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HISTORICAL PERSPECTIVES INC.

PHASE IA ARCHAEOLOGICAL ASSESSMENT

WORLD TRADE CENTER PROPERTY
BOUNDED BY CHURCH, VESEY, LIBERTY AND WEST STREETS

NEW YORK, NEW YORK

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Appendix B-3: **Phase 1A Archaeological Assessment: World Trade Center Property**

PHASE IA ARCHAEOLOGICAL ASSESSMENT

WORLD TRADE CENTER PROPERTY, BLOCK 58, LOT 1
BOUNDED BY CHURCH, VESEY, LIBERTY, AND WEST STREETS
NEW YORK, NEW YORK

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EXECUTIVE SUMMARY

The Lower Manhattan Development Corporation (LMDC) proposes to undertake, in cooperation with the United States Department of Housing and Urban Development and the Port Authority of New York and New Jersey, a World Trade Center Memorial and Redevelopment Plan (the Proposed Action) that includes construction of a World Trade Center Memorial and memorial-related improvements, as well as commercial, retail, museum and cultural facilities, new open space areas, new street configurations, and certain infrastructure improvements at the World Trade Center Site (WTC Site) and the Adjacent Sites including the two city blocks south of the WTC Site and portions of Liberty and Washington Streets (collectively the Southern Site) and possibly below grade portions of Site 26 in Battery Park City.

LMDC is conducting a coordinated environmental review pursuant to the National Environmental Policy Act (NEPA) and the New York State Environmental Quality Review Act (SEQRA). LMDC is preparing a Generic Environmental Impact Statement. This archaeological study was prepared as part of the environmental review process and to satisfy the requirements of Section 106 of the National Historic Preservation Act, and complies with the standards of the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) (New York Archaeological Council 1994) and the guidelines of the New York City Landmarks Preservation Commission (LPC) (CEQR 2001; LPC 2002). This report focuses on the WTC Site; a separate study was prepared for the Southern Site.

The WTC Site is known as Block 58, *Lot* 1, and bounded by Church Street on the east, Vesey Street on the north, Liberty Street on the south, and West Street on the west. All of the buildings formerly on the site were destroyed during a terrorist attack on September 11, 2001, and subsequently, most of the remains of these buildings have been demolished and removed.

This Phase IA assessment describes both current and pre-9/11 conditions on the project site (including soil and geological boring data), previous cultural resources investigations undertaken within and adjacent to the project site, the history of the property, and based upon the preceding sections, the site's sensitivity for the recovery of archaeological resources. The Area of Potential Effect (APE) will be referred to throughout this report, and constitutes the footprint of planned construction and disturbance on the site. Because construction plans are still being revised, the APE is considered the entire World Trade Center site.

The World Trade Center APE consists of two distinct areas: the portion of the property east of Greenwich Street, which originally was located on firm land above the Hudson River shoreline, and the area west of Greenwich Street, which was once under the waters of the Hudson River. All of the area west of Greenwich Street and large portions of the area east of Greenwich Street have been significantly disturbed by construction and excavation activities, precluding the recovery of any potential archaeological resources in these areas. Ruling out these portions of the APE, the following report concentrates

chiefly on those remaining sections that may still have the potential for archaeological resources. These are the southern part of the block once bounded by Liberty, Church, Greenwich, and Cortlandt Streets (former Block 60); and the northern part of the block once bounded by Vesey, Church, Greenwich, and Fulton Streets (former Block 85).

There is little likelihood that precontact archaeological resources have survived within the World Trade Center APE. Within the portion of the APE west of Greenwich Street, the lowest level that precontact deposits could have survived under the river-deposited silts is about 40 feet below grade. The "bathtub" excavation extends to a depth of about 70 feet below grade, ensuring that any potential precontact resources have been removed. East of Greenwich Street, within the two areas of the APE outside the former World Trade Center footprint along Liberty and Vesey Streets, the likelihood is also low that precontact archaeological resources have survived. Here, it is probable that original precontact occupation surfaces have been destroyed by basement construction in these areas.

Potential shaft features predating the 1850s may survive under former basements along areas north of Liberty Street, between Church and Greenwich Street, and south of Vesey Street, between Church and Greenwich Street. Where former basements were 10 feet below grade or less, there is a good likelihood for preservation of shaft features; the project team has assigned these lots a high archaeological sensitivity. Lots with former basements 20 feet or more below grade have a much lesser likelihood of shaft feature preservation, and are assigned a low archaeological sensitivity.

Based on these conclusions, further archaeological consideration in the form of Phase IB archaeological field testing is recommended for former lots assigned a high sensitivity within the two areas of the APE considered potentially sensitive. Those lots assigned a low sensitivity require no further archaeological investigations.

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I. INTRODUCTION

The Lower Manhattan Development Corporation (LMDC) proposes to undertake, in cooperation with the United States Department of Housing and Urban Development and the Port Authority of New York and New Jersey, a World Trade Center Memorial and Redevelopment Plan (the Proposed Action) that includes construction of a World Trade Center Memorial and memorial-related improvements, as well as commercial, retail, museum and cultural facilities, new open space areas, new street configurations, and certain infrastructure improvements at the World Trade Center Site (WTC Site) and the Adjacent Sites including the two city blocks south of the WTC Site and portions of Liberty and Washington Streets (collectively the Southern Site) and possibly below grade portions of Site 26 in Battery Park City.

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The WTC Site is known as Block 58, Lot 1, and bounded by Church Street on the east, Vesey Street on the north, Liberty Street on the south, and West Street on the west. All of the buildings formerly on the site were destroyed during a terrorist attack on September 11, 2001, and subsequently, most of the remains of these buildings have been demolished and removed.

This Phase IA assessment will describe both current and pre-9/11 conditions on the project site (including soil and geological boring data), previous cultural resources investigations undertaken within and adjacent to the project site, the history of the property, and based upon the preceding sections, the site's sensitivity for the recovery of archaeological resources. The Area of Potential Effect (APE) will be referred to throughout this report, and constitutes the footprint of planned construction and disturbance on the site. Because construction plans are still being revised, the APE is considered the entire World Trade Center site.

The World Trade Center APE consists of two distinct areas: the portion of the property located between Church Street and Greenwich Street, which originally was located on firm land above the Hudson River shoreline, and the area from Greenwich Street to West Street, which was once under the waters of the Hudson River. From the outset of this investigation, it was understood by the project team that the area from Greenwich Street to West Street, which was filled during the eighteenth and nineteenth centuries, has been significantly disturbed, first by excavation of the I.R.T. subway line along Greenwich

Street, and later for excavation of the 70-foot deep slurry wall (known as "the bathtub") that surrounded the twin towers complex. As will be described in detail, the excavation in these areas has extended well below the depth that any potential surviving archaeological resources could remain. Additionally, the portion of the site east of Greenwich Street that formerly contained the Hudson and Manhattan (H & M) Church Street Terminal (from Cortlandt to Fulton Streets), and later the World Trade Center complex itself (which rested on the old H & M foundations and extended north from Fulton Street and south from Cortlandt Street), has also been disturbed to a significant depth, precluding recovery of archaeological resources. Ruling out these portions of the APE, the following report concentrates chiefly on those remaining sections that may still have the potential for archaeological resources. These are the southern part of the block once bounded by Liberty, Church, Greenwich, and Cortlandt Streets (former Block 60); and the northern part of the block once bounded by Vesey, Church, Greenwich, and Fulton Streets (former Block 85). These two areas are shown on Figure 2.

The HPI project team consisted of Julie Abell Horn, M.A., R.P.A., who conducted the majority of the project research and wrote this report; Cece Saunders, M.A., R.P.A., who accompanied Ms. Horn on the site walkover, and Christine Flaherty, M.A., who collected the historic maps and prepared the graphics. Betsy Kearns and Faline Fox provided editorial and interpretive assistance.

