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**EAST RIVER ESPLANADE
AND PIERS
BOROUGH OF MANHATTAN
NEW YORK, NEW YORK**

**ARCHAEOLOGICAL
FIELD MONITORING
AND
SOIL BORING ANALYSIS**

NYS OPRHP No. 06PR00221

LPC Project No. LMDC/106-M



1037

**EAST RIVER ESPLANADE AND PIERS
ARCHAEOLOGICAL FIELD MONITORING
AND SOIL BORING ANALYSIS
BOROUGH OF MANHATTAN
NEW YORK, NEW YORK**

NYS OPRHP No. 06PR00221

LPC Project No. LMDC/106-M

Prepared For:
New York City Economic Development Corporation
110 William ST
New York, NY 10038

Prepared By:

Historical Perspectives, Inc.
P.O. Box 3037
Westport, CT 06880

Primary Authors: Sara Mascia, Ph.D., RPA
Richard Schaefer, Ph.D.

March 2008

MANAGEMENT SUMMARY

SHPO Project Review Number (if available): 06PR00221

Involved State and Federal Agencies: Lower Manhattan Development Corporation (LMDC), New York State Office of Environmental Protection (NYSDEP), New York State Office of Parks, Recreation and Historic Preservation (OPRHP), U.S. Army Corps of Engineers, U.S. Department of Housing and Urban Development (HUD)

Phase of Survey: Phase 1B Archaeological Field Monitoring and Soil Borings

Location Information

Location: South Street and Marginal Streets between Broad Street and Coenties Slip, Wall Street and John Street, and Pike Street and Rutgers Slip
Minor Civil Division: 06101 Manhattan
County: New York

Survey Area

Length: varies
Width: varies
Number of Acres Surveyed: <.002 acres

USGS 7.5 Minute Quadrangle Maps: Brooklyn, Jersey City

Archaeological Survey Overview

Number & Interval of Shovel Tests: N/A
Number & Size of Units: N/A
Width of Plowed Strips: N/A
Surface Survey Transect Interval: N/A

Results of Archaeological Survey

Number & name of precontact sites identified: None
Number & name of historic sites identified: None
Number & name of sites recommended for Phase II/Avoidance: None

Report Authors(s): Sara F. Mascia, Ph.D., RPA; Richard G. Schaefer, Ph.D. Historical Perspectives, Inc.

Date of Report: March 2008

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INTRODUCTION

The Lower Manhattan Development Corp. (LMDC) is the lead agency for the development of the proposed East River Waterfront Esplanade and Piers Project (ERE), which is intended to revitalize the East River waterfront by improving a two-mile-long, City-owned public open space connecting the Whitehall Ferry Terminal and Peter Minuit Plaza on the south with East River Park on the north. The Area of Potential Effect (APE) runs along present South and Marginal Streets roughly from Whitehall Street to Jackson Street, along the East River shoreline of the Borough of Manhattan (Figure 1).

Historical Perspectives, Inc. (HPI) has completed three Phase 1A documentary studies, each covering a section of the total APE, and has identified several categories of potential archaeological resources in the APE and determined that additional testing regarding potentially-surviving archaeological resources is necessary. These studies and their conclusions have been reviewed and approved by both the State Office of Parks, Recreation and Historic Preservation (SHPO) and the New York City Landmarks Preservation Commission (LPC) (6/14/07; 6/19/07; 7/12/07).

This report has been prepared in response to the availability of new subsurface data from a new set of soil borings performed in the APE (Appendix A: Soil Boring Logs), and from monitoring the excavation of two small test trenches (Trenches ERW-T6 and T7). The identified purpose for excavating the trenches was to determine the depth and extent of the existing FDR Drive column footings. The excavation of these trenches occurred on 10/30/07 and 10/31/07 under a monitoring protocol prepared by HPI.¹

Specifically, the new subsurface data relates to APE Segments 2, 4, and 7, which were evaluated in the two Phase 1A reports covering the dry land APE. The two reports divided the inboard APE into sections north and south of the Brooklyn Bridge.² The areas of potential archaeological sensitivity, their locations, depths, and the types of resources are detailed in Appendix B.

The Phase 1A technical reports' conclusions and recommendations for further archaeological consideration were based, in part, on the subsurface data available at the time of evaluation. As with any active urban site with a long history of use, however, there are many unknown variables that may have affected the subsurface integrity of a city lot, bulkhead, or streambed. The collection of new subsurface data can provide the opportunity to revise and/or focus the conclusions and recommendations of the approved studies, and for that purpose are analyzed below.

¹Monitoring Protocol and Unanticipated Discovery Plan for the Geotechnical Investigations of Marginal Road Area between Pine Street and Rutgers Slip: Cultural Resources. East River Waterfront Esplanade and Piers LMDC/106-M. Historical Perspectives, Inc., Westport, CT. September 25, 2007.

²East River Waterfront Esplanade and Piers – Inboard Resources Whitehall Street to the Brooklyn Bridge Phase 1A; East River Waterfront Esplanade and Piers – Inboard Resources Brooklyn Bridge to Jackson Street Phase 1A, both HPI, 2007.

PHASE 1A CONCLUSIONS FROM SUBSURFACE DATA

Based on soil boring data (WPA 1965) and documentary evidence of deep dredging disturbance related to the construction and maintenance of 19th- and 20th-century piers, and the construction of the modern East River bulkhead, the Phase 1A study concluded that potential archaeological sensitivity was eliminated in the sections of Segments 2, 4, and 7 which are within 42.5 feet of the modern bulkhead. This eliminated area generally encompasses most of what is today called Marginal Street. The areas of potential sensitivity for some archaeological resources were further limited to the northern (landward) 70 feet of present South Street, based on the late time period (ca. 1900) in which the land on the river side of this line was bulkheaded and filled (Appendix B).

Soil boring log evidence of this deep dredging and construction disturbance is the absence of the historical and/or precontact riverbottom, or the submerged precontact surface. A substantial stratum of river mud deposits, overlying strata of glacial till, would indicate the presence of the riverbottom.

NEW SOIL BORING LOGS

Segment 2 – Broad Street to Vietnam Veterans Plaza, on South and Marginal Streets

Two soil borings, ERW-L10 and ERW-L11, were completed between Broad Street and Coenties Slip in Segment 2. For their locations, see Figure 2.

