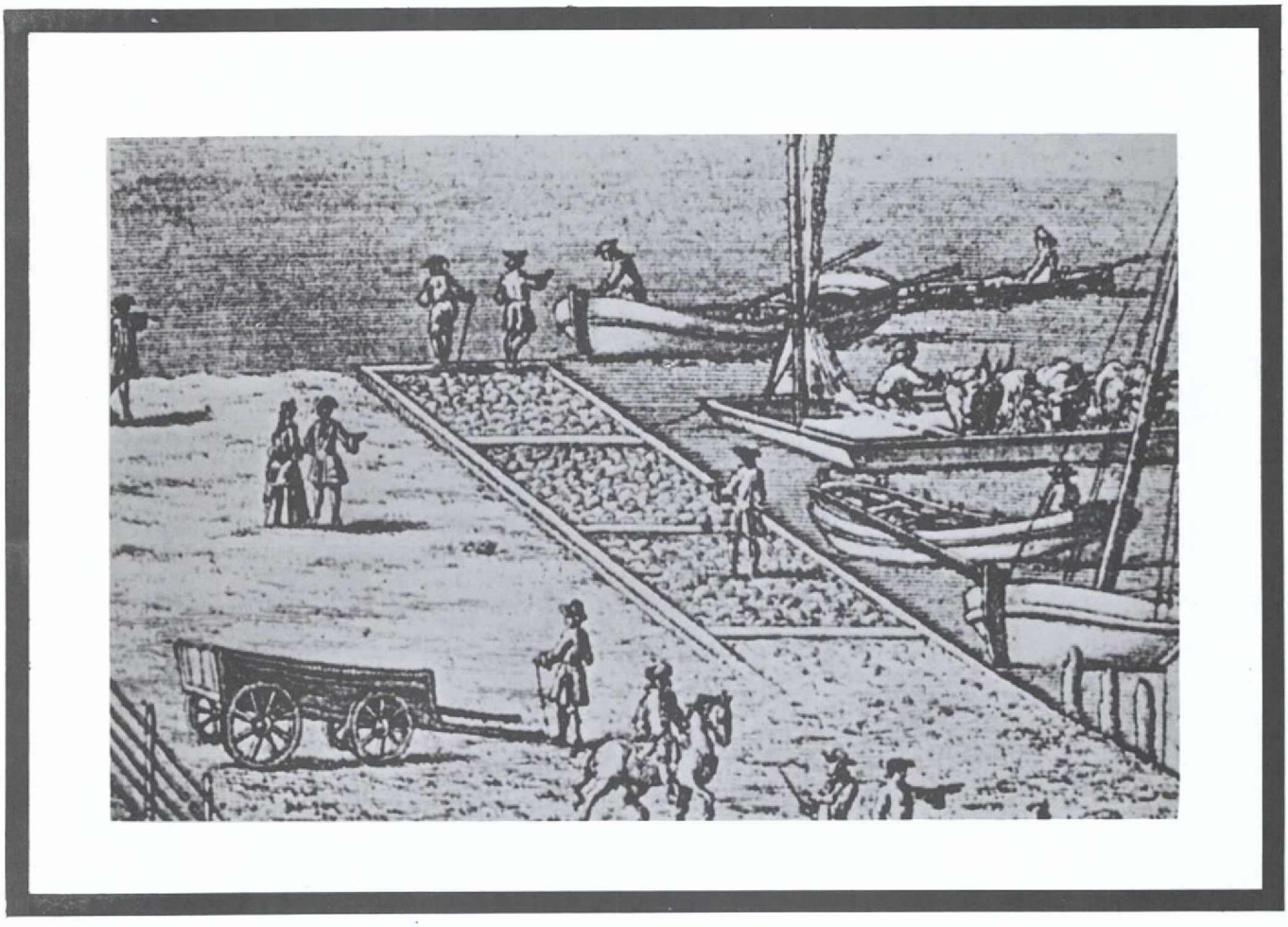


PLATE 1 : THE TOP OF WHAT ARE POSSIBLY COBB WHARVES DOCUMENTED ON THE BROOKLYN SIDE OF THE EAST RIVER.
(DETAIL OF THE 1717 BURGIS VIEW).

PLATE 2 : MEDIEVAL COBB WHARVES EXCAVATED IN BRYGEN (BERGEN), NORWAY
(FROM BAART et al. 1977)

also suggested some of the considerations of the early-nineteenth-century-engineer, including the dynamics of wharf use and construction.

Soil data recovered in this field phase indicate that prior to filling, the block bounded by Washington, Beach, Greenwich, and Hubert Streets was a small cove or lagoon of the Hudson River. This refutes eighteenth-century maps that indicate a diagonal shoreline for this block (this was a configuration perpetuated by subsequent map makers). However, it confirms the shoreline reconstruction recently compiled from boring data by Woodward-Clyde Consultants (Woodward-Clyde 1984).

In addition to the above information some interesting nineteenth-century construction elements, including a mortised wooden spread-footer, cork insulation, and brick sewage conduit, were documented during this field phase.

There are at least two aspects of the wharves, piers, and fill constructions on the block that remain speculative: the size and exact configuration of the wharf and pier system remain unknown as do the actual fill-retaining constructions that hold the landfill in place while keeping the Hudson River out. The wharf configuration documented through monitoring appears to be a series of staggered but parallel constructions extending west beyond Washington Street into the Hudson River. It is the ultimate size of these wharves and their total scheme that are presently unknowns. Since no fill-retaining features were found within the extensive excavations that were monitored, it appears that they are not located in the project area but should be found under or beyond West Street, a street with a long history.

The detailed procedures and findings of this monitoring phase will be found in the following sections. It is information that not only documents rich archaeological material, but also the efficacy of monitoring when conducted in cooperation with developers and construction crews.

B. MONITORING PROCEDURES

The methods employed in archaeological monitoring were governed by the operational procedures used by Delma Construction Company, the principal contractor responsible for the foundation-related excavations. Various types of heavy machinery were used for these excavations, including two Buyries-Erie 40-H backhoes with 52-inch buckets, a 9.5-foot wide Fiat Allis Fr-20 front end loader, a 190-4 Dynahoe with a 26-inch bucket and an 8-foot wide front end loader, an 8-foot wide 190 MY-Dynamic Dynahoe front end loader and hammer, a C-235 caterpillar with a hammer, and a C-235 Caterpillar backhoe with a 26-inch bucket.

Foundation excavations entailed several operations. Among them were the broad-stripping of an area of approximately 70,000 square feet, with opening elevations varying from +5.5 to +10.0 feet and the excavation of ten deep sump holes located throughout the site (Plate 3). As a method of water control, these sumps were excavated to depths ranging from -5.0 to -13.0 feet and were fitted with large, perforated tin pipes (Plate 4). Accumulated water was then pumped. In addition, holes to accommodate pile caps were excavated at pile cluster locations specified in the design of the foundation supports. Most of the pile cap excavations were hampered at some point by obstructions such as concrete piles and concrete or granite spread-footers left from demolished buildings.

The broad-stripping, which was done in stages, was also somewhat hindered by obstructions that often determined the depth of excavation. Ultimately, these depths ranged from -3.0 to -14.0 feet. Very deep excavations (-8.0 to-14.0 ft.) were undertaken in the western portion of the site to expedite the removal of rows of large concrete blocks (7 by 7 by 8 ft.) and concrete and beam platforms (1 by 6 by 28 ft.) that apparently had supported late-nineteenth to early-twentieth-century foundations. As obstructions were removed, excavated areas were refilled to create a uniform surface at -3.0 feet.

The excavation procedures used by Delma Construction Company determined the selection of suitable methods of archaeological monitoring. This method was aimed at retrieving the most complete data possible given the restrictions of the situation. Because of the rapid pace of excavation and the extensive disturbance by heavy machinery, it was necessary to establish priorities in data collection. One concern was to maintain controls to keep data recovery as consistent and systematic as possible. Primary attention was given to gathering information pertaining to wharves, piers, and landfill constructions as well as the configuration of the river bottom and related fill information. In addition, miscellaneous archaeological features that were considered unusual or unique were also recorded.

Design specifications for the Shearson Lehman/American Express Information Service Center developed by Skidmore, Owings, and Merrill called for the control of foundation excavations through a grid with access lines intersecting at known intervals and angles. During monitoring, this grid was used for systematic horizontal coverage of the site. All archaeological features were tied to the grid by using a transit, rod, and tape. Measurements were taken either from permanent control points established on the excavation surface or from temporary chalk marks indicating the location of pile cap holes which were recorded on construction plans. The Borough of Manhattan Datum (BMD), which is 2.75 feet above the U.S. Coast and Geodetic Survey datum at Sandy Hook, New Jersey, was the zero elevation of the site (this datum is 6.57 ft. below the site datum used during the archaeological

PLATE 3 : GRADING AND SUMPHOLE EXCAVATIONS (LOOKING TOWARD THE JUNCTION OF WEST STREET AND HUBERT STREET)