II. METHODOLOGY

Preparation of this archaeological study involved using documentary, cartographic, and archival resources. Repositories visited (either in person or by using their on-line electronic resources) or contacted included the New York City Register; the New York City Municipal Archives; the New York City Department of Buildings; the New York City Department of Design and Construction; the New York Public Library; the Columbia University library; the LPC; and the NYSOPRHP. AKRF provided current site data and various maps.

A site walkover was undertaken on September 8, 2003 by Julie Abell Horn and Cece Saunders of HPI and Anne Locke of AKRF. Conditions were sunny and dry. The team made notes and took photographs of buildings, structures, and existing ground conditions.

III. ENVIRONMENTAL/PHYSICAL SETTING

As described above, prior to landfilling in the eighteenth and early nineteenth centuries, the portion of the World Trade Center APE east of Greenwich Street was on firm ground, whereas the area west of Greenwich Street was under water. Soil borings within and adjacent to the APE, conducted at various times during the twentieth century (most in the late 1960s and early 1970s, prior to construction of the former World Trade Center, the Westside Highway, and adjacent Battery Park City), are useful in reconstructing the past landforms and specific subsurface conditions on the site.

The foundation bedrock, which extends across the entire APE, is composed of a metamorphic rock known as the Manhattan formation. East of Greenwich Street, bedrock ranged from about 45-80 feet below sea level; bedrock was deepest between Cortlandt and Fulton Streets (70-80 feet), and shallowest at Liberty Street (45 feet). West of Greenwich Street, bedrock depths ranged from 45-70 feet below sea level, again with the shallowest area near Liberty Street (Moran et al. 1970).

Soil stratigraphy above the bedrock varied depending on location throughout the APE. In many soil borings, a stratum of decomposed rock, gravel, or boulders was found directly above the bedrock, ranging from 5-25 feet in thickness. In other locations, the rock layer was absent. In areas originally east of the Hudson River, a thick stratum of silt and sand (ranging from about 40-50 feet in thickness) was documented above the decomposed rock or bedrock. Above the silt and sand, there generally was a top layer, described variously as a mixture of sand, silt, and gravel, or decomposed rock, and in a few instances, fill material. This uppermost stratum ranged from 10-20 feet in thickness (Rock Data Map, Sheet 3).

Portions of the APE once under the Hudson River had bedrock or decomposed rock overlain by a thinner layer of coarse sand, 5-10 feet in thickness (which was the original glacially-deposited land surface prior to flooding of the Hudson River channel), then capped by a layer of silt, or "river mud" that accumulated on the river bottom over thousands of years (and ranged from 7-30 feet thick). The uppermost layer was historic fill, bringing the area up to its current elevation. In some instances, the fill material contained notations of wood, timbers, or cribbing, suggesting former wharf or bulkhead construction (Rock Data Map, Sheet 3).

Before landfilling occurred, all portions of the APE west of Greenwich Street were at about sea level, with Greenwich Street marking the approximate edge of the former shoreline. Historic filling, undertaken as the shoreline was moved west (and described in Section IV), raised these areas up to their twentieth century elevations. Sanborn maps indicate elevations above sea level of all intersections. Prior to construction of the former World Trade Center, these elevations within the APE were as follows:

Street intersection	Elevation
Church and Liberty	21
Church and Cortlandt	22

Street intersection	Elevation
Church and Dey	23
Church and Fulton	23
Church and Vesey	25
Greenwich and Liberty	11
Greenwich and Cortlandt	11
Greenwich and Dey	11
Greenwich and Fulton	9
Greenwich and Vesey	7
Washington and Liberty	5
Washington and Cortlandt	5
Washington and Dey	6
Washington and Fulton	5
Washington and Vesey	5
West and Liberty	4
West and Cortlandt	3
West and Dey	3
West and Fulton	3
West and Vesey	3

Dr. Dennis Weiss of City College has conducted research on reconstructing Paleo-shorelines in the metropolitan New York area. While working with Ed Rutsch on the Westway project (which later became the Route 9A project) he proposed that 6,000 years ago there was a cove at the intersection of West and Vesey Streets. It would now be about 30' below current sea level. He indicated a possible bay from Cedar Street to north of the World Trade Center, and an irregular shoreline forming a spit of land near Vesey Street, at about 40 feet below sea level (HCI 1983:57). The configuration of these drowned shoreline features is shown in Figure 3. Construction of the slurry wall surrounding the former twin towers complex (bounded by Liberty, West, Greenwich, and Vesey) necessitated excavation to a depth of 70 feet below street grade, a depth that far exceeds the Paleo shoreline location in this area (Port Authority 2003).

IV. BACKGROUND RESEARCH/HISTORICAL OVERVIEW

A. Site File Search Results

Research conducted at the NYSOPRHP, the LPC, and the library of HPI revealed one archaeological resource within the project APE, and a number of archaeological sites within a one-mile radius of the APE. Table 1, below, summarizes these resources. Those sites with NYSM or NYSOPRHP numbers are listed first; the remaining sites have been reported to the LPC and do not have site numbers.

The single archaeological resource documented within the APE was remains of a wooden ship dating to the Dutch period of occupation, and thought to be remains of the *Tyjger*, a vessel that burned and was abandoned along the shoreline in 1613. It was found during excavation for the I.R.T. subway line along Greenwich Street (at Dey Street) in 1916, and

documented by amateur historian James Kelly, who was a supervisor on the subway project. The ship, which consisted of a burned keelson and three rib frames, was found beneath about 9 feet of fill and 11 feet of river silt. Archaeologists Ralph Solecki and Bert Salwen returned to the area in 1967, when the World Trade Center was being built, and attempted to find the rest of the ship, which was thought to lie west of the I.R.T. line. Unfortunately, their efforts were unsuccessful, and the remains of the *Tyjger* were never found (Solecki 1974).

The remaining archaeological sites recorded within a one-mile radius of the APE are concentrated in the Financial District, the area within and surrounding the South Street Seaport, and the City Hall Park and Foley Square areas. Although researchers have undertaken a number of archaeological assessments in close proximity to the APE, such as the Westside Highway project (HCI 1983), the Route 9A project (Hartgen and HPI 1990), the 7 World Trade Center Project (Cobbs et al. 2002), and the AT&T building project (Greenhouse Consultants, Inc. 1985), these studies did not entail any archaeological testing, and therefore no sites were recorded. For that reason, these investigations are not included in the table, below. Sites that fall within larger historic districts (HD), either state or locally designated, are indicated.

Table 1: Archaeological sites within a one-mile radius of the APE

Site Number	Site Name	Location	Time Period	Remarks
NYSM 4059	Shell Point	Near Canal St.	Unknown Precontact	
NYSM 4060	N/A	Lower East side vicinity	Unknown Precontact	
A06101.000531	Clasons Point	Battery Park	Woodland	
A06101.007671	576 Broome St.	Above Canal St.	Unknown historic	Site form missing
A06101.001285	Washington Street Urban Renewal Site	Tribeca	Early nineteenth century	
A06101.001304	City Hall Park	City Hall Park	Eighteenth century	Part of Commons and African Burial Ground HD
A06101.000604	209 Water Street.	South Street Seaport Area	c. 1775-1800	Within South Street Seaport HD
A06101.000623	Telco Block	South Street Seaport Area	c. 1740-1775	Within South Street Seaport HD
A06101.001283	Barclay's Bank	Financial District	1750s-1820s	
A06101.001284	Assay Site	Financial District	Revolutionary era	

Site Number	Site Name	Location	Time Period	Remarks
A06101.001272	64 Pearl Street	Financial District	Late 17th century	
A06101.001282	Broad Street Plaza	Financial District	17th century-modern	
A06101.001271	175 Water Street	Near South Street Seaport	c. 1740-1780	
A06101.006763	Schermerhorn Row	South Street Seaport Area	1780-1810	
	Tyjger	Greenwich and Dey Streets	1613	Within project area
	7 Hanover Square	Financial District	Late 17th century	
	Old Slip and Cruger's Wharf	Financial District	1690-1800	
	Stadt Huys Site	Financial District	17th-19th centuries	
	Foley Square	North of City Hall Park	19th century	
	African Burial Ground	North of City Hall Park	18th-19th century	Within the Commons and African Burial Ground HD

B. Site History

1. Precontact Period

Indian settlement near fresh-water rivers and salt bays is known both from early documents and archaeological research conducted over the past 100 years. For this assessment, it is necessary to establish whether the World Trade Center site would have been attractive to the Native American population, and if so, what kind of sites might be expected.