ERW-L10 was performed in the Marginal Street section of Segment 2 that is not considered archaeologically sensitive due to historical dredging activities. Research found that dredging would have cleared deposits down to the shallow bedrock (24 feet below mhw³). Even routine slip maintenance in the vicinity involved dredging to between 25 and 35 feet below mhw. The recent date (early 20th century) of the subsequent deposit of fill materials also rules out potential archaeological sensitivity. The data from this soil boring log confirms both this interpretation and the data presented in the Phase 1A report logs (the nearest is Sheet 1 #473), which records large amounts of fill (more than 16 feet in ERW-L10) and thin, or missing, river mud strata. For boring log ERW-L10, the thin stratum of black organic silt mixed with fill encountered at 9 feet below mhw, and the “wood obstruction” recorded atop the bedrock at 19 feet below mhw, were by their shallowness, clearly early 20th century deposits.

ERW-L11 was performed in the landward 70 feet of South Street, which had been bulkheaded and filled by ca. 1800. This location is considered sensitive for Sunken Vessels; Landfill retaining structures, wharves and piers; Landfill deposits; and wooden water mains.

³The new boring logs use the surface as elevation datum (i.e., 0.0 feet) and have been converted to elevations relative to mean high water (mhw), which in this part of Segment 2 is approximately 5 feet below the current surface (WPA 1965:Sheet 1, Borings #473, 474). Hence bedrock encountered at 29 and 28 feet below the surface, is at an elevation of approximately 24 and 23 feet below mhw, respectively.

Like the earlier soil boring logs from this part of South Street where early cribworks were sunk (Sheet 1 #472, #474, #476), ERW-L11 records a substantial fill stratum 21 feet thick, (extending to approximately 16 feet below mhw), over a relatively thin 7-foot stratum of silty sand and rock fragments. This data, together with the presence of shallow bedrock (23 feet below mhw), suggests that the submerged precontact surface would have been removed through dredging episodes prior to or at the time of bulkheading and filling (by ca. 1800), thus eliminating potential precontact and early historical river bottom archaeological remains.

Segment 4 – Old Slip to the North Side of Pier 15 between Fletcher and John Streets

Soil Boring ERW-L1

According to the location maps, ERW-L1 was performed immediately outside the areas potentially sensitive for archaeological resources, i.e., within 42.5 feet of the modern bulkhead (Figure 2). This location would have been impacted by dredging and other preparations for the construction of the modern bulkhead. As would be expected, a comparison of the ERW-L1 boring log with the adjacent boring logs from the sensitive location in South Street (Sheet 4 #337), and non-sensitive location in Marginal Street (Sheet 4 #338) clearly points up the similarities between ERW-L1 and the non-sensitive location boring. ERW-L1 shows large amounts of fill (>32 feet, extending to 27 feet below mhw⁴) mixed with sand, gravel, rock fragments, wood, over silty clay, sand and silt. There is no thick river mud strata, which indicates the results of dredging preparation for modern bulkhead construction, where river mud deposits were removed to a sand stratum (to between 35 and 40 feet below mhw in this area of deep bedrock), prior the driving of piles.

Field Monitoring

Trench ERW-T6

According to the schematic map provided, the test trench location, west of Maiden Lane, is within 15 feet to the south of, but not within the areas of Segment 4 designated as archaeologically sensitive (Figure 2; Photograph 1). Adjacent to the FDR Column in this location, a 1.8 x 2 meter/6 x 7 foot trench was excavated in order to determine the depth and breadth of the below-ground footing.

The concrete footing was encountered at a depth of 76 cm/2.5 feet below the surface asphalt (2 feet above mhw). The footing was found to be 76 cm/2.5 feet thick, extending to a depth of 1.5 meters/5 feet below the surface (0.5 feet below mhw). It was within a stratum of miscellaneous fill, which was above, beneath, and around the footing (3 feet above mhw to >0.5 feet below mhw). The fill was comprised of very dark grayish brown (10YR3/2) silty gravelly sand. Also noted in the fill were some fragments of 20th-century artifacts including part of a blue cosmetic bottle, a graniteware finial, a spall of whiteware with blue decal decoration, slag, and very small brick fragments. Excavation halted just below the base of the concrete footing (Photograph 2).

⁴The new boring logs use the surface as elevation datum (i.e., 0.0 feet) and have been converted to elevations relative to mean high water (mhw), which in this part of Segment 4 is approximately 5 feet below the current surface (WPA 1965: Sheet 4 Borings #337-338). Hence a fill stratum extending to 32 feet below the surface would reach an elevation of approximately 27 feet below mhw.

Approximately one quarter of the footing was exposed. Based on the size of the exposed portion, the entire footing was determined to be approximately 3.35 x 2.74 meters/11 x 9 feet, aligned with its longer dimension parallel to South/Marginal Streets and the FDR Drive. Since trench excavation did not extend more than 45 cm/1.5 feet beyond the edge of the footing, it could not be determined whether the fill was redeposited from the footing location, or brought in from elsewhere. No evidence of historical or precontact archaeological features, or artifact concentrations, was observed during the monitoring of this excavation trench.

Segment 7 North of Pier 15 (between Fletcher and John Streets) to Montgomery Street

Soil Borings ERW-L3, L4, and L5

Soil Borings ERW-L3 (East of Pike Street), L4 (West of Rutgers Slip), and L5 (Rutgers Slip) were performed immediately outside the areas of potential archaeological sensitivity in Segment 7, the Marginal Street section of APE (Figure 3). Based on documentary evidence, the area within 42.5 feet of the modern bulkhead was eliminated from further archaeological consideration due to the deep dredging (recorded at between 30 and 37 feet below mhw) and foundation construction associated with the construction of the bulkhead.

Similar to the logs from the nearby soil borings (Sheet 10 #103-106, #113-118) evaluated for the Phase 1A report, the three new logs record large fill strata (extending to 33 feet,⁵ 19.5 feet, and 36 feet below mhw, respectively), with wood and rocks recorded in and beneath the fill strata of ERW-L3 and L5, as would be expected on made land which has undergone multiple pier crib/bulkheading construction and removal episodes.

Documentary research indicated that dredging (between 30 and 37 feet below mhw) occurred around this location in 1899. Within ERW-L4 and L3 (20 to 22 feet below mhw), the organic silt/mud strata were thin and shallow, which is consistent with post-dredging 20th-century deposits that would be present following the reported extensive dredging activity. In ERW-L5 a grey organic silt and clay stratum extends below the proposed dredging zone (36 to 42 feet below mhw), yet this stratum also contains wood, and its presence would not be incompatible with a scenario of local material redeposited as fill once the bulkhead was completed; or surviving, isolated pockets of deep mud due to inconsistent dredging practices. These appear scattered around the APE in some of the nearby boring logs (Sheet 10 #104, #114, #116).