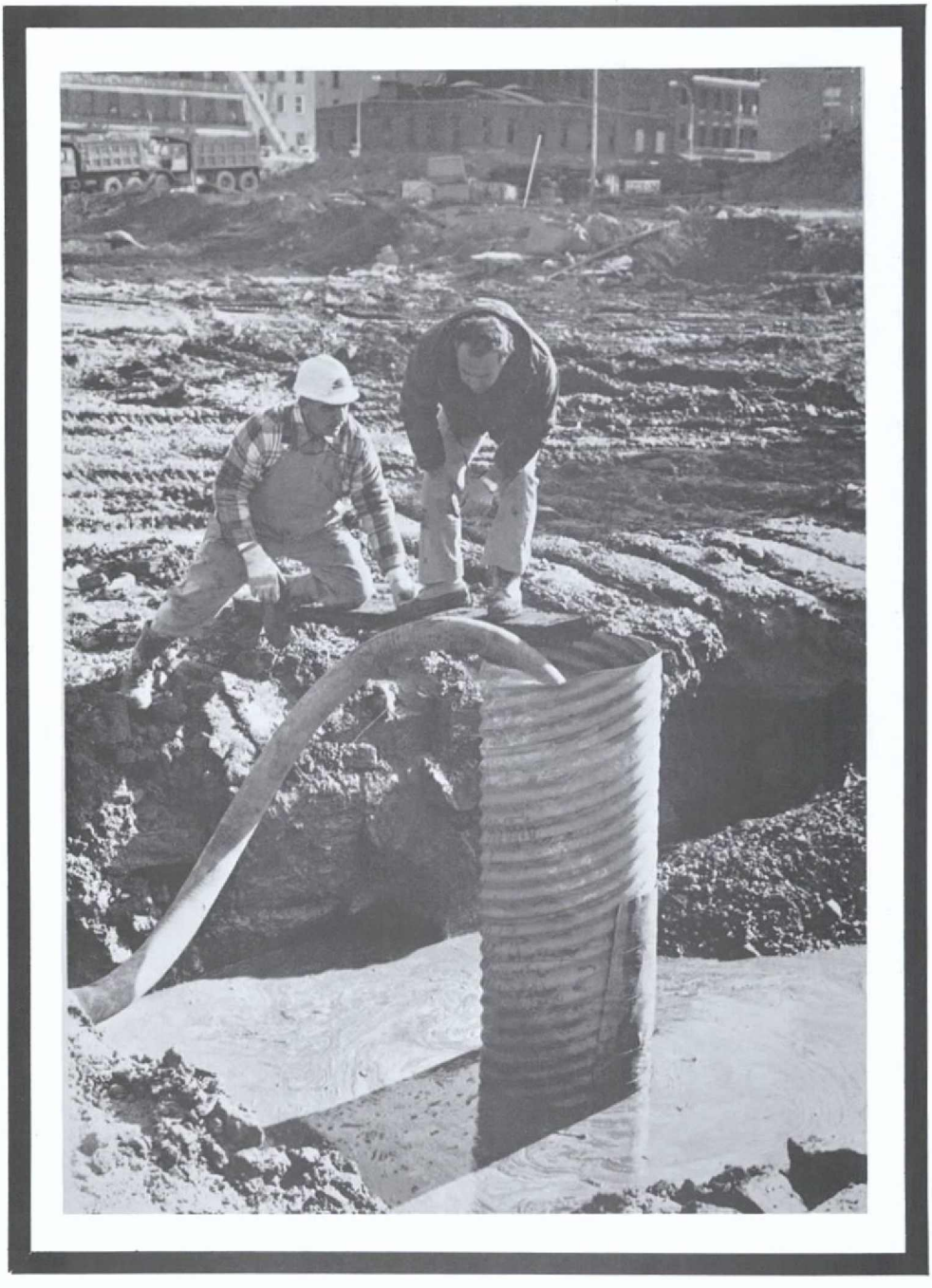


PLATE 4 : PUMPING IN SUMPHOLE D .

field investigations conducted from May to June, 1984). The relation of the transit to the BMD was determined by five correlated benchmarks established on the site during monitoring.

Location, dimensions, and top and bottom elevations were recorded for all the broad-stripping and sump and pile cap holes. Any observed occurrences of black clay or clayey silt indicative of river bottom were recorded by their location and depth, and stratigraphic profiles and sketches of various cuts were drawn whenever possible. In addition, a distinction was made between log cribbing observed in situ and notched logs removed by backhoes from uncertain contexts. When in situ, the position of cribbing was carefully recorded in three dimensional drawings and plans, and profiles were drawn with special emphasis on the mode of articulation of all logs. Whenever notched logs were removed, their location was recorded in relation to the grid.

Throughout the monitoring, a 35mm black and white photographic record was kept; when possible, this was augmented by color slides. In addition, late-nineteenth to early-twentieth-century foundations (concrete piles, concrete and beam platforms, etc.) were recorded when they were associated with earlier features or if they were of particular interest.

Although monitoring was simultaneous with excavation, it did not interfere with construction operations. As a rule, the archaeological recording occurred either between the excavation and the backfilling of various holes or during pumping operations; only occasionally did backhoe excavation pause to allow a sequence of quick transit shots. Not only did the relationship between the construction crew and the archaeologist quickly become amiable, it essentially became symbiotic.

On the one hand, the archaeologists gave the construction crews information about the variables governing the site's water problem and provided data pertinent to locating buried walls. They also helped establish on-site benchmarks and shared their photographic record, both from the monitoring and from earlier excavations. The construction crews, on the other hand, shared their demolition record, assisted in archaeological surveying, and when possible provided scheduling information that allowed the archaeologists to budget their field time judiciously.

C. MONITORING RESULTS

1. Wharfs, Piers, and Landfill Constructions

Late-eighteenth to early-nineteeth-century cobb crib wharfing was observed in situ at four locations (B.5/8, B.5/6, B.5/2, and B.5/1; see site plan, Figure 2). The information from these observations indicated that a large wharf had run east to west through the middle of both site blocks. The northern edge of the

cribbing, located in pile cap hole B.5/8, was found 11.5 feet south of line B.5. In addition, the backhoe removed a number of notched logs from pile cap hole B.5/4 which was filled with water.

Four other water-filled locations north and south of line B.5 (D.5/10, D/4, A/5, and A/3) yielded additional notched logs with joints similar to those observed in the wharf. It is important to note, however, that no in situ wharfing was found either on line D nor line A. The source of the notched logs recovered here is unclear. Possibly, they represent features more ephemeral than the wharf itself, but, given the extensive disturbance that occurred during the construction of late-nineteenth to early-twentieth century basements, they probably are merely displaced from their original locations.

The cobb crib recorded on line B.5 was found immediately under a concrete basement floor. Fill material within the log crib mainly consisted of medium-sized rocks and occasional small-to-medium cobbles in a soil matrix of dark gray sandy silt. The rock-fill that projected above the uppermost logs supported the concrete floor. The proximity of the wharf to the floor suggests that its upper portion was partially destroyed during basement construction.

a. Pile Cap B.5/8: The top of the northernmost row of logs had an elevation of -2.10 feet BMD and three east-west courses were observed in the field. The logs in this row did not lie on top of each other, but were separated by moderate spaces or chinks, that accommodated north-south crossties (Figure 3a). Two treenails, or trunnels (wooden pegs of dry wood meant to swell and fasten timber or planks in a wet environment), held the crossties and log courses together (Plate 5). The second row was structurally similar to the first in that the courses alternated with overlapping crossties.

Articulations of the first and second rows and their respective crossties all represented cross lap joints. Three variations of this joint were observed in this portion of the wharf. One was a cross lap with a broad, "squared-off" notch (Rockman et al. 1983:64-65), while others were crosslaps using a saddle notch and a crosslap treenail fastening (Figure 4).

The structure and articulations of the third row were distinctly different. The courses of this row lay either directly atop each other or were separated by thin wooden boards (see Figure 3b). Little or no chinking was found between the courses. Apparently, half-lap joints were the fastenings used to extend the east-west log rows (Appendix A). Here the ends of two logs were halved and overlapped to form a continuous line. No cross lap joints were observed in this row; instead, the ends of the crossties were thinned to form shouldered tenons which were inserted into housings cut on the articulating surfaces of two courses. Three variations were used for crosstie insertion: dovetail and

SITE I, WASHINGTON STREET URBAN RENEWAL PROJECT

PILE CAP HOLE B.5/8.