To understand how Native Americans exploited different environmental niches over time, researchers typically separate the prehistory into time periods according to their distinct cultural differences. Archaeologists divide the Native American period into three sub-periods: the Paleo-Indian, the Archaic, and the Woodland, which are further divided as shown below:

PERIOD	YEARS BEFORE PRESENT (BP)
Paleo-Indian	13,000 – 10,000
Early Archaic	10,000 – 8,000

PERIOD	YEARS BEFORE PRESENT (BP)
Middle Archaic	8,000 - 6,000
Late Archaic	6,000 - 3,700
Terminal Archaic	3,700 – 2,700
Early Woodland	2,700 - 2,000
Middle Woodland	2,000 – 1,200
Late Woodland	1,200 – 300

Paleo-Indian Period

The sea level was notably lower during this period, so many sites that were once on well-drained land near the ancient coast are now submerged, and sites that later became swamps could have been dry land. Leonard Eisenberg's research has indicated that three types of terrain were preferred for Paleo-Indian sites (Eisenberg 1978):

- lowland waterside camps near coniferous swamps and near larger rivers;
- upland bluff camps in the areas where deciduous trees dominated;
- ridge-top camps, also where deciduous trees dominated.

Eisenberg notes that the waterside settlements he studied were situated on locally well-drained soils (Eisenberg 1978). Archaeo-exploitation of upland zones was limited primarily to the Late Archaic Period and after, whereas Connecticut River Valley research indicates Paleo- Indian exploitation of the upland zone ridge terraces overlooking water courses (Gorman 1983:18-22). Paleo-Indian sites are scarce in the Northeast. More scientifically documented field excavations of this period would greatly aid our understanding of southern New York's past.

Archaic Period

The sea level began to rise during the Archaic Period, as the glacier melted and receded. In the coastal and tidewater area of New York, the Archaic Stage (ca. 9,000 years ago) is "represented by numerous, small, nearly always multi-component sites, variously situated on tidal inlets, coves and bays, particularly at the heads of the latter, and on fresh-water ponds on Long Island, Shelter island, Manhattan Island, Fisher's Island, and Staten Island and along the lower Hudson River on terraces and knolls, at various elevations having no consistent relationship to the particular cultural complex" (Ritchie 1980:143). These people were primarily hunters and gatherers, with recent indications of more permanent settlements.

Woodland Period

By the time of the Woodland Stage (c. 3,000 years ago) the sea level and exposed coastal regions were, in most respects, as they appear today. The archaeological evidence from Woodland Stage sites indicates a strong preference for large scale habitation sites to be within proximity to a major fresh water source (e.g., a river, a lake, an extensive wetland), and smaller scale extractive-functioning sites to be situated at other resource centers (e.g., quarrying sites, butchering stations, and shell gathering localities). The production of pottery and the use of the bow and arrow began in this period, as did the practice of agriculture.

Contact Period

This final period, after the arrival of the first Europeans, is characterized as a period of decline for the Native Americans. Their pattern of hunting was disrupted by the spread of settlement, many died from diseases to which they had no resistance, and there were wars, which drove them out of their homelands. As a result, a few fled to eastern Long Island while many others went west.

2. Historic Period

Prior to 1700, the large majority of the World Trade Center APE was either undeveloped farmland or under water, with the future line of Greenwich Street marking the approximate shoreline. The block between Fulton and Vesey Streets originally was part of an early seventeenth century Dutch farm grant to the "Bouwery of the West India Company" and known by various other names through the early eighteenth century. This land eventually became the property of Trinity Church (Stokes 1967, Vol. VI:79-80). The blocks between Liberty and Fulton Streets were part of the Jan Jansen Damen farm, also conveyed in the early seventeenth century, and later subdivided and sold to different buyers (Stokes 1967, Vol. VI:86). Although these farms had various structures on them, none are documented within the APE.

The first map that illustrates the APE in any detail (most maps before 1700 showed only the southern tip of Manhattan) is the Miller Plan, made in 1696 (Figure 4). Here, the first known structures are depicted – a house and windmill belonging to Peter Mesier on the west side of what would become Church Street, between Liberty and Cortlandt. The windmill was constructed at some point between 1682-1686, and demolished in 1788 (Stokes 1967, Vol. III:961). No other structures are shown within the APE.

By the turn of the eighteenth century, landfilling along the Hudson River shore had begun. Generally, early travelers had found the East River a better and safer harbor as the high bluffs and jagged edges of the Hudson River thwarted docking. However, the Hudson River did prove vital in linking northern territories to the growing village on Manhattan. Toward that end, between 1699 and 1701 several entrepreneurs filled and built docks on the three blocks between Cedar and Cortlandt Streets and Greenwich Street and Washington Street (Buttenwieser 1987:32). These docks are visible on the

Lyne-Bradford Plan, published in 1731 (Figure 5). The dock between Liberty and Cortlandt Street was called Thurman's Slip (HCI 1983:240). This map also reveals additional development along the north side of Liberty Street (then called Crown Street), and the road leading to the windmill.

The year before the Lyne-Bradford Plan was published, the Montgomery Charter was established, extending land ownership privileges an additional two blocks beyond the low water mark into the Hudson River. The charter included a provision for creating three streets – Greenwich, Washington and West – parallel to the river (Hoag 1905:32). The Maerschalck Plan, made in 1755, shows the continued outward spread of the waterfront, as well as additional development within the APE (Figure 6). By the 1740s, a slip had been built near Liberty Street (Valentine 1855:584), and Dey's Dock was built in 1743, just south of Dey Street (HCI 1983:240).

Activity along the Hudson River waterfront within the APE accelerated in 1764, when regular ferry service began between Paulus Hook, Jersey City and Mesier's Slip (at Cortlandt and the future intersection of Washington Street). King's Wharf was built between Cortlandt and Dey Streets by 1767, and by 1775, the city's dock, known as Corporation Dock, had been constructed at Fulton and Greenwich Streets, and received passengers from the new Hoboken Ferry (HCI 1983:240). The Ratzen Plan, published in 1776, illustrates the location of King's Wharf and an adjacent arsenal, as well as the ferry service route to Paulus Hook (Figure 7). It also shows that by this time, a portion of Greenwich Street had opened within the APE.

In 1789, the city's directory included a map for the first time, showing points of interest (Figure 8). Within the World Trade Center APE, the map indicates the location of the Bear Market, established in 1771 on Greenwich Street between Fulton and Vesey Streets (Stokes 1967, Vol. III:958). It also shows that Washington Street had been constructed within the APE. In the years following the Revolutionary War, an attempt was made to urge the construction of the street along the Hudson River originally provided for in the 1730 charter. In 1795 the Common Council again passed an ordinance creating West Street, a 70 foot wide outer street, demarcating the western boundary of the city. The proposed creation of West Street was intended to compel landowners to pursue landfilling where they were granted water rights. The Taylor-Roberts Plan of 1797 illustrates the pace of progress along the shoreline (Figure 9). In 1804 the Common Council increased the distance from Washington to West Street from 160 feet to 200 feet, lengthening the developed blocks between them by 40 feet (HCI 1983:153).