Field Monitoring

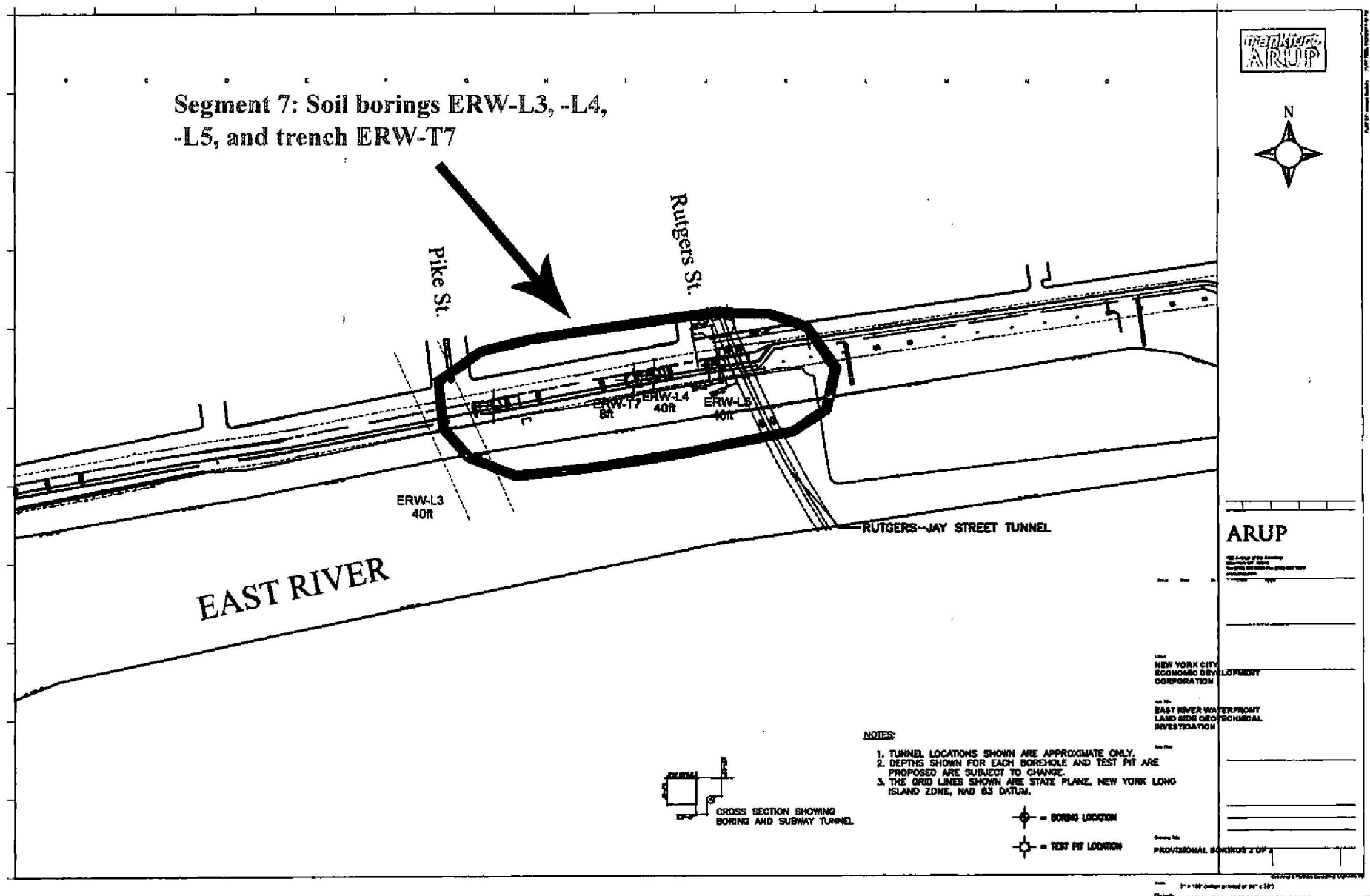
Trench ERW-T7

According to the schematic map, the test trench location west of Rutgers Slip, is approximately 15 feet to the south of the areas of Segment 7 designated as archaeologically sensitive (Figure 3: Appendix B). Trench ERW-T7 was again located adjacent to an FDR support column (Photograph 3). The excavation trench was approximately 3.35 x 3 meters/11 x 9.8 feet in size. The concrete footing was encountered at approximately 1 meter/3.5 feet (0.5 feet *above* mhw),

⁵The new boring logs use the surface as elevation datum (i.e., 0.0 feet) and have been converted to elevations relative to mhw, which in this part of Segment 7 is approximately 4 feet below the current surface (WPA 1965:Sheet 10 #103-106). Hence fill strata extending to 33 feet below the current surface are at an elevation of approximately 29 feet below mhw.

and was 76 cm/2.5 feet thick, extending to 1.8 meters/6 feet below the surface (2.0 feet below mhw). Following the removal of the asphalt, two former concrete surface pads were found before a fill level was encountered. The footing was within the stratum of dark brown to black (10YR 3/1) miscellaneous fill, which was found above, beneath, and around the footing (approximately 2 feet above mhw to >2.0 feet below mhw). The fill also contained a significant amount of gravel along with architectural fragments (brick, mortar, sewer pipe) and a handful of scattered artifacts (whiteware, colorless bottle glass, Rockingham ceramic, and oyster shell). Excavation halted approximately 0.6 meters/2 feet below the base of the concrete footing when water was encountered (Photographs 4 and 5).