FIG. 3A.
B.5/8, WEST PROFILE

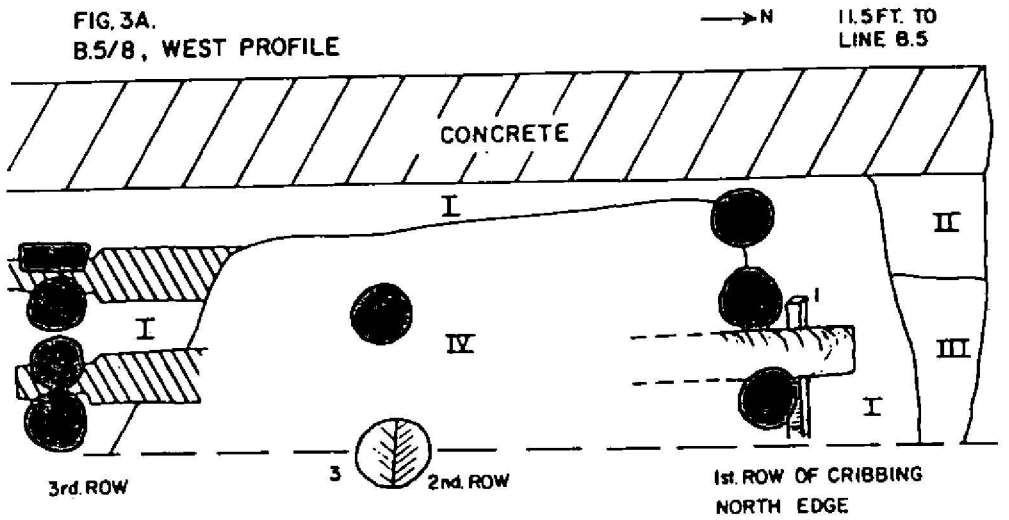
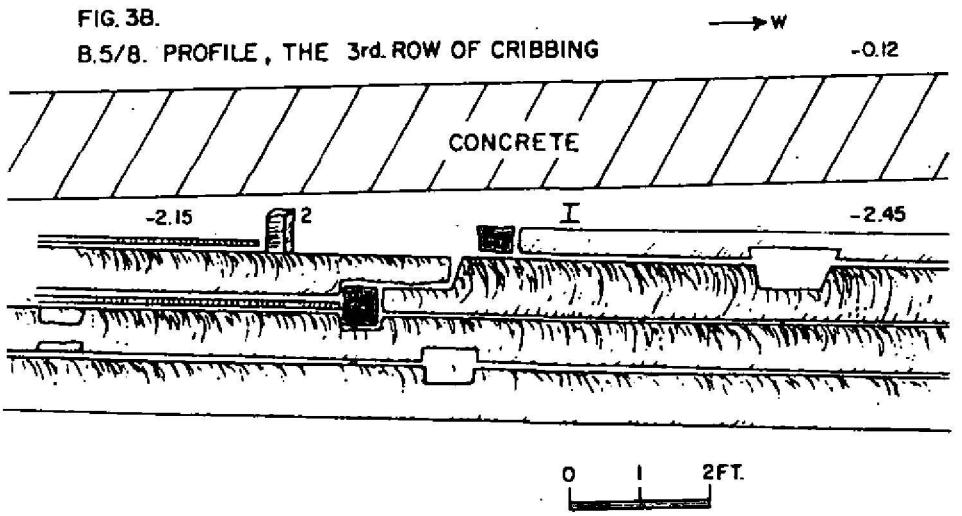


FIG. 3B.
B.5/8. PROFILE, THE 3rd. ROW OF CRIBBING



LEGEND

- LOGS EXTEND EAST
- PROJECTED
- CROSSTIE. FACE OF TENON
- 1,2 TREENAILS
- 3 BUTT
- — — WATER LEVEL

- I ROCKFILL
- II COARSE BROWN SAND. LANDFILL
- III BROWN SAND WITH LENSES OF GRAY BROWN SAND. LANDFILL
- IV AREA OF SLUMPING

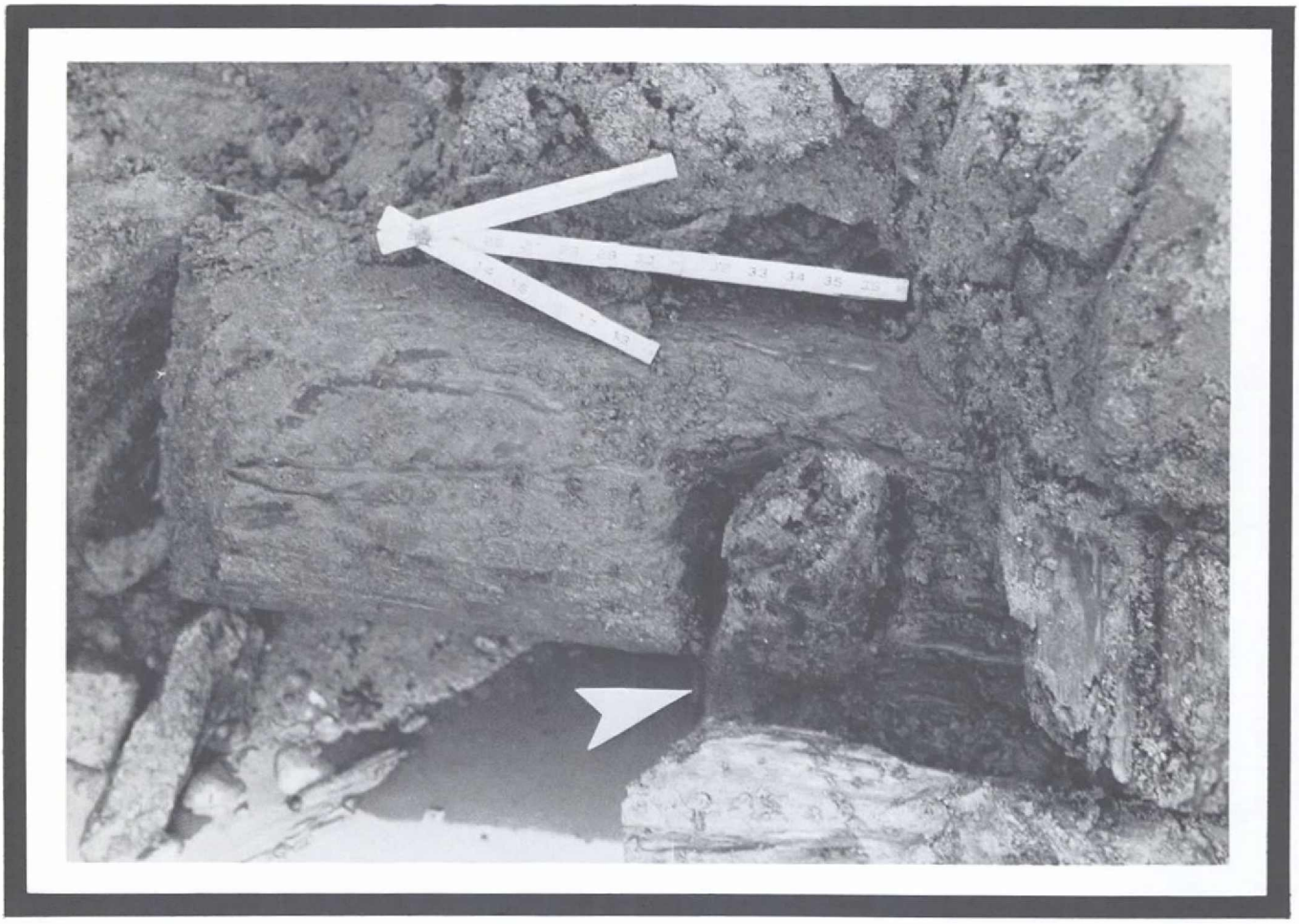
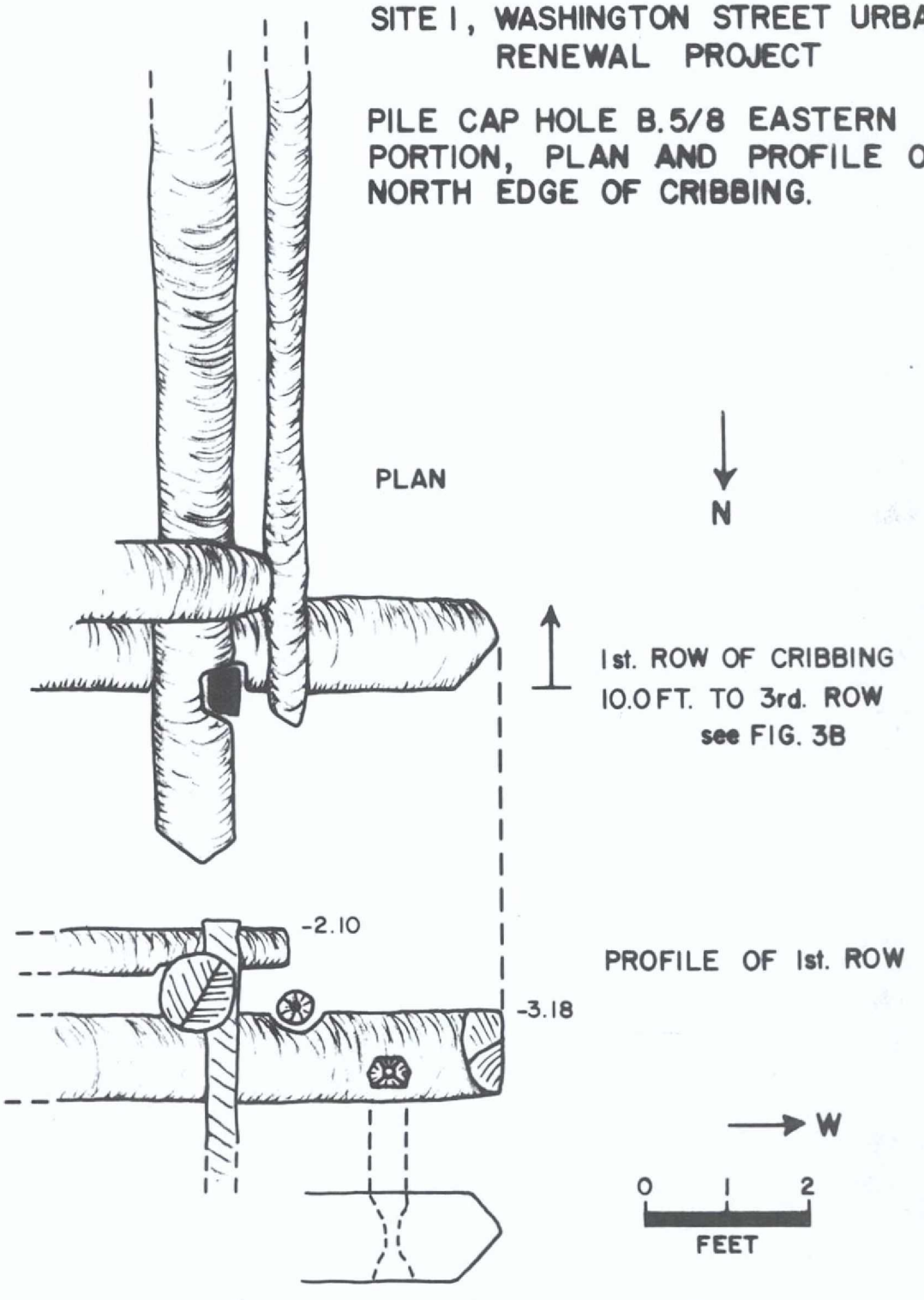


PLATE 5 : TREENAIL FASTENING (ARROW) IN PILE CAP HOLE B. 5/8

FIG. 4

SITE I, WASHINGTON STREET URBAN RENEWAL PROJECT

PILE CAP HOLE B.5/8 EASTERN PORTION, PLAN AND PROFILE OF NORTH EDGE OF CRIBBING.