Construction of West Street was a slow process, occurring over the approximate 15-year stretch from 1817-1831 (HCI 1983:162). The City continued to pass ordinances during this period to impel development. In 1825, the Common Council passed an ordinance demanding the creation of West Street and filling of water lots. In 1828 the Council further requested that West Street be extended to cross the slip at Washington Market between Fulton and Vesey Streets (HCI 1983:161). Although the Common Council was relentless in their pursuit to assure the complete construction of West Street, filling and development was slow. Land reclamation and filling along the Hudson River waterfront

was pursued by either allowing unstructured harbor silts and river accretion to build up, or by placing fill in engineered retaining devices (Geismar 1983:672). In lower Manhattan, ships were sometimes deliberately sunk as cribbing to help stabilize fill (Berger 1983:9). After wharves and piers were built, derelict ships were sunk adjacent to them, and together these features contributed to and operated to retain fill.

Wooden cofferdams, wharves, and bulkheads were built as fill retaining devices, framed with hewn logs, filled with loose stone, and covered with earth (Geismar 1983:30). Timber grillage was commonly used as cribbing, a practice first employed in Europe. Colonists continued to use this method, as both the Dutch and English had previously, aided by the ample supply of wood in the region. To retain fill, quays were first built by driving a row of wooden piles into the river with diagonal braces bolted to the inside, forming the face work. Earth and fill was then placed in the vacant area behind the piles, and was then planked over to form a roadway level with adjacent streets (Geismar 1983:31). Wooden jetties were similarly built. Once the economic value of clean fill generated from building excavations was realized, this was no longer used as fill. Instead, wharves and piers were frequently used as dumping boards, where garbage was collected and pushed overboard into scows or directly into the river. Rubbish, ballast, and street trash pushed the shoreline further west. The 1836 Colton topographical map illustrates the configuration of West Street after years of landfilling (Figure 10).

The rapidly growing west side supported many successful business ventures. One of these was the Washington Market, also known as both the Bear and Oswego Markets. As described above, the market was established in 1771 on landfill between Fulton and Vesey streets, and Washington and West Streets, with the APE (HCI 1983:369). By 1800 the city purchased water grants between Vesey and Fulton Streets, formerly belonging to Mayor Varick, and piers were lengthened and the slips between them filled to expand the profitable Washington Market. After burning down, the market was rebuilt in 1812 on the same site. Just to the west were the Corporation Docks, built in 1817. These docks ran within several feet of the west side of the market and intruded into the path of West Street (De Voe 1867:427).

The pace of development within the APE is visible on several mid-nineteenth century maps. The Dripps 1852 map illustrates that by this time, all the streetfronts within the APE had been solidly filled with buildings (Figure 11). Labeled structures include a variety of banks, hotels, and markets, including the Washington Market, which endured until ca. 1960. The Perris 1857-62 maps show additional detail of the APE, indicating that the blocks had been nearly completely built up by this period (Figure 12). Of note, Church Street had not yet been extended from Fulton to Liberty Streets by this time. It was ordered cut through the APE in 1873 (Stokes 1967, Vol. V:1953).

By the 1850s, the APE had been supplied with piped city water, allowing residents to discontinue their reliance on public and private wells and cisterns for their water supply. The build out of lots within the APE shown on the Dripps and Perris maps is partially related to the introduction of piped water: private wells and cisterns were located in

backyard areas of lots; once they were no longer necessary, they could be covered over and the yard areas used for additional building space.

Sanborn Insurance maps depict the APE from the late nineteenth century through the mid-twentieth century (1894, 1923, and 1951). Figures 13, 14, and 15 illustrate the continued development within the APE during this period, with the blocks completely covered by multiple-story buildings containing various businesses. An early twentieth century construction milestone within the APE was the Hudson and Manhattan Railroad, which after emerging from a tunnel under the Hudson River, had subsurface lines running under Cortlandt and Fulton Streets to its Church Street Terminal, on the blocks bounded by Cortlandt, Church, Fulton, and Greenwich Streets. Above the terminal were the Cortlandt and Fulton Buildings, each 21 stories tall. The complex was built in 1907 (Sanborn 1923). Nearby, the I.R.T. subway was built under Greenwich Street, opening in 1918.

The World Trade Center complex, which encompassed 16 acres on newly designated "Superblock" 58 (and which required demapping the interior streets between the twelve original blocks), broke ground in 1966 and was completed in 1973 (Figure 16). Its construction necessitated demolishing all of the standing structures on the property. The area east of Greenwich Street, originally under the Hudson River before landfilling, was excavated down to bedrock (at about 70 feet below grade) and a slurry foundation wall was built around this area to keep out water. This portion of the site supported the twin towers, each 110 stories high, and seven underground levels. The area east of Greenwich Street was not excavated as deeply; it had four basement levels.

Following the terrorist attacks on September 11, 2001, all of the buildings in the World Trade Center APE were destroyed, and subsequently, debris from these structures was removed from the site. The area within the "bathtub" foundation, west of Greenwich Street, has been reexcavated. Portions of the site east of Greenwich Street have also been excavated, although the lower levels of the former H & M terminal are extant, and have not been removed.

3. Disturbance Record

The large majority of the World Trade Center APE has had significant subgrade disturbance to the original and historically created topography. The area west of Greenwich Street (the "bathtub") is disturbed down to bedrock (Photographs 1 and 2). The line of Greenwich Street has been disturbed by construction of the I.R.T. subway line (Photograph 3). Excavation for the H & M Terminal also has disturbed the area between Greenwich, Church, Cortlandt, and Dey Streets (Photograph 4). Last, construction of World Trade Center Building 4, south of the former H & M Terminal, has disturbed the area south of Cortlandt Street, and construction of World Trade Center Building 5, north of the former H & M Terminal, has disturbed the area north of Fulton Street (Photographs 5 and 6).

Discounting these portions of the APE that have been impacted by construction, there are only two remaining sections on Block 58 that may not be extensively disturbed. These are the areas north of Liberty Street, between Church and Greenwich Street (the area south of World Trade Center Building 4; Photographs 7 and 8); and south of Vesey Street, between Church and Greenwich Street (the area north of World Trade Center Building 5; Photographs 9 and 10). Both areas were outside the former World Trade Center construction footprint, although within the APE. Each of these areas will be subjected to future subsurface impacts as part of the reconstruction project.

In order to determine whether previous excavation had disturbed these two areas prior to the World Trade Center construction, building records (block and lot folders) were examined at the Municipal Archives for these lots. Frequently, these records document former depths of basements and foundations.

Liberty Street

The portion of the APE along Liberty Street encompassed Lots 1-10 on former Block 60. Lot 1 was at the Church Street intersection and Lot 10 was at the Greenwich Street intersection. Basement depths were available for several of these lots; where data were unavailable an estimate was made of former basement depths based on height and age of similar buildings that did have this information. Usually, nineteenth-century buildings up to 5-6 stories high had basements of about 10 feet in depth, whereas twentieth century buildings and/or buildings more than 10 stories high had deeper basements, usually at least 20 feet below grade.

Lot number	**Depth of Basement**
1 (includes former Lots 2 and 3)	24 feet below grade
4	22 feet below grade
5	13 feet below grade
6	10 feet below grade
7-9	Data unavailable, but building was 18 stories tall; assume basement at least 20 feet below grade
10	Data unavailable, but building was one story tall; assume basement no more than 10 feet below grade

Vesey Street

The portion of the APE along Vesey Street encompassed Lots 6-17 on former Block 85. Lot 6 was at the Greenwich Street intersection and Lot 17 was at the Church Street intersection. Basement depths were available for several of these lots. Again, where data were unavailable an estimate was made of former basement depths based on height and age of similar buildings that did have this information.