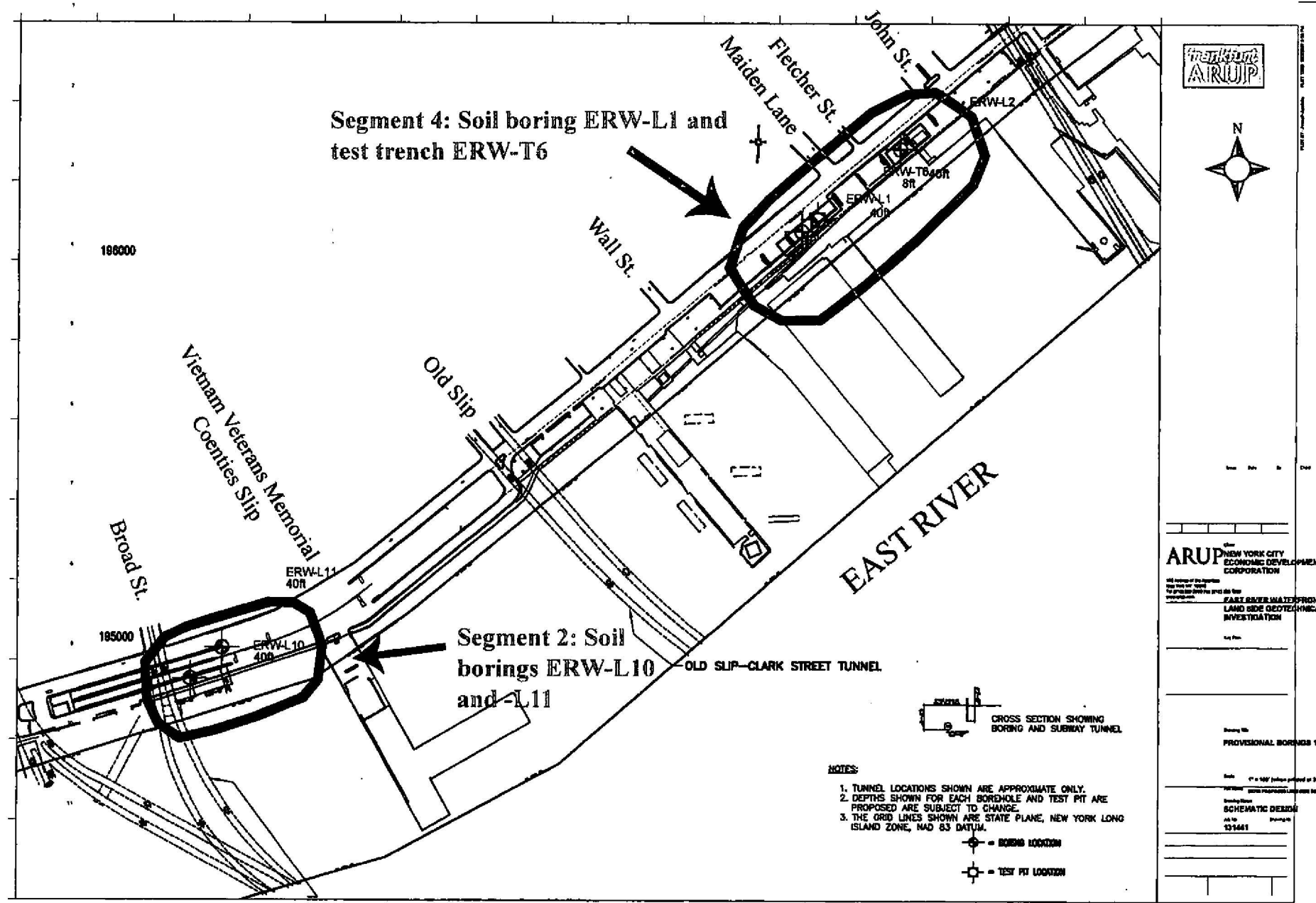
Similar to the footing found in ERW-T6, the footing size in ERW-T7 was approximately 3.35 x 2.74 meters/11 x 9 feet, aligned with its longer dimension parallel to South/Marginal Streets and the FDR Drive. Since trench excavation did not extend more than 1 meter/3 feet beyond the edge of the footing, it could not be determined whether the fill was redeposited from the footing installation, or brought in from elsewhere. No evidence of historical or precontact archaeological features, or artifact concentrations, was observed during the monitoring of this excavation trench.



EAST RIVER ESPLANADE AND PIERS: Archaeological Field Monitoring and Soil Boring Analysis

FIGURE 3. SOIL BORINGS AND TEST TRENCH LOCATIONS IN SEGMENT 7





EAST RIVER ESPLANADE AND PIERS: Archaeological Field Monitoring and Soil Boring Analysis

FIGURE 2. SOIL BORINGS AND TEST TRENCH LOCATIONS IN SEGMENTS 2 AND 4



APPENDIX A

SOIL BORING LOGS

Bus.: (845) 365-9710

Fax: (845) 365-9713

CMI**Subsurface
Investigations, Inc.****BORING NO. ERW - L1**

375 Western Highway Tappan, New York 10983

SHEET 1 of 2**BORING LOG****PROJECT:** East River Waterfront Landside Investigation**PROJECT NO.:****LOCATION:** Manhattan, New York**START DATE:** 10/07**CLIENT:** Frankfurt / ARUP JV**FINISH DATE:** 10/07**INSPECTOR:** L. Moretti**DRILLER:** J. Imperato**HELPER:** T. Tserbis**RIG:** B-61

DEPTH (FEET)	SAMPLE NO.	DEPTH (FEET)	SOIL BLOWS / 6"				REMARKS (INCHES)	ROCK CORE		ROD %	SOIL/ROCK DESCRIPTION & REMARKS	CASING LOGS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
—											Rollerbit Through Multiple Pavements 0' to 3'	
—	S-1	3	100				1				Grey Concrete (FILL) (11-65)	
—		5	5									
—	S-2	5	17	13	8	8	1				Brick Fragments (FILL) (11-65)	
—		7									Note: Rollerbit Through Obstructions From 7' to 10'	
—												
—												
10												
—	S-3	10	4	5	4	6	1				Black Rock Fragments (FILL) (11-65)	
—		12										
—	S-4	12	8	6	14	19	8				Brown Silty SAND & GRAVEL Mixed w/Misc. Fill (FILL) (11-65)	
—		14										
15	S-5	15	12	8	15	18					WOOD (FILL) (11-65)	
—		17										
—												
—												
20												
—	S-6	20	30	20	9	9	3				WOOD & ROCK FRAGMENTS (FILL) (11-65)	
—		22										
—												
25	S-7	25	7	9	10	8	4				ROCK FRAGMENTS (FILL) (11-65)	
—		27										
—												
30												
—	S-8	30	9	16	11	13	6				Misc. FILL (FILL) (11-65)	
—		32										
—												
35	S-9	35	WR	WR	WR	5	18				Grey Silty CLAY (CL.) (9-65)	
—		37										

TOOLS & EQUIPMENT USED

CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	-
CORE BIT USED	DIA	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	
OBSERVATION WELL		
DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT.)
	N/A	