NOTE : ALL ELEVATIONS ARE TO BOROUGH OF MANHATTAN DATUM.

shouldered housings as well as one at the cheek and shoulder of a half-lap joint (Appendix A and Figure 3b). In addition, a mitre joint was cut in the log of the second course; this joint appears to have accommodated a diagonal strut connecting this course with its crosstie.

The structural differences between the two outer rows and the third row suggests that force directed perpendicularly to the line of the outer log rows (for example, the impact of a docking ship) would not meet rigid resistance but would instead be absorbed by the flexibility of the outer rows. This flexibility was created by the broadness of the notches in the cross lap joints which permitted some shifting of the logs. While the outer rows and crossties acted as a cushion, the third row was apparently designed to arrest applied force. This was achieved by using a shouldered tenon at the end of a crosstie (Appendix A); the inward movement of this joint would be resisted by the edge of its housing. The third row of logs apparently served as a vertebra that prevented the dislocation of the wharf.

Because of water in the excavation units, the vertical extent of the cribbing remains uncertain. Assuming the cobb crib was sunk and floored by the rockfill (Greene 1917:53-54), it probably continued down since river bottom at this location was apparently about -10.0 feet BMD.

b. Pile Cap B.5/6: The top elevation of the first row of logs was -3.47 feet BMD and three courses and three crossties were observed in the field (Plate 6). The outward movement of the row was prevented by a slender external wooden piling driven vertically into the sediment. As in B.5/8, several variations of the cross lap joint were found in this row. Part of what appeared to be a wooden box made of a single observable course of tongue-and-groove planks (only the length, which was 8.98 feet was observable) was located about 4 feet north of the wharf edge (Plate 7). This might represent part of a later fill construction used to structure landfill that had settled (Geismar 1983:692-693), but this remains uncertain. A "partition" made of three boards nailed together and standing on edge occupied an intermediate position between the wharf and the "box" (Figure 5).

c. Pile Cap B.5/2 and B.5/1: Cobb crib wharfing similar to that found in B.5/8 and B.5/6 was briefly observed *in situ* at these locations directly under a cement basement floor. The construction and rockfill in both excavations appears similar to that found in B.5/8 and B.5/6. The top elevation of the wharf in B.5/1 was -3.80 feet BMD.

d. Additional Construction Information

A number of assorted notched logs recorded on the site (Figure 6) provided additional insight into the construction of the wharf. The majority of these logs displayed a V-notch which undoubtedly connected log rows and crossties in a wedge joint. An

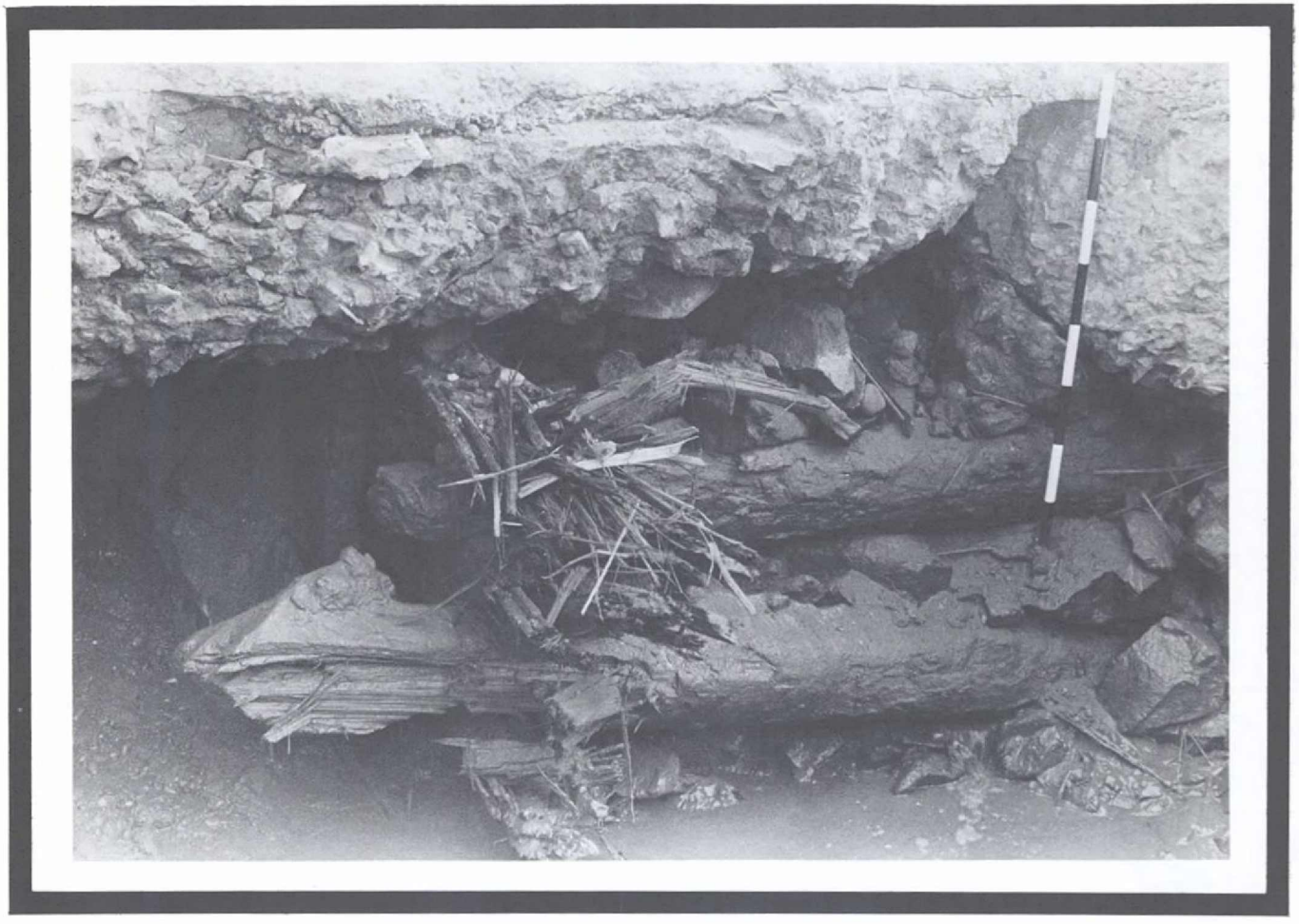


PLATE 6 . NORTH EDGE OF COBB WHARF IN PILE CAP HOLE B. 5/6.