Lot number	Depth of Basement
6 (includes former Lot 7)	Data unavailable, but building was 12 stories tall; assume basement at least 20 feet below grade
8	10 feet below grade
9	10 feet below grade
10	Data unavailable, but building was 5 stories tall; assume basement depth ca. 10 feet below grade
11	Data unavailable, but building was 3 stories tall; assume basement depth no more than 10 feet below grade
12	Data unavailable, but building was 5 stories tall; assume basement depth ca. 10 feet below grade
13	Data unavailable, but building was 6 stories tall; assume basement depth ca. 10 feet below grade
14 (includes former Lot 15)	Data unavailable, but building was 5 stories tall; assume basement depth ca. 10 feet below grade
16	Data unavailable, but building was 5 stories tall; assume basement depth ca. 10 feet below grade
17	Data unavailable, but building was 2 stories tall; assume basement depth ca. 10 feet below grade

Sidewalks

On both Liberty and Vesey Streets, the building line for the former World Trade Center complex was pushed back approximately 40 feet from the original sidewalk boundaries in order to create extra lanes of traffic, which were separated from the main roadways by concrete islands. These traffic lanes were carved out of areas once supporting the street-fronting parts of the structures listed above. The sidewalks that bordered the former World Trade Center plaza also fell within the area once supporting the structures, above. According to utility data provided by the Port Authority, the original (pre-World Trade Center) sidewalk locations contain various subsurface conduits, to a depth of about five feet below grade, although the sidewalk areas surrounding the World Trade Center complex footprint are relatively free of subsurface utilities (Port Authority 2003).

4. Precontact Archaeological Sensitivity

There is little likelihood that precontact archaeological resources have survived within the World Trade Center APE. Within the portion of the APE west of Greenwich Street, the lowest level that precontact deposits could have survived under the river-deposited silts is about 40 feet below grade. The "bathtub" excavation extends to a depth of about 70 feet below grade, ensuring that any potential precontact resources have been removed. East of Greenwich Street, within the two areas of the APE outside the former World Trade Center footprint along Liberty and Vesey Streets, the likelihood is also low that precontact archaeological resources have survived. Here, it is probable that original

precontact occupation surfaces have been destroyed by basement construction in these areas.

Finally, under the original sidewalks abutting Liberty and Vesey Streets, which contain active utilities, searching for precontact resources would be extremely difficult. In addition, any area tested would be highly confined by these same utilities, prohibiting excavations to the depth necessary to explore potential precontact strata.

5. Historical Archaeological Sensitivity

The two areas of the APE that were not extensively disturbed as part of the World Trade Center construction, east of Greenwich Street along the north side of Liberty Street and the south side of Vesey Street, have the potential to contain historical archaeological resources associated with occupation of the blocks from the late 1600s through the 1850s, when the area was supplied with public piped water and sewers. Prior to the nineteenth century, when build out occurred on these blocks, properties would have had open yard areas where shaft features such as privies, cisterns, wells, and cesspools would have been located. Historical archaeological resources related to dwellings are often preserved in these features. The survival of these resources will depend on the extent to which former basements disturbed these former yard areas, and the depth to which these shaft features were excavated.

The potential depth of shaft features throughout Manhattan is varied, and depends, in part, on the subsurface conditions at the time they were excavated. Wells would have been excavated at least as deep as the water table, and possibly deeper to access potable water. For example, once the water from the Collect Pond in Lower Manhattan was no longer potable, having been declared "stagnant and mephitic" in 1796, deeper wells were dug throughout the city to access clean water (Kieran 1982:31). At Bleecker Street near Broadway, in 1832 a well was bored to a depth of 448', of which 400' was through solid rock (Ibid.). However, this was not the typical depth for wells hand excavated in backyards throughout the city prior to the availability of high pressure steam engines (ca.1815) which allowed for deep drilling. These would typically have extended through soil to the water table, at whatever depth that was encountered, and possibly deeper to access better water.

The anticipated depth of privies is also difficult to estimate, given that subsurface conditions such as soil permeability and the number of households served would have affected the size and depth of vaults. Geismar notes that a possible privy identified at 17 State Street extended 13' below the grade that existed at the time it was constructed, and that this depth coincided with the depth of a privy excavated at the Augustine Heerman warehouse site on the block bounded by Whitehall, Broad, Bridge, and Pearl Streets, also in Lower Manhattan (Geismar 1986:44). As noted above, by 1823 they were required to be at least five feet deep (Goldman 1988:45).

In areas along Liberty and Vesey Street where basements were 10 feet below grade or less, there is a reasonable likelihood that the lower reaches of early shaft features may be

extant under the former cellar floors. Where former basements were 20 feet or greater, this probability decreases. The historic level of the water table (which presumably would dictate the minimum depth of wells) along Liberty and Vesey Streets east of Greenwich Street is unknown, but Port Authority engineers are assuming it was at about sea level, or zero elevation. If the historic water table was at or just below sea level, wells would need to have been excavated a minimum of 15-25 feet below grade, depending on the location (see Section III for street intersection elevations).

V. CONCLUSIONS AND RECOMMENDATIONS

A. Precontact Period Resources

As the preceding sections have described, any precontact archaeological resources that may have once existed within the World Trade Center APE have almost certainly been either removed or destroyed by excavation and/or construction activities.

No archaeological field testing is recommended for precontact resources.

B. Historic Period Resources

Potential shaft features predating the 1850s may survive under former basements along areas north of Liberty Street, between Church and Greenwich Street, and south of Vesey Street, between Church and Greenwich Street. Where former basements were 10 feet below grade or less, there is a good likelihood for preservation of shaft features; the project team has assigned these lots a high archaeological sensitivity. Lots with former basements 20 feet or more below grade have a much lesser likelihood of shaft feature preservation, and are assigned a low archaeological sensitivity. The sensitivity rankings are summarized below, based on data presented in Section IV.

Liberty Street Lots (Former Block 60)

Lot number	Archaeological Sensitivity
1-3	Low
4	Low
5	High
6	High
7-9	Low
10	High

Vesey Street Lots (Former Block 85)

Lot number	Archaeological Sensitivity
6-7	Low
8	High
9	High
10	High
11	High
12	High

Lot number	Archaeological Sensitivity
13	High
14-15	High
16	High
17	High

Identifying and examining buried features associated with seventeenth through mid-nineteenth century occupation of these lots may reflect the daily activities of the residents and provide insight into cultural behavior. Shaft features were usually filled and capped, providing stratified deposits within the feature. Because of the unique depth of these resources, the lowest levels are rarely disturbed even if the feature becomes truncated by subsequent historical activity. The deepest layers often act as a time capsule, preserving historical artifacts within the enclosed environment.

If undisturbed deposits of cultural material from the historic development of the World Trade Center APE do still exist, they may have the potential to provide meaningful information regarding the lives of the people who lived there. When recovered from their original context and in association with a specific historical occupation, historical deposits can provide a wealth of information about consumption patterns, consumer choice, gender relations, ethnicity, economic status, and other important issues.

Based on these conclusions, the following recommendations are offered for the two areas of the APE considered potentially sensitive. No additional archaeological investigations are recommended for those former lots whose basements were 20 feet or more below grade, and assigned a low archaeological sensitivity. However, further archaeological consideration in the form of Phase IB archaeological field testing is recommended for former lots with basements 10 feet below grade or less, and assigned a high sensitivity. Figure 17 illustrates those former lots assigned a high sensitivity, where Phase IB testing is recommended.

All Phase IB archaeological testing should be conducted according to applicable archaeological standards (New York Archaeological Council 1994; LPC 2002), and in consultation with the NYSOPRHP and the LPC. RPA-certified professional archaeologists, with an understanding of and experience in urban archaeological excavation techniques, would be required to be part of the archaeological team.