BORING NO. ERW - L1 SHEET 1 OF 2

Fax.: (845) 365-9713

BORING NO. ERW - L1

CMI

**Subsurface
Investigations, Inc.**

SHEET 2 of 2

375 Western Highway Tappan, New York 10983

BORING LOG

PROJECT: East River Waterfront Landside Investigation

PROJECT NO.:

LOCATION: Manhattan, New York

START DATE: 10/07

CLIENT: Frankfurt / ARUP JV

FINISH DATE: 10/07

INSPECTOR: L. Moretti

DRILLER: J. Imperato

HELPER: T. Tserbts

RIG: B - 61[illegible]

TOOLS & EQUIPMENT USED

TABLE OF EQUIPMENT USED			
CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	-
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

GROUND WATER DATA

GROUND WATER DATA		
DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	

OBSERVATION WELL		
DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
	N/A	

MISCELLANEOUS ITEMS:

BORING NO. ERW-L1 SHEET 2 OF 2

Bus.: (845) 365-9710

Fax.: (845) 365-9713

CMI**Subsurface
Investigations, Inc.**

375 Western Highway Tappan, New York 10983

BORING NO. ERW - L31

SHEET 1 of 1

BORING LOG

PROJECT: East River Waterfront Landside Investigation

LOCATION: Manhattan, New York

CLIENT: Frankfurt / ARUP

INSPECTOR: L. Moretti

DRILLER: F. Navarro

HELPER: N. Delre

PROJECT NO.:

START DATE: 10/07

FINISH DATE: 10/07

RIG: B - 61

DEPTH (FEET)	SAMPLING NO.	DEPTH (FEET/IN)	SOIL BLOWS / 6"				REMARKS (FEET)	ROCK CORE		RQD %	SOIL/ROCK DESCRIPTION & REMARKS	CASING BLOWS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
—	S-1	1 3	100	-	-	-	1				ASPHALT over CONCRETE Blue/Grey Gravel	
—	S-2	3 5	21	7	19	8	10				Brown Silty SAND & GRAVEL (FILL) (11-65)	
—	S-3	5 7	12	15	12	9	10				Ditto (FILL) (11-65)	
—											Note: Drilled Through Multiple Obstructions From 7' to 10'	
10	S-4	10 12	100 3	-	-	-	1				WOOD FILL (FILL) (11-65)	
—												
15	S-5	15 17	22	100 4	-	-	3				WOOD & MISC. FILL (FILL) (11-65)	
—											Note: Drilled Through Multiple Obstructions From 17' to 20'	
20	S-6	20 22	75	100 4	-	-	4				WOOD FILL (FILL) (11-65)	
—												
25	S-7	25 27	9	20	13	12	8				BLACK MISC. FILL (FILL) (11-65)	
—											Note: Drilled Through Multiple Obstructions From 27' to 30'	
30	S-8	30 32	2	9	3	36	6				WOOD	
—												
35	S-9	35 37	100 4	-	-	-	2				WOOD & ROCK FRAGMENTS (FILL) (11-65)	
—											E.O.B. @ 37'	

TOOLS & EQUIPMENT USED

CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	NO
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	
OBSERVATION WELL		
DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT.)
	N/A	

BORING NO. ERW - L3 SHEET 1 OF 1

Bus.: (845) 365-9710

Fax.: (845) 365-9713

CMI**Subsurface
Investigations, Inc.**

375 Western Highway Tappan, New York 10983

BORING NO. ERW - L4**SHEET 1 of 2****BORING LOG****PROJECT:** East River Waterfront Landside Investigation**PROJECT NO.:****LOCATION:** Manhattan, New York**START DATE:** 10/07**CLIENT:** Frankfurt / ARUP JV**FINISH DATE:** 10/07**INSPECTOR:** L. Moretti**DRILLER:** J. Imperato**HELPER:** T. Tserbis**RIG:** B - 61

DEPTH (FEET)	SAMPLE NO.	DEPTH (FEET)	SOIL BLOWS / 6"				RECOVERY (INCHES)	ROCK CORE		RQD %	SOIL/ROCK DESCRIPTION & REMARKS	CASING BLOWS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
—	S-1	1 3	100 6	-	-	-	1				ASPHALT over CONCRETE Grey Rock Fragments (FILL) (11-65)	
—	S-2	3 5	100 2	-	-	-	2				Ditto (FILL) (11-65)	
— 5	S-3	5 7	8	6	7	8	2				Brown Gravel (FILL) (11-65)	
—	S-4	7 9	100 0	-	-	-	NR				No Recovery Note: Rollerbit Through Obstructions From 7' to 10'	
— 10	S-5	10 12	1	2	3	3	6				Brown Silty SAND Mixed w/Brick Fragments (FILL) (11-65)	
— 15	S-6	15 17	2	3	4	3	2				Ditto (FILL) (11-65)	
— 20	S-7	20 22	2	2	1	3	NR				No Recovery (Two Attempts) (FILL) (11-65) Bottom of Fill @ 23.5'	
— 25	S-8	25 27	12	7	3	3	16				Black Organic Silty CLAY (OL) (10-65)	
— 30	S-9	30 32	WR	WR	2	1	16				Grey Silty CLAY w/m-f SAND (CL) (9-65)	
— 35	S-10	35 37	1	2	3	6	16				Ditto (CL) (9-65)	

TOOLS & EQUIPMENT USED

CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	-
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	

OBSERVATION WELL

DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
	N/A	

BORING NO. ERW - L4 SHEET 1 OF 2

Bus.: (845) 365-9710

Fax.: (845) 365-9713

CMISubsurface
Investigations, Inc.