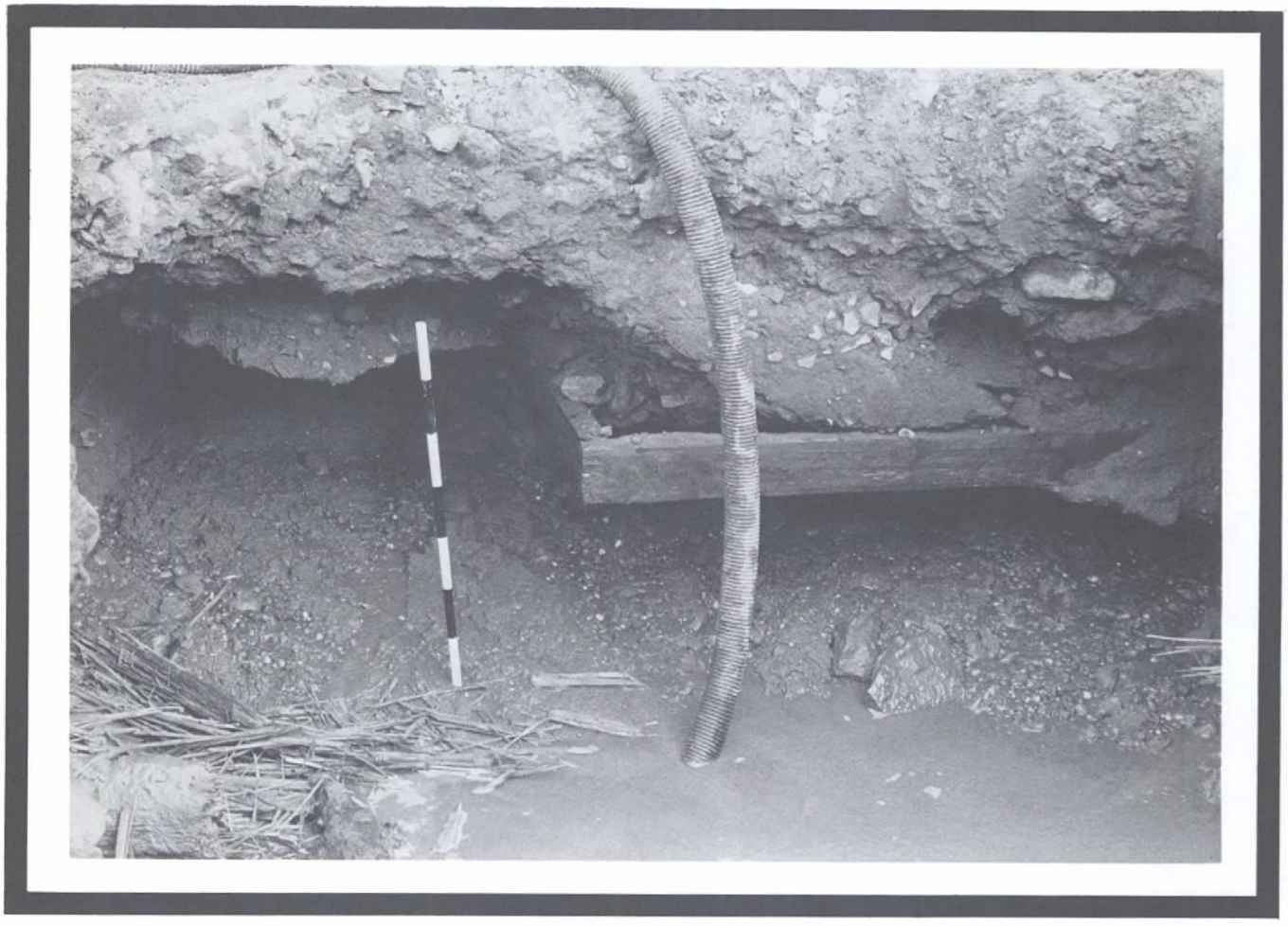
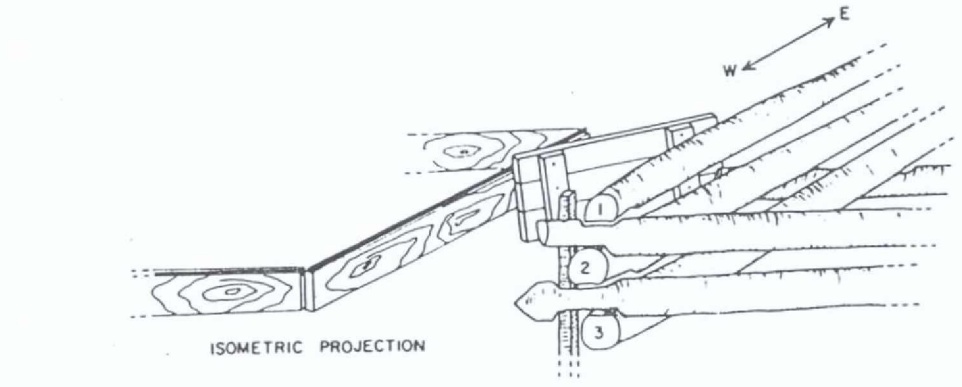


PLATE 7 : CORNER OF WOODEN BOX NORTH OF COBB WHARF IN PILE CAP HOLE B. 5/6.

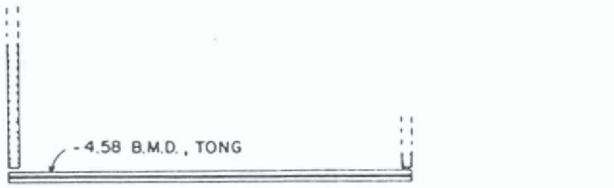
SITE I , WASHINGTON STREET
URBAN RENEWAL PROJECT

FIG. 5 PILE CAP HOLE B.5/6 NORTH EDGE OF CRIBBING

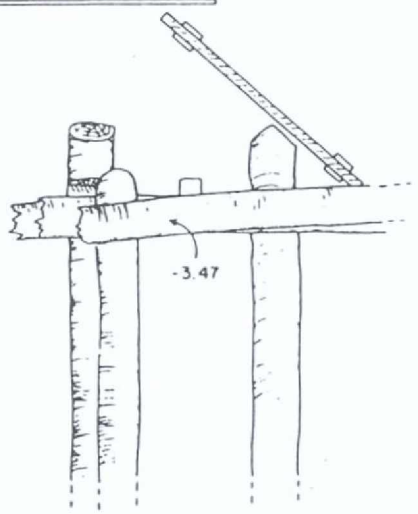


ISOMETRIC PROJECTION

LEGEND:
1,2,3 LOGS CONTINUE WEST
CRIBBING CONTAINS ROCKFILL

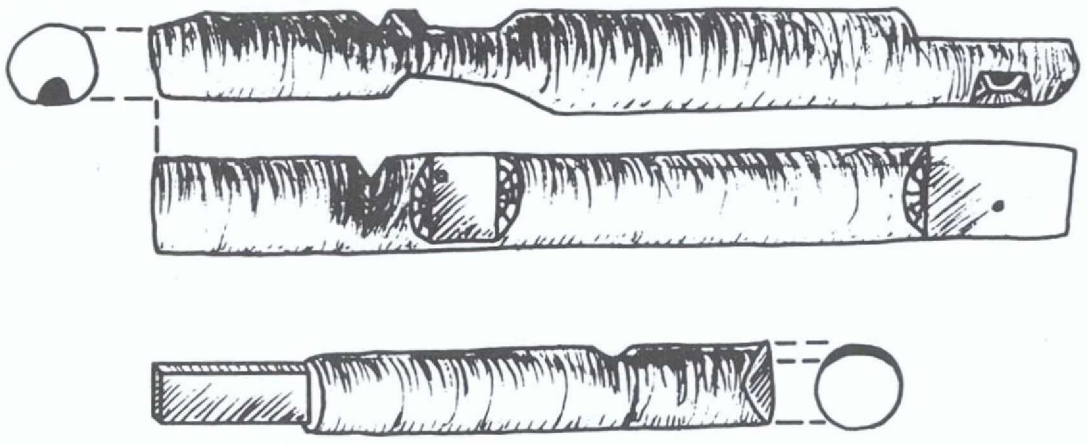


PLAN



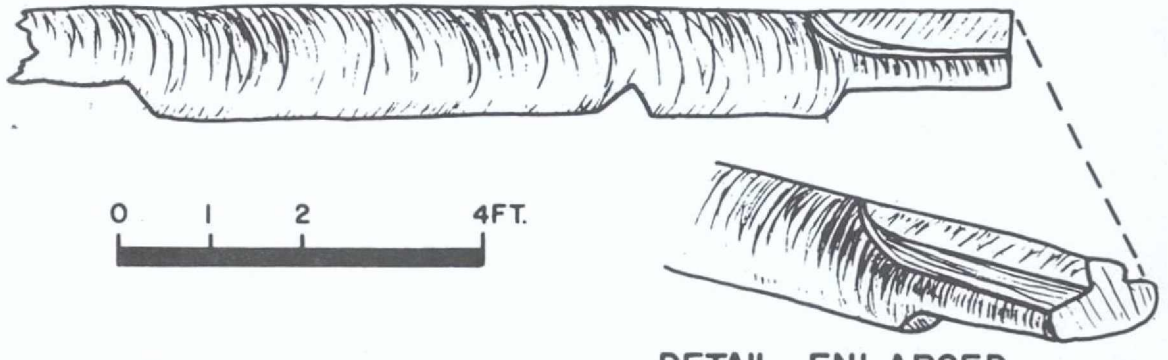
SITE I, WASHINGTON STREET URBAN RENEWAL PROJECT

FIG. 6 LOGS FOUND IN CRIBBING



PILE CAP HOLE B. 5/8

PILE CAP HOLE B.5/6



DETAIL, ENLARGED

PILE CAP HOLE C/2

analysis of the morphological features of these logs suggests that two additional varieties of the half lap joint were used for the extension of the wharf. One is a half lap joint with a metal bolt fastening; the other is a scarf joint which articulated lengthwise with two other logs in the same row by using a typical half lap joint and a dovetail cleat inserted into a keying groove (see Appendix A for a compendium of joints and joinings).

2. River Bottom and Landfill

Black clay or clayey silt with a strong organic odor was observed at ten locations and depths during the current monitoring and in the course of field investigations conducted from May to June 1984.

In the western portion of the site these sediments were located beneath landfill deposits of brown and reddish brown coarse sands. In the east (east of Line 11; Figure 2) medium to coarse olive gray sands were deposited above the black clay (Figure 7).