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FIGURES

FIGURE 1

USGS Jersey City, NJ and Brooklyn, NY Quadrangles, 1976 and 1995.

World Trade Center Project Site.

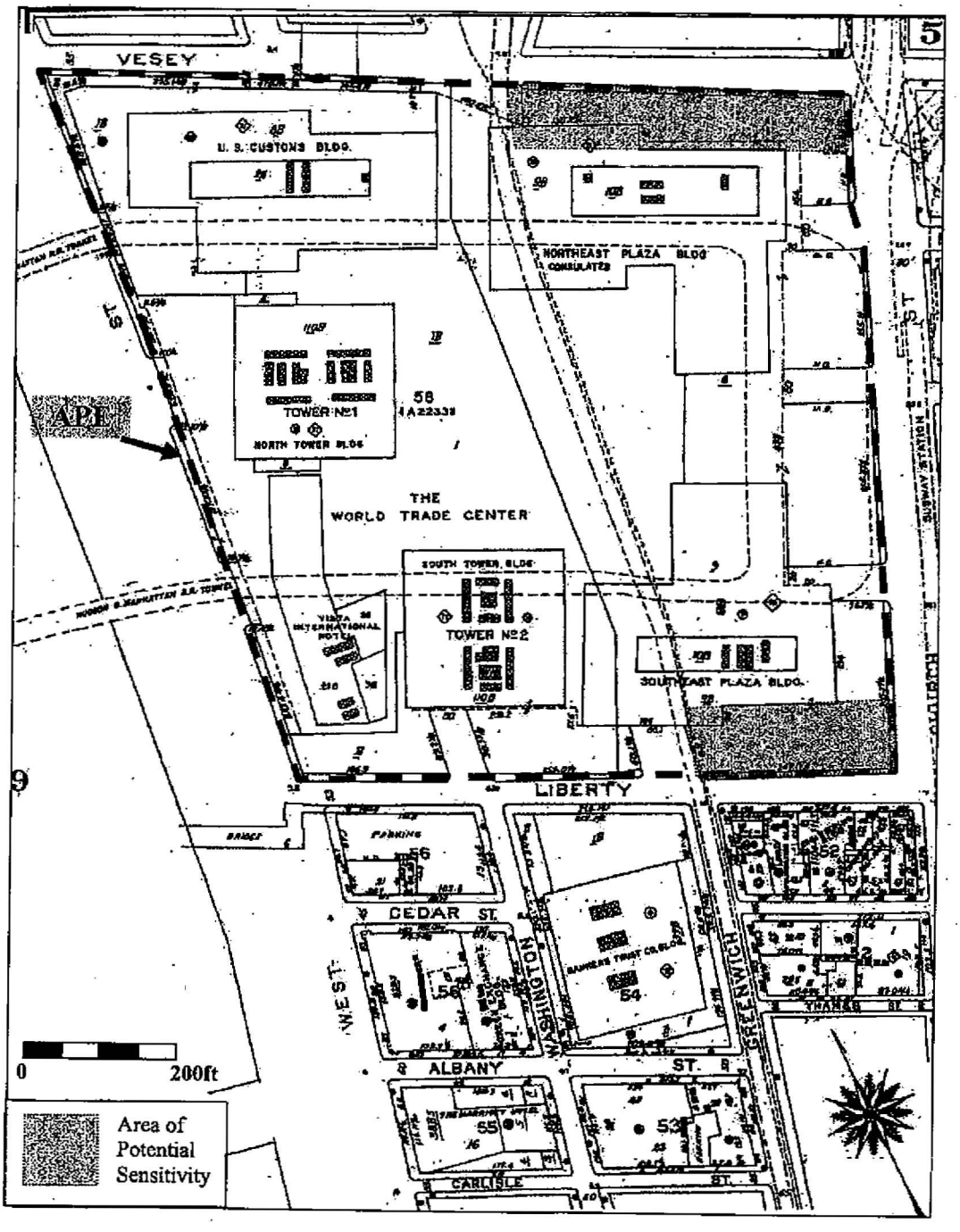

FIGURE 2

World Trade Center APE.
Sanborn 2001.

World Trade Center Project Site.

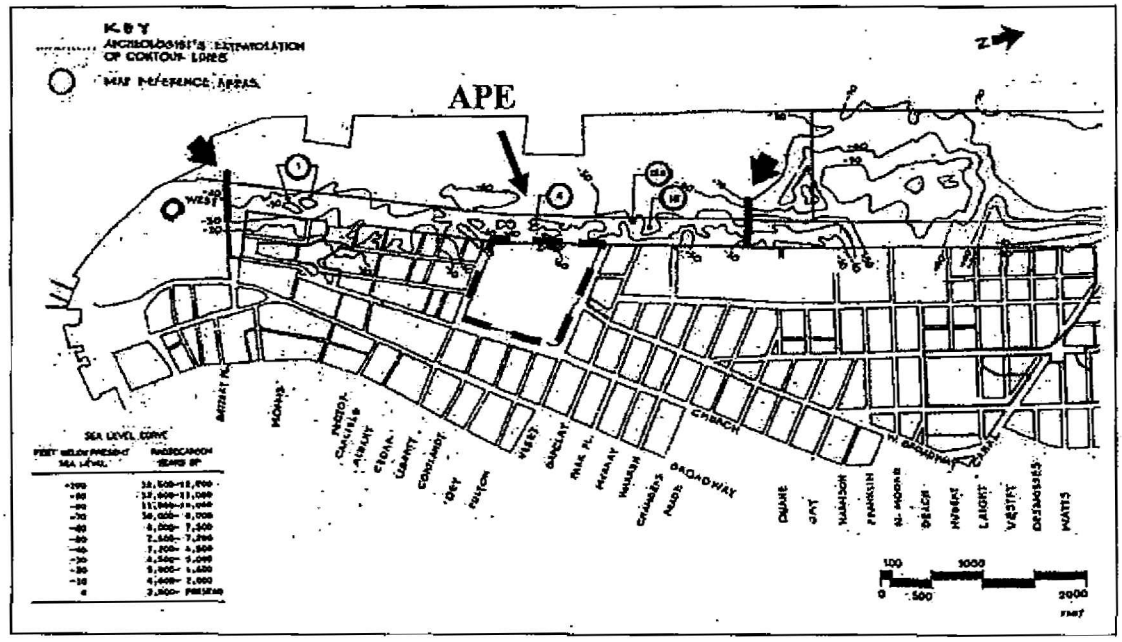

FIGURE 3

Ancient Sea Levels along the Hudson River with Potential Archaeological Sites.
HCI 1983, Figure 4, p. 48.

World Trade Center Project Site.