BORING NO. ERW - L4

SHEET 2 of 2

375 Western Highway Tappan, New York 10983

BORING LOG

PROJECT: East River Waterfront Landside Investigation

PROJECT NO.:

LOCATION: Manhattan, New York

START DATE: 10/07

CLIENT: Frankfurt / ARUP JV

FINISH DATE: 10/07

INSPECTOR: L. Moretti

DRILLER: J. Imparato

HELPER: T. Tserbis

RIG: B - 61

DEPTH (FEET)	SAMPLE NO.	DEPTH (FEET)	SOIL BLOWS / 6"				RECOVERY (PERCENT)	ROCK CORE		RCD %	SOIL/ROCK DESCRIPTION & REMARKS	CASINO BLOWS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
40	S-11	40 42	2	2	3	3	18				Ditto (CL) (9-65)	
45	S-12	45 47	12	25	13	11	8				Brown Silty c-f SAND, Trace fine Gravel (SP-SM) (7-65)	
50	S-13	50 52	19	17	19	18	3				Brown Silty SAND & GRAVEL (GP-GM) (6-65)	
55	S-14	55 57	18	23	20	33	3				Ditto (GP-GM) (6-65)	
60	S-15	60 62	40	36	20	16	6				Ditto (GP-GM) (6-65)	
65											E.O.B. @ 62'	
70												
75												

TOOLS & EQUIPMENT USED

CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	-
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	
OBSERVATION WELL		
DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
	N/A	

BORING NO. ERW-L4 SHEET 2 OF 2

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BORING NO. ERW - L5

SHEET 1 of 2

BORING LOG

PROJECT: East River Waterfront Landside Investigation

PROJECT NO.:

LOCATION: Manhattan, New York

START DATE: 10/07

CLIENT: Frankfurt / ARUP JV

FINISH DATE: 10/07

INSPECTOR: L. Moretti

DRILLER: F. Navarro

HELPER: N. Delre

RIG: B - 61

DEPTH (FEET)	SAMPLE NO.	DEPTH (FEET)	SOIL BLOWS / 6"				RECOVERY (INCHES)	ROCK CORE		RQD %	SOIL/ROCK DESCRIPTION & REMARKS	CASING BLOWS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
—											ASPHALT OVER CONCRETE NOTE: Drilled Through Multiple Layers of Pavement 0' to 3'	
—	S-1	3 5	3	6	5	9	6				Brown Silty SAND & GRAVEL (FILL) (11-65)	
—	S-2	5 7	17	27	25	36	6				Ditto (FILL) (11-65)	
—	S-3	7 9	1	1	4	5	0				No Recovery (Two Attempts)	
—												
—	S-4	10 12	5	7	10	12	4				Misc. FILL & ROCK FRAGMENTS (FILL) (11-65)	
—												
—	S-5	15 17	11	17	15	10	6				Ditto (FILL) (11-65)	
—												
—												
—	S-6	20 22	17	35	28	34	16				GREY ROCK FRAGMENTS (FILL) (11-65)	
—												
—	S-7	25 27	11	100 3	-	-	4				WOOD (FILL) (11-65)	
—												
—	S-8	30 32	15	60	53	41	18				Grey Weathered ROCK FRAGMENTS (FILL) (11-65)	
—												
—	S-9	35 37	10	12	13	11					WOOD & ROCK FRAGMENTS (FILL) (11-65)	
—												

TOOLS & EQUIPMENT USED

CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	-
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

MISCELLANEOUS ITEMS: -

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	
OBSERVATION WELL		
DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
	N/A	

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BORING NO. ERW - L5

SHEET 2 of 2

375 Western Highway Tappan, New York 10983

BORING LOG

PROJECT: East River Waterfront Landside Investigation

PROJECT NO.:

LOCATION: Manhattan, New York

START DATE: 10/07

CLIENT: Frankfurt / ARUP JV

FINISH DATE: 10/07

INSPECTOR: L. Moretti

DRILLER: F. Navarro

HELPER: N. Delre

RIG: B - 61

DEPTH (FEET)	SAMPLE NO.	DEPTH (FEET)	SOIL BLOWS / 6"				RECOVERY (%)	ROCK CORE		RQD %	SOIL/ROCK DESCRIPTION & REMARKS	CALCULATED BLOWS
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
40	S-10	40 42	6	9	6	5	6				Grey Organic SILT & CLAY (OL) (10-65)	
45	S-11	45 47	13	13	12	16	8				Ditto, Mixed w/WOOD (OL) (10-65)	
50	S-12	50 52	13	28	15	17	18				Grey CM (?) Fine SAND, Trace Silt (SP-SM) (7-65)	
55	S-13	55 57	12	14	14	19	18				Brown CM (?) Fine SAND, Trace Silt (SP-SM) (7-65)	
60	S-14	60 62	10	9	8	8	14				Ditto (SP-SM) (7-65)	
65	S-15	65 67	7	10	15	14	10				Brown m-f SAND, Trace Silt (SP-SM) (7-65)	
70											E.O.B. @ 67'	
75												

TOOLS & EQUIPMENT USED

CASING SIZE	4"	SPOON SIZE	2"
CASING HAMMER	300 #	SPOON HAMMER	140 #
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"
CORE BARREL USED	NX	DRILLING MUD USED	-
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-
AUGER SIZE	-	STANDBY TIME	-

MISCELLANEOUS ITEMS:

GROUND WATER DATA

DATE	TIME	DEPTH (FT.)
	N/A (TIDAL)	
OBSERVATION WELL		
DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
	N/A	

BORING NO. ERW-L5 SHEET 2 OF 2

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BORING NO. ERW - L10

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SHEET 1 of 1

BORING LOG

PROJECT: East River Waterfront Landside Investigation

PROJECT NO.:

LOCATION: Manhattan, New York

START DATE: 10/07

CLIENT: Frankfurt / ARUP

FINISH DATE: 10/07

INSPECTOR: L. Moretti

DRILLER: J. Imparato

HELPER: T. Tserbis

RIG: B - 61

[illegible]

TOOLS & EQUIPMENT USED				GROUND WATER DATA		
CASING SIZE	4"	SPOON SIZE	2"	DATE	TIME	DEPTH (FT.)
CASING HAMMER	300 #	SPOON HAMMER	140 #		N/A (TIDAL)	
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"			
CORE BARREL USED	NX	DRILLING MUD USED	NO			
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-	OBSERVATION WELL		
AUGER SIZE	-	STANDBY TIME	-	DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
MISCELLANEOUS ITEMS:	-				N/A	

BORING NO. ERW - L10 SHEET 1 OF 1

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BORING NO. ERW - L11

SHEET 1 of 1

375 Western Highway Tappan, New York 10983

BORING LOG

PROJECT: East River Waterfront Landside Investigation

LOCATION: Manhattan, New York

CLIENT: Frankfurt / ARUP

INSPECTOR: L. Moretti

DRILLER: J. Imparato

HELPER: T. Tserbis

PROJECT NO.:

START DATE: 10/07

FINISH DATE: 10/07

RIG: B - 61

DEPTH (FEET)	SAMPLE NO.	DEPTH (FEET)	SOIL BLOWS / 6"				RECOVERY (PERCENT)	ROCK CORE		RQD %	SOIL/ROCK DESCRIPTION & REMARKS	CASING BELOW
			0"-6"	6"-12"	12"-18"	18"-24"		RUN (IN.)	REC. (IN.)			
—	S-1	1 3	18	100 2	—	—	3				ASPHALT over CONCRETE Grey Misc. FILL (FILL) (11-65) Black Silty SAND mixed w/Misc. FILL (FILL) (11-65) Brown Silty SAND mixed w/BRICK & Misc. FILL (FILL) (11-65) Note: Drilled Through Multiple Obstructions 7' to 10' Ditto (FILL) (11-65) Ditto (FILL) (11-65) S-6 Top: Ditto (FILL) (11-65) <u>BOTTOM FILL @ 21'</u> S-6 Bottom: Dark Grey Organic SILT Grey Silty fine SAND w/Mica Schist Rock Fragments (SP-SM) (7-65) Grey MICA SCHIST Slightly Weathered Joints (9 PCS.) (2-65) DITTO (5 PCS.) (1-65) E.O.B. @ 38'	
—	S-2	3 5	12	42	100 4	—	6					
—	S-3	5 7	10	7	7	6	12					
—												
10	S-4	10 12	4	2	1	2	6					
—												
15	S-5	16 17	10	9	11	13	14					
—												
20	S-6	20 22	6	2	11	38	16					
—												
25	S-7	25 27	2	8	16	18	16					
—												
30	R-1	28 33						60	60			
—												
—	R-2	33 38						60	60			
35												
—												

TOOLS & EQUIPMENT USED				GROUND WATER DATA		
CASING SIZE	4"	SPOON SIZE	2"	DATE	TIME	DEPTH (FT.)
HAMMER FALL - CASING	300 #	HAMMER FALL - SPOON	140 #			
HAMMER FALL - CASING	24"	HAMMER FALL - SPOON	30"		N/A (TIDAL)	
CORE BARREL USED	NX	DRILLING MUD USED	NO			
CORE BIT USED	DIA.	UNDISTURBED SAMPLER	-	OBSERVATION WELL		
AUGER SIZE	-	STANDBY TIME	-	DEPTH (FT.)	DIAMETER (IN.)	SCREEN LENGTH (FT)
MISCELLANEOUS ITEMS:					N/A	

BORING NO. ERW - L11 SHEET 1 OF 1

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ERW - T6DEPTH (FT.)

0.00'	GROUND SURFACE
0.25'	ASPHALT
1.25'	CONCRETE (w/ 3/8" WIRE MESH)
2.00	3/4" CRUSHED STONE
3.00	MISC. FILL (Brown Silty SAND & Gravel (11-65) (SP-SM))
5.50	CONCRETE FOOTING

NOTE: FOOTING SIZE WAS
11.0 FT. IN THE DIRECTION OF FDR
(JOB NORTH/SOUTH); 9.0 FT. (JOB
EAST/WEST)

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ERW - T 7

TH (FT.)

0.00	GROUND SURFACE (ASPHALT)
0.25	ASPHALT
0.50	ASPHALT
0.75	ASPHALT
1.25	CONCRETE
1.50	ASPHALT
2.0	CONCRETE
3.50	
6.00	<div>CONCRETE FOOTING</div> <div> <p>MISC. FILL (Brown Silty SAND) ± Gravel mixed w/ wood, brick, etc.) TIDAL GROUNDWATER (11-65) (SP. SM)</p> </div>

NOTE: FOOTING SIZE WAS
11.0 FT IN THE DIRECTION OF FDR
(JOB NORTH/SOUTH); 9.0 FT (JOB EAST/
WEST)

APPENDIX B: AREAS OF ARCHAEOLOGICAL SENSITIVITY

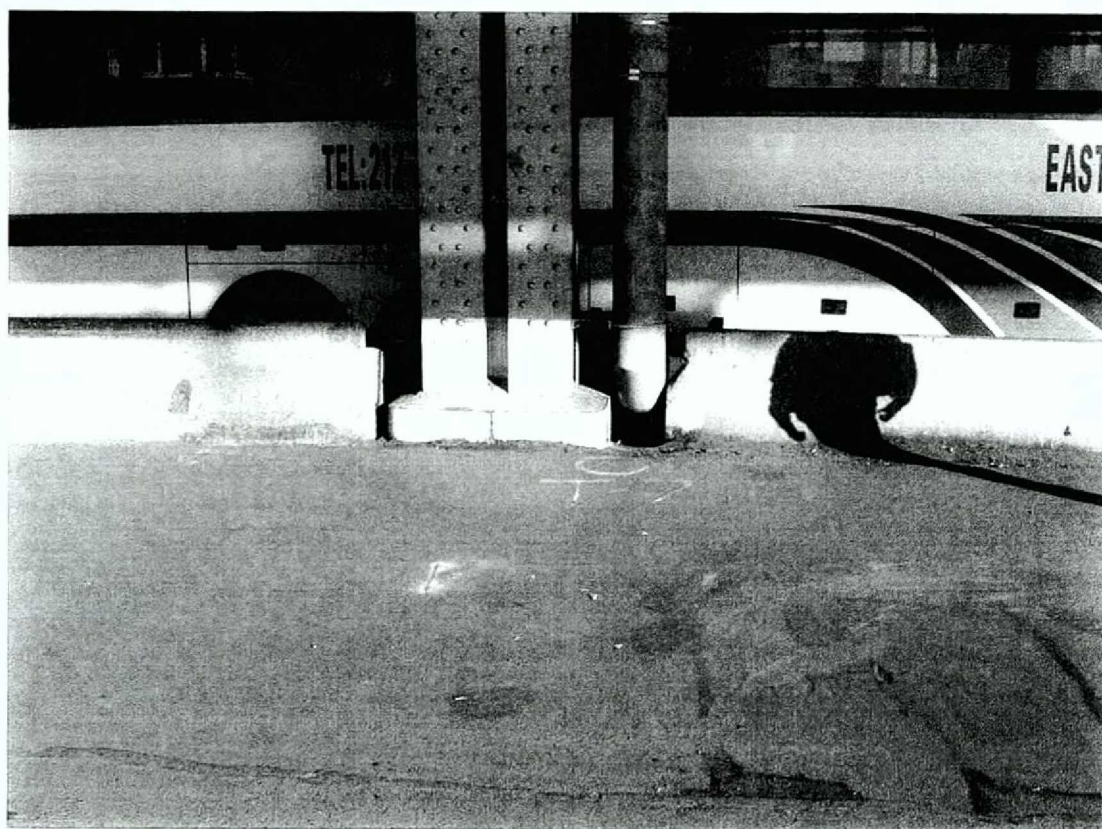
(Source: HPI, East River Waterfront Esplanade and Piers – Inboard Resources Whitehall Street to the Brooklyn Bridge Phase 1A; East River Waterfront Esplanade and Piers, 2007)