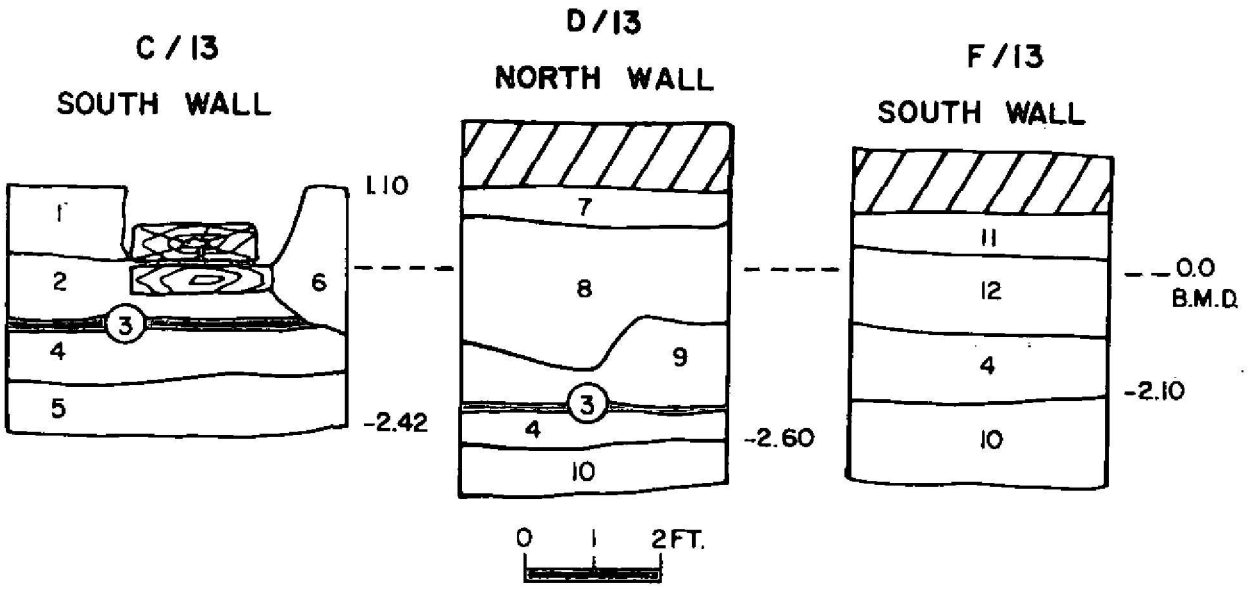
It appears that these sands were deposited by slow to moderate moving waters, rather than by the backwater conditions that formed the clay and silt layer. The texture and color of the medium to coarse olive gray sand found uniformly distributed in the eastern portion of the site suggest an arobic condition of a low lying swampy area that may have been present near the shoreline. Further west, brown and reddish brown coarse sands appear to comprise the fill matrix overlying the river bottom.

Soil stratigraphy observed during monitoring and the information from three deep tests excavated during the earlier field investigation can be used to reconstruct approximate river bottom contour. Plotted samples suggest a curved shoreline possibly indicative of a cove or lagoon, and a river bottom that gently slopes to the west (Figure 8). Except for one anomalous high area that may be related to wharf building, it appears that the wharf was situated where river bottom was relatively deep.

3. Miscellaneous Features

a. Feature 63: This is the designation for a complex of walls and spread-footers, or foundation supports, located at the edge of Lots 28 and 30 recorded on Bromley's 1899 Atlas. These lots are in the eastern portion of the block bounded by Beach, Greenwich, North Moore, and Washington Streets. A double brick wall running east to west through the middle of the block combined several interesting construction and insulation techniques. The northern end of the wall (Lot 28) rested on concrete spread-footers, while a more elaborate foundation was found in the wall belonging to Lot 30. Here, a row of wooden timbers (29 in. by 12 in. by 5 in.) was positioned perpendicularly to the wall (Plate 8). Dressed beams with cross section dimensions of 23 inches by 7 inches and approximately 18 feet long were found

SITE I, WASHINGTON STREET
URBAN RENEWAL PROJECT
FIG.7 STRATIGRAPHIC COLUMNS



1 HARD PACKED YELLOW BROWN CLAYEY SILT

2 COARSE BROWN SAND

3 HARD PACKED OLIVE GRAY SAND

4 OLIVE GRAY SAND

5 OLIVE GRAY SAND WITH BANDS OF GRAY BLACK SILT

6 GRAY BROWN SILTY SAND WITH RUBBLE

7 RUBBLE

8 REDDISH SILTY SAND WITH GRAVEL AND FRAGMENTS OF RED SANDSTONE

9 COARSE BROWN SAND

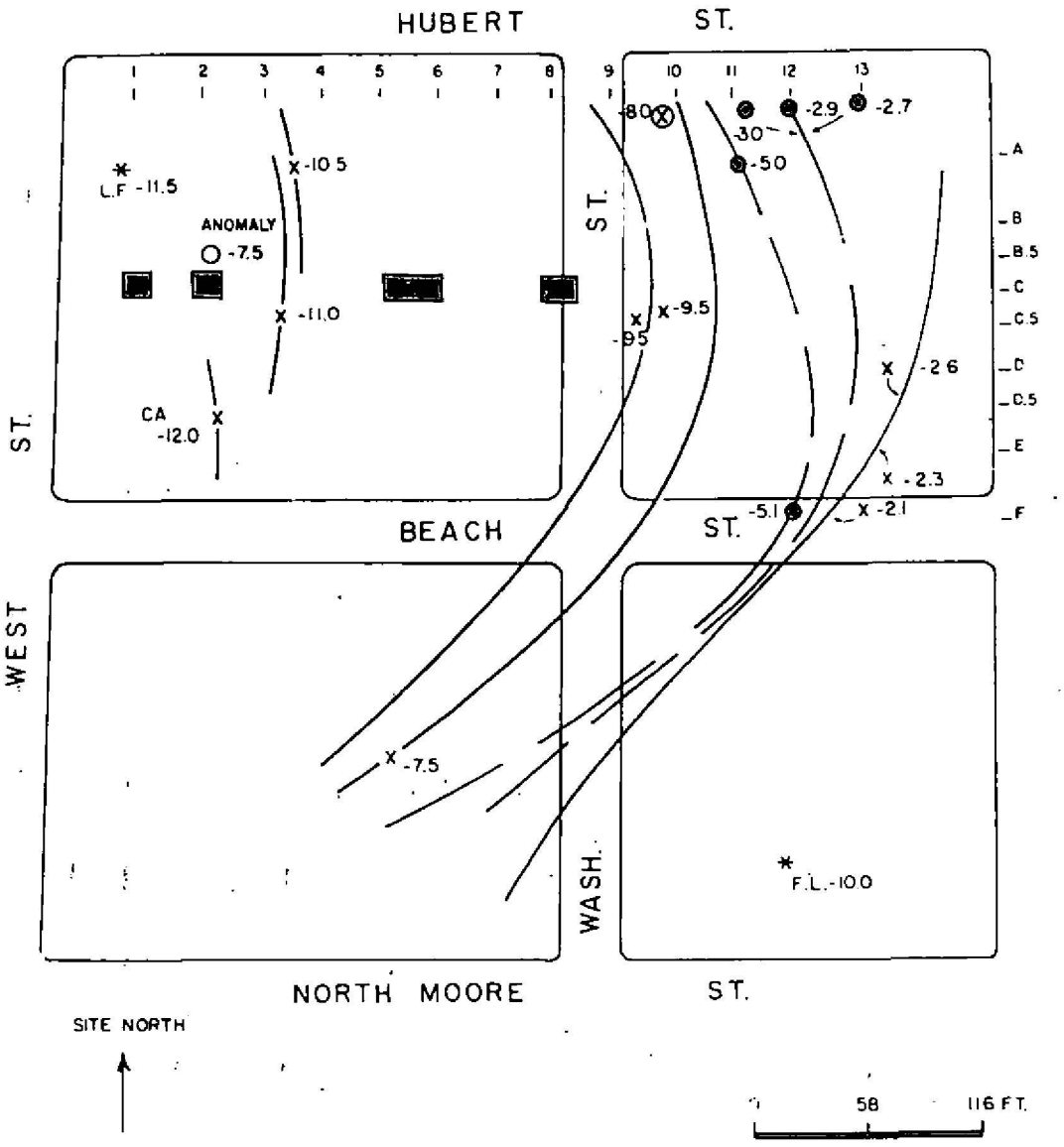
10 BLACK CLAYEY SILT

11 REDDISH SILTY SAND WITH PEBBLES

12 OLIVE GRAY SILTY SAND

SITE I, WASHINGTON STREET
URBAN RENEWAL PROJECT

FIG. 8 CONTOUR OF RIVER BOTTOM



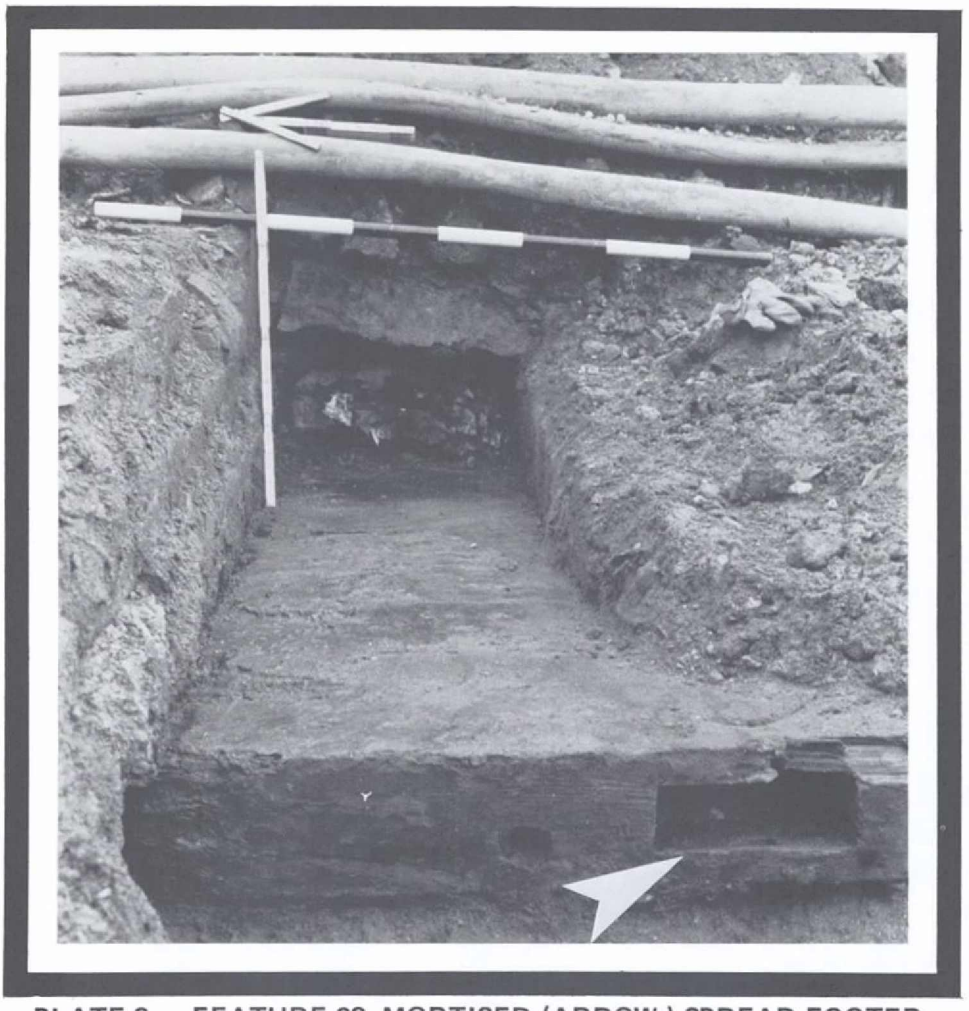


PLATE 8 : FEATURE 63. MORTISED (ARROW) SPREAD FOOTER

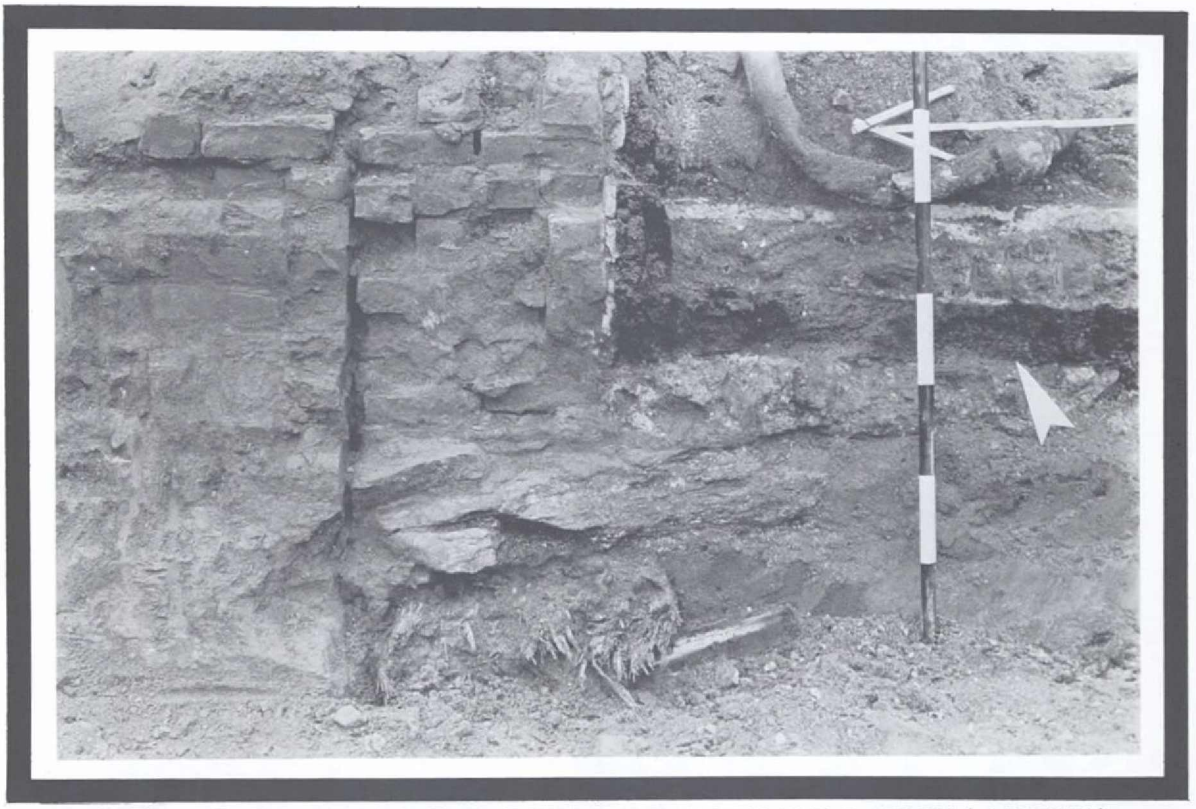


PLATE 9 : FEATURE 63. DOUBLE WALL AND CORK INSULATION (ARROW)

above the timbers. Stone blocks of Manhattan schist were placed on the beams and these in turn supported a brick wall (Figure 9 and Plate 9). In both lots, the basement floors were formed by two layers of concrete separated by sheets of compressed cork. In Lot 30, this cork was also mortared to the wall, presumeably for insulation.

b. Brick Sewage Conduit: An arched brick sewage conduit was uncovered 12 feet south of the southern curb of Beach Street at -0.75 feet BMD. Running east to west, it was constructed of two layers of mortared brick. In profile, the conduit was domed with interior dimensions of 43 inches by 32 inches (Plate 10). This feature was observed at three locations spanning 310 feet.

Site 1 Washington Street Urban Renewal Project

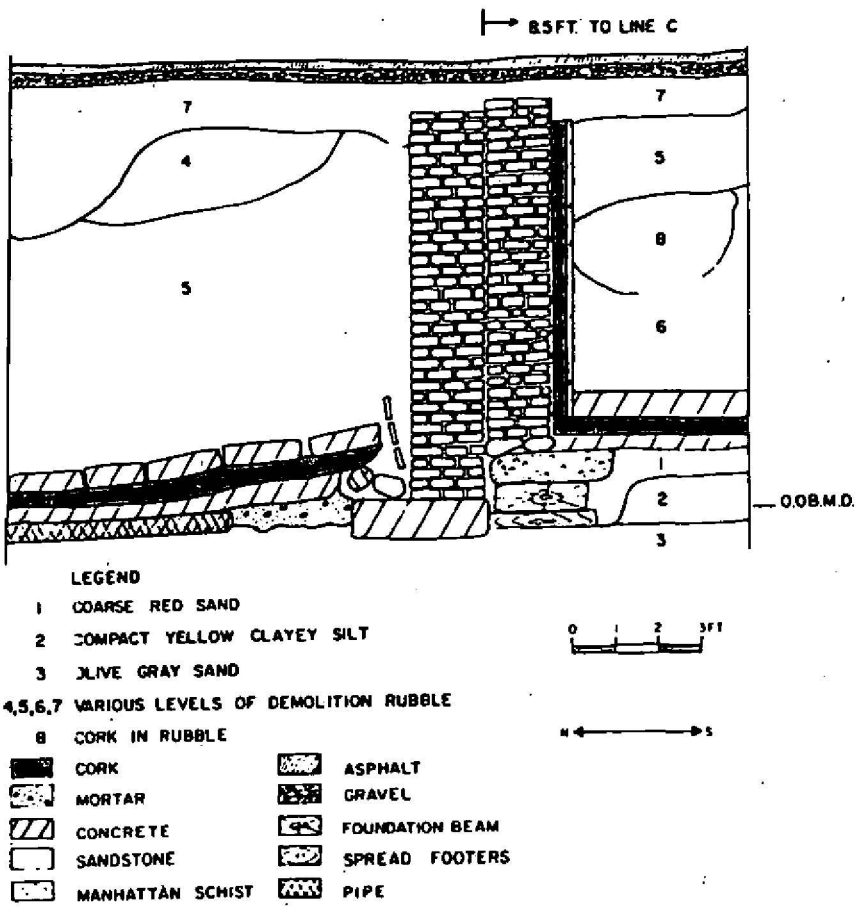
Legend to Figure 9

	Wharf
B.5;13	Grid lines
*L.F.	Landfill only
*F.L.	Fast Land only
	No river bottom to this elevation
X	Location and depth of black clay/clayey silt
	Location and depths of olive gray sands overlaying black clay/clayey silt
	Projected contour lines for black clay/clayey silt and olive grey sands

Note: Contour intervals not to scale, all elevations are to Borough of Manhattan Datum

SITE I, WASHINGTON STREET
URBAN RENEWAL PROJECT

FIG. 9 FEATURE 63, EAST PROFILE



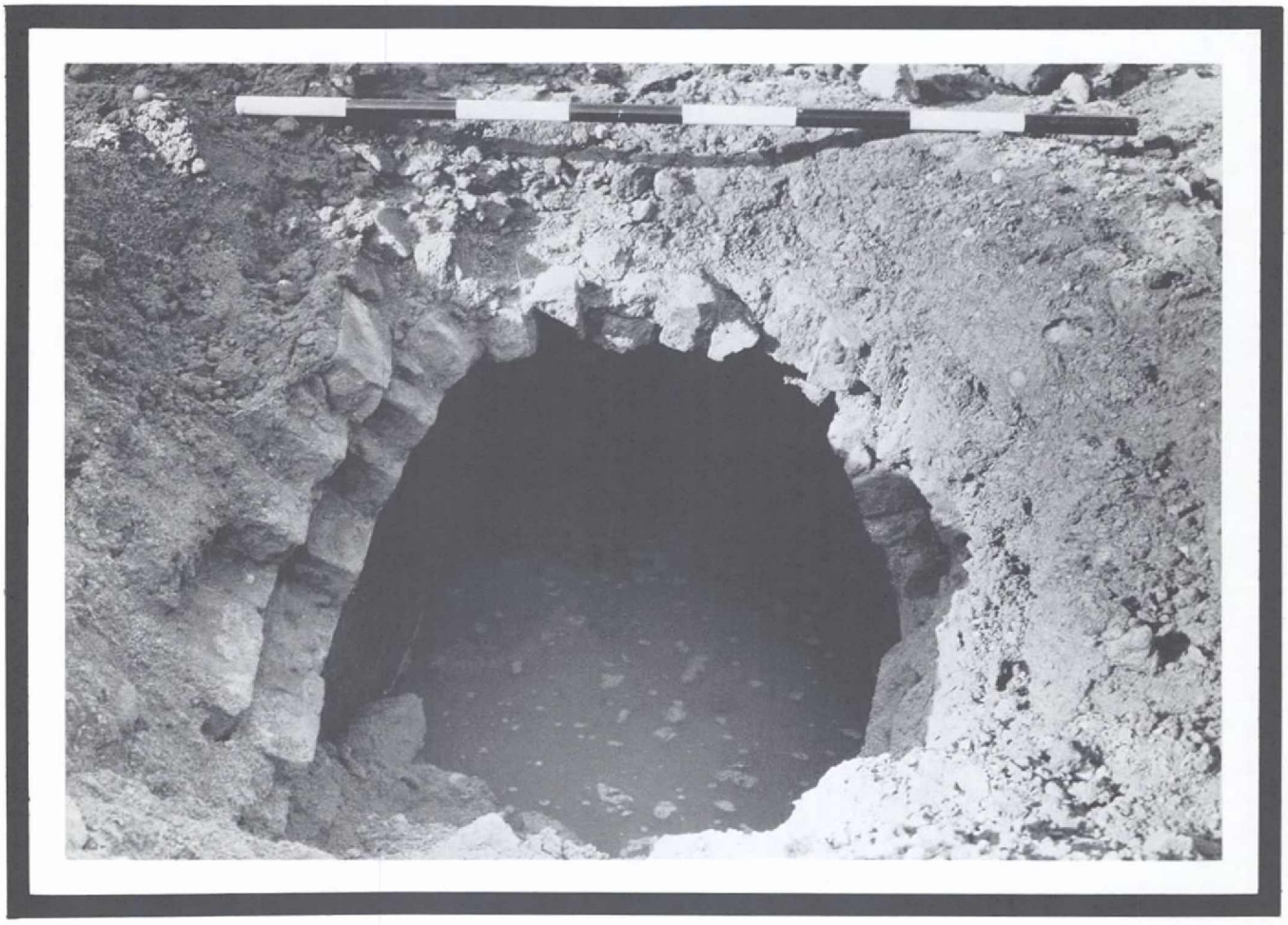


PLATE 10 : SEWAGE CONDUIT UNDER BEACH STREET.
NOTE DOMED CONSTRUCTION.

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REFERENCES CITED

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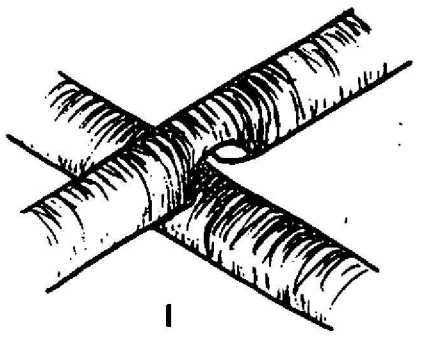
APPENDIX A

COBB WHARF JOINTS



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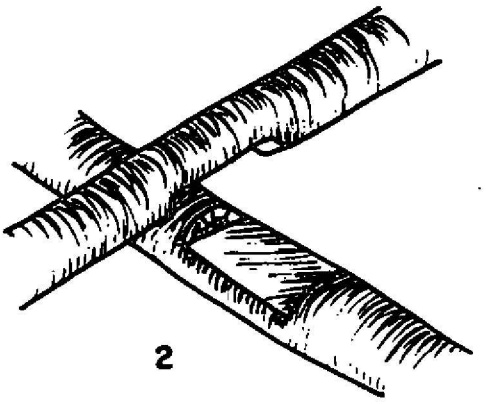

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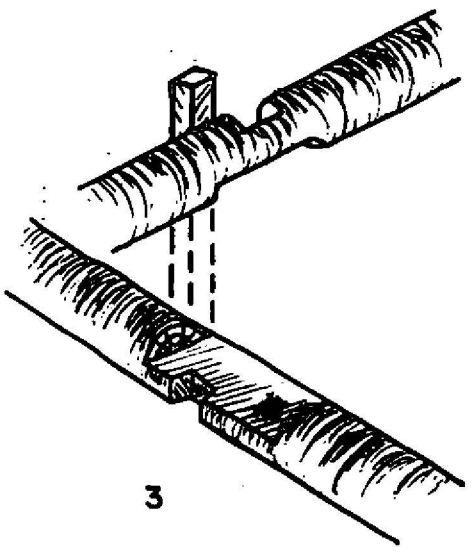

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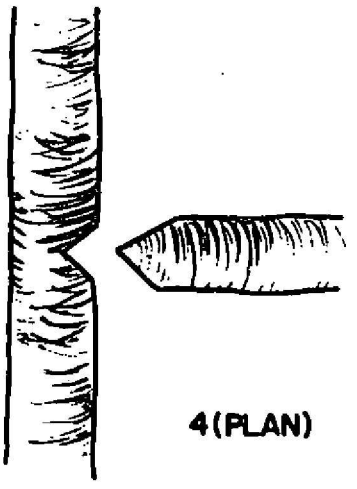
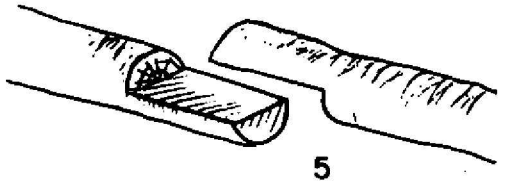


4(PLAN)

APPENDIX A. JOINTS OF OUTER ROWS

1 SADDLE NOTCH
2 CROSS LAP VIA SQUARED-OFF NOTCH
3 CROSS LAP WITH TREENAIL
4 WEDGE



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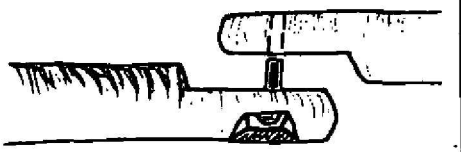

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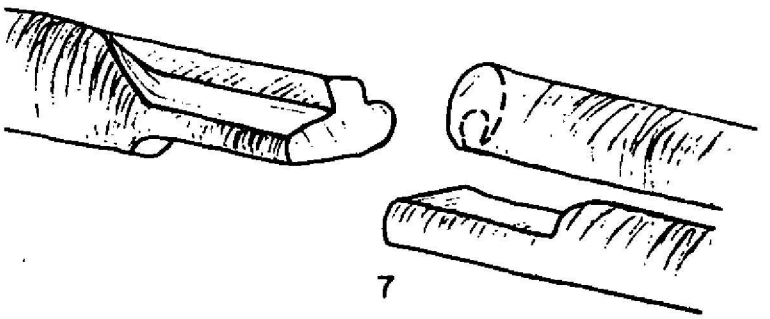

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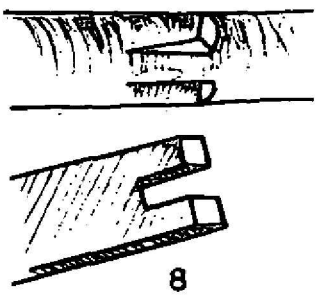

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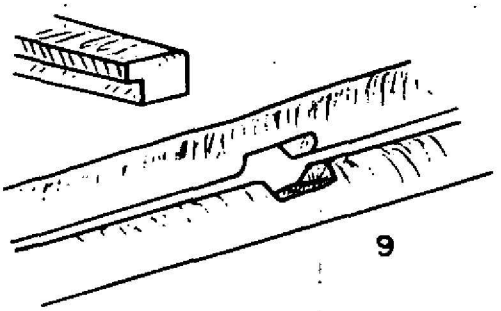

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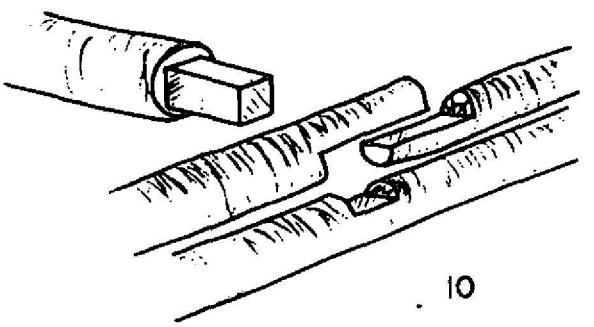

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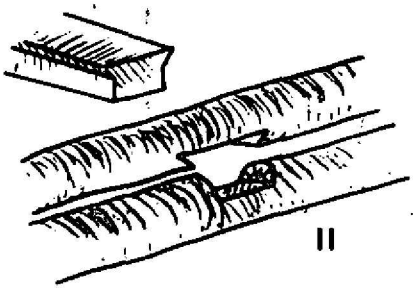

11

ROW EXTENTION

5 HALF LAP

6 HALF LAP WITH METAL BOLT FASTENING

7 SCARF JOINT WITH HALF LAP DOVETAIL CLEAT

JOINTS OF THE THIRD ROW

8 MITRE JOINT

9 SHOULDERED HOUSING

10 HOUSING AT CHECK AND SHOULDER OF HALF LAP

11 DOVETAIL JOINT