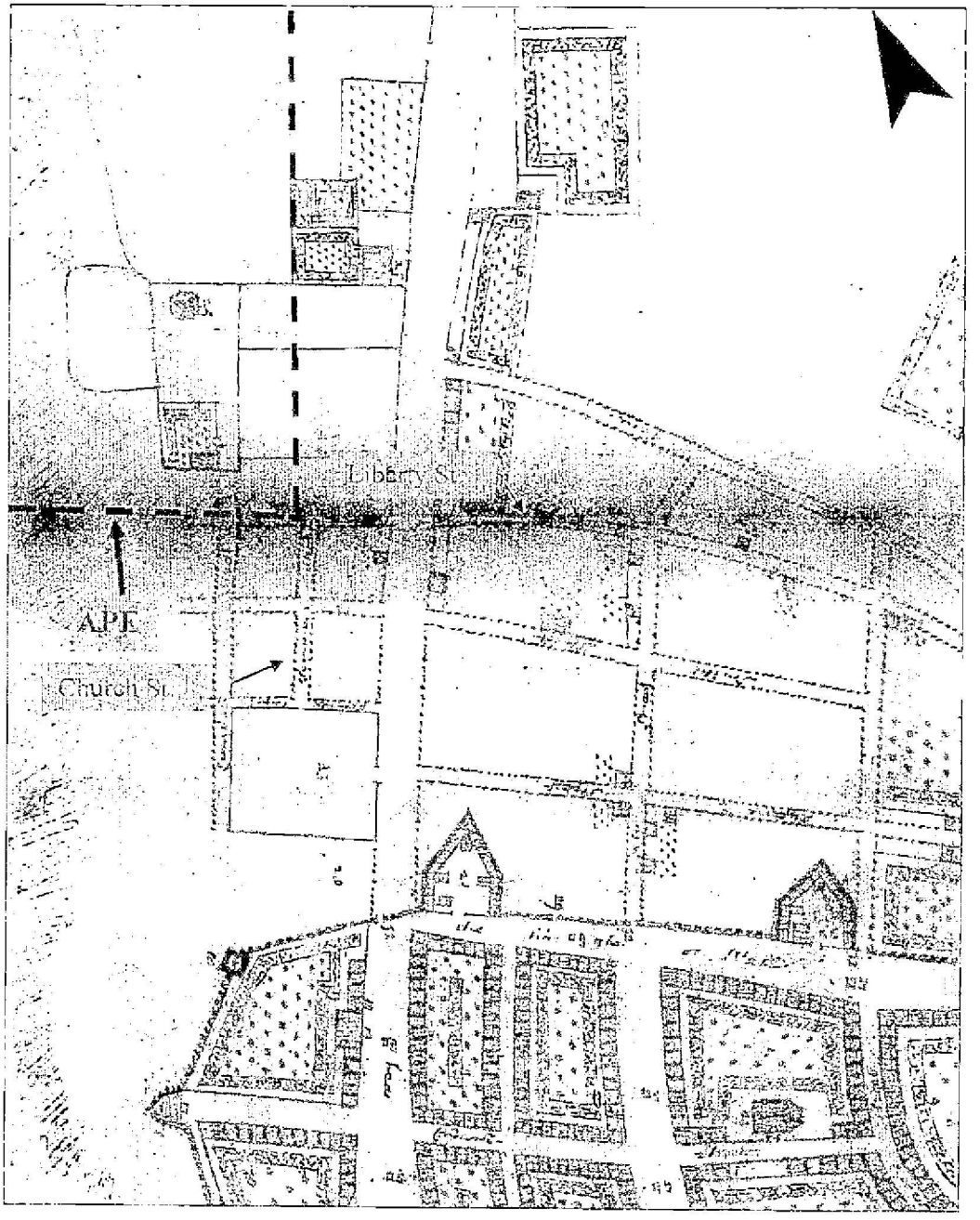

FIGURE 4

New Yorke.
Miller 1696.

World Trade Center Project Site.

Approximate Scale: 1 inch= 400 feet

FIGURE 5

A Plan of the City of New York from an actual Survey Made by James Lyne. Bradford 1731.

World Trade Center Project Site.

Approximate Scale: 1 inch= 250 feet

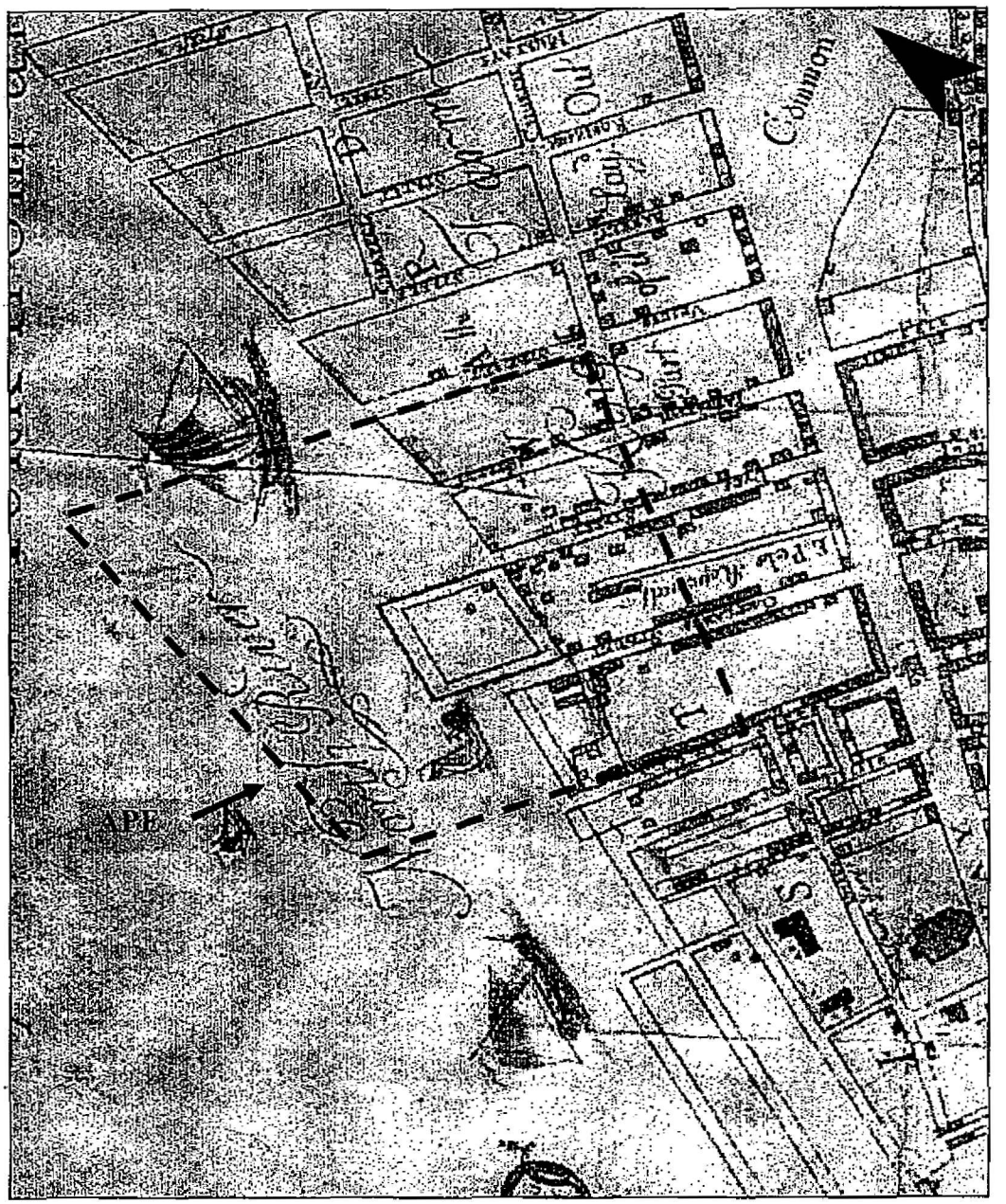

FIGURE 6

A Plan of the City of New York from an actual Survey Anno Domini – M,DCC,IV.
Maerschalk 1755.

World Trade Center Project Site.

Approximate Scale: 1 inch= 250 feet

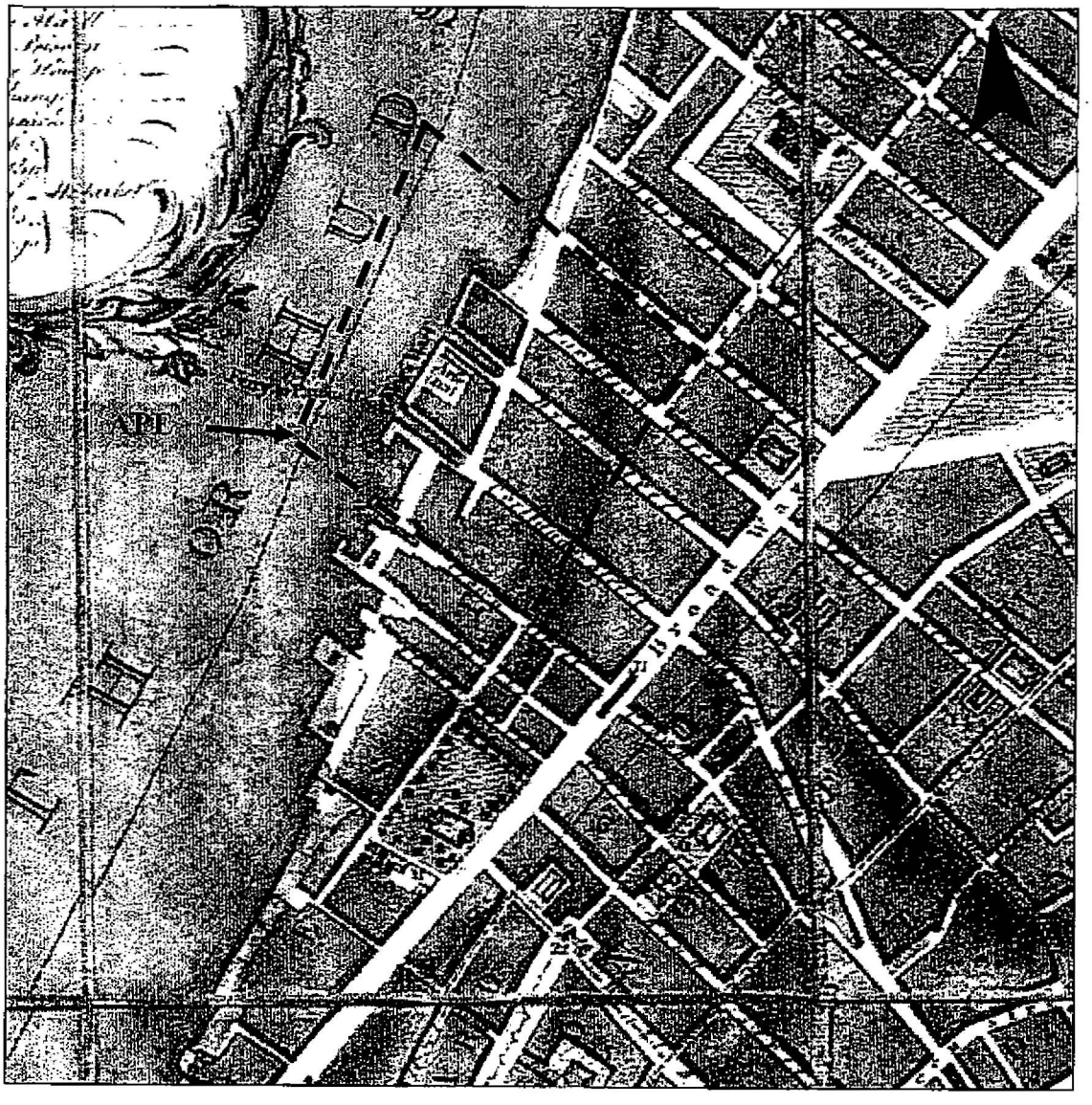

FIGURE 7

To His Excellency Sr. Henry Moore, Bart...This Plan of the City of New York, Is Most Humbly Inscribed.
Ratzen 1776.

World Trade Center Project Site.

Approximate Scale: 1 inch= 400 feet

FIGURE 8

The New-York Directory and Register for the Year 1789.
McComb 1789.

World Trade Center Project Site.

Approximate Scale: 1 inch= 500 feet

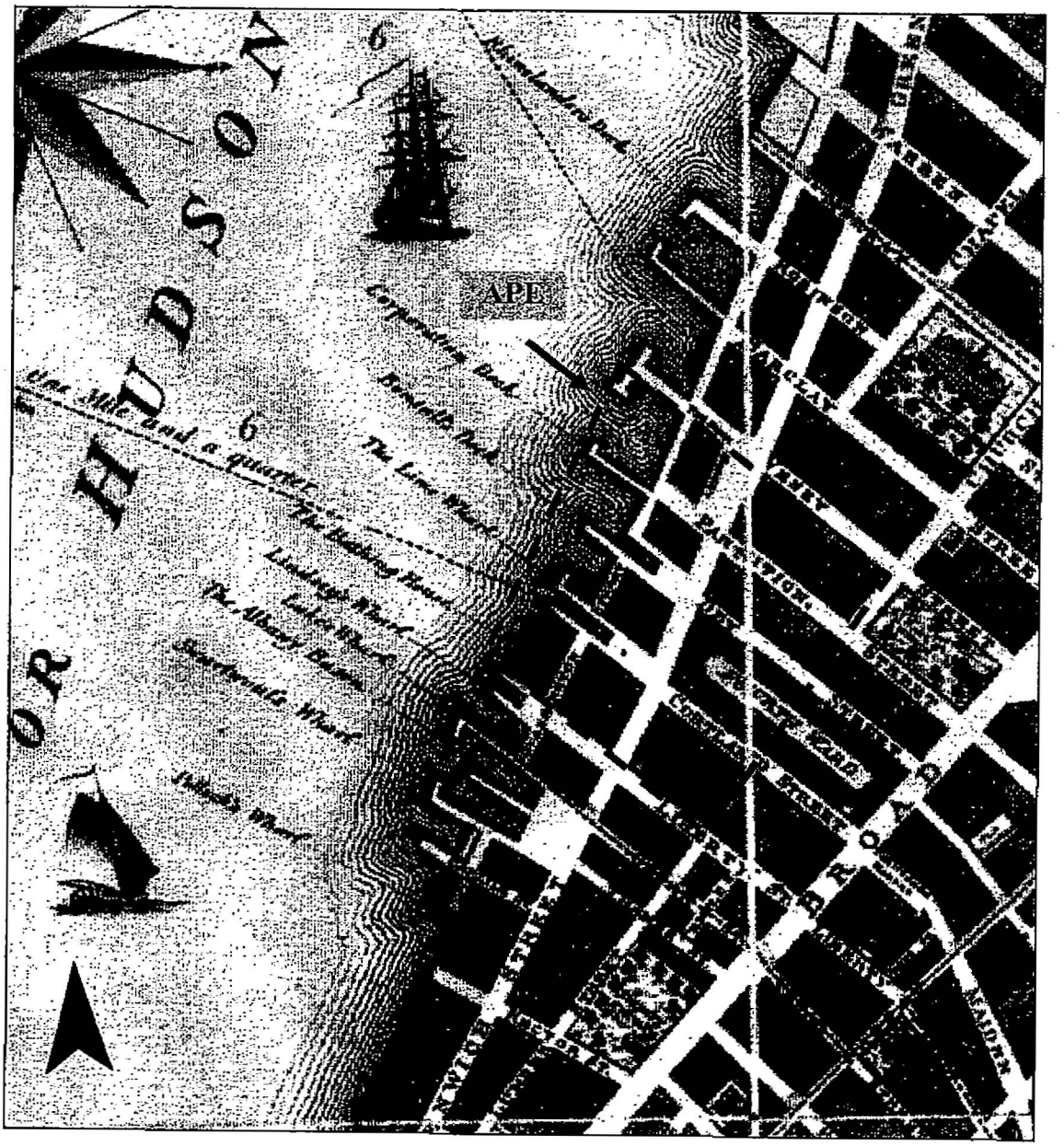

FIGURE 9

A New & Accurate Plan of the City of New York in the State of New York in North America.
Taylor-Roberts 1797.

World Trade Center Project Site.

Approximate Scale: 1 inch= 400 feet