Resource	Location	Depth	Notes
Precontact	Segment 7: northern side of Marginal Street between Burling Slip and Fulton Street East	≥33.7 feet to ≥50.1 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Precontact	Segment 7: northern side of Marginal Street between Burling Slip and Fulton Street East	≥39 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Precontact	Segment 7: South and Marginal Streets mid-way between Dover and Roosevelt Streets (beneath the Brooklyn Bridge span)	≥36 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Sunken vessels	Segments 2 (and part of Segment 3)	2.0 feet below grade to bedrock stratum (19.9 to 25.7 feet below mhw)	Northern 70 feet of South Street
Riverbottom remains	Segment 7: northern side of Marginal Street between Burling Slip and Fulton Street East	25.5 feet to 50.4 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Riverbottom remains	Segment 7: northern side of Marginal Street between Burling Slip and Fulton Street East	25.4 feet to 39 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Riverbottom remains	Segment 7: South and Marginal Streets mid-way between Dover and Roosevelt Streets (beneath the Brooklyn Bridge span)	6.8 feet to 35.8 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Landfill retaining structures, wharves, piers	Segment 2 (and part of Segment 3)	2.0 feet below grade to bedrock stratum (19.9 to 25.7 feet below mhw)	Northern 70 feet of South Street
Landfill retaining structures, wharves, piers	Segment 4	2.0 feet below grade to 44.0 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Landfill retaining structures, wharves, piers	Segment 7	2.0 feet below grade to 44.4 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Landfill deposits	Segment 2 (and part of Segment 3)	2.0 feet below grade to bedrock stratum (19.9 to 25.7 feet below mhw)	Northern 70 feet of South Street
Landfill deposits	Segment 4	2.0 feet below grade to 45.6 feet below mhw.	Area within 42.5 feet of bulkhead not sensitive
Landfill deposits	Segment 7	2.0 feet below grade to 46.5 feet below mhw.	Area within 42.5 feet of bulkhead not sensitive
Wooden water mains	Segment 2 (and part of Segment 3)	Upper 4 feet beneath modern paving	Northern 70 feet of South Street
Wooden water mains	Segment 4	Upper 4 feet beneath modern paving	Northern 70 feet of South Street
Wooden water mains	Segment 7	Upper 4 feet beneath modern paving	Northern 70 feet of South Street

APPENDIX B: AREAS OF ARCHAEOLOGICAL SENSITIVITY

(Source: HPI, East River Waterfront Esplanade and Piers – Inboard Resources Brooklyn Bridge to Jackson Street Phase 1A, 2007)

Resource	Location	Depth	Notes
Landfill retaining structures, wharves, piers	Segment 7 Pavilions/Utility Connections from Roosevelt Street to Catharine Slip West	2.0 feet below grade to 40.1 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Landfill retaining structures, wharves, piers	Segment 7 Pavilions/Utility Connections from Catharine Slip West to Rutgers Slip West	2.0 feet below grade to 56 feet below mhw	Area 38 to 64 feet north of bulkhead not sensitive
Landfill deposits	Segment 7 Pavilions/Utility Connections from Roosevelt Street to Catharine Slip West	2.0 feet below grade to 40.1 feet below mhw	Area within 42.5 feet of bulkhead not sensitive
Landfill deposits	Segment 7 Pavilions/Utility Connections from Catharine Slip West to Rutgers Slip West	2.0 feet below grade to 60.6 feet below mhw	Area 38 to 64 feet north of bulkhead not sensitive



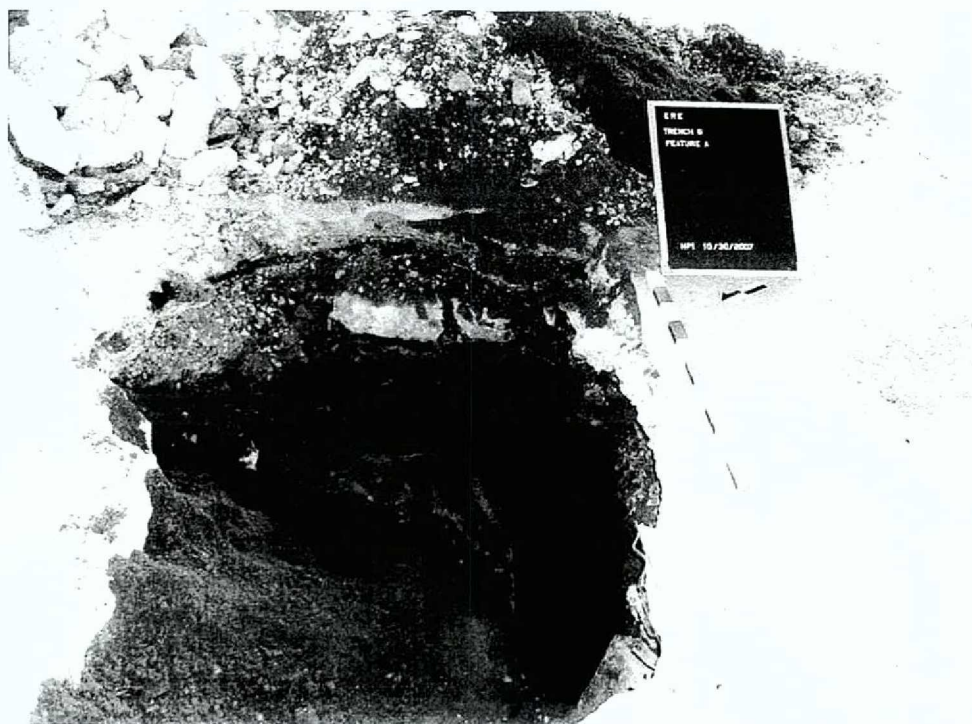
Photograph 3. Location of Trench ERW-T7, Prior to Excavation.



Photograph 4. Trench ERW-T7, Feature B, Facing Northwest.



Photograph 1. Location of Trench ERW-T6, Prior to Excavation.



Photograph 2. Trench ERW-T6, Feature A, Facing East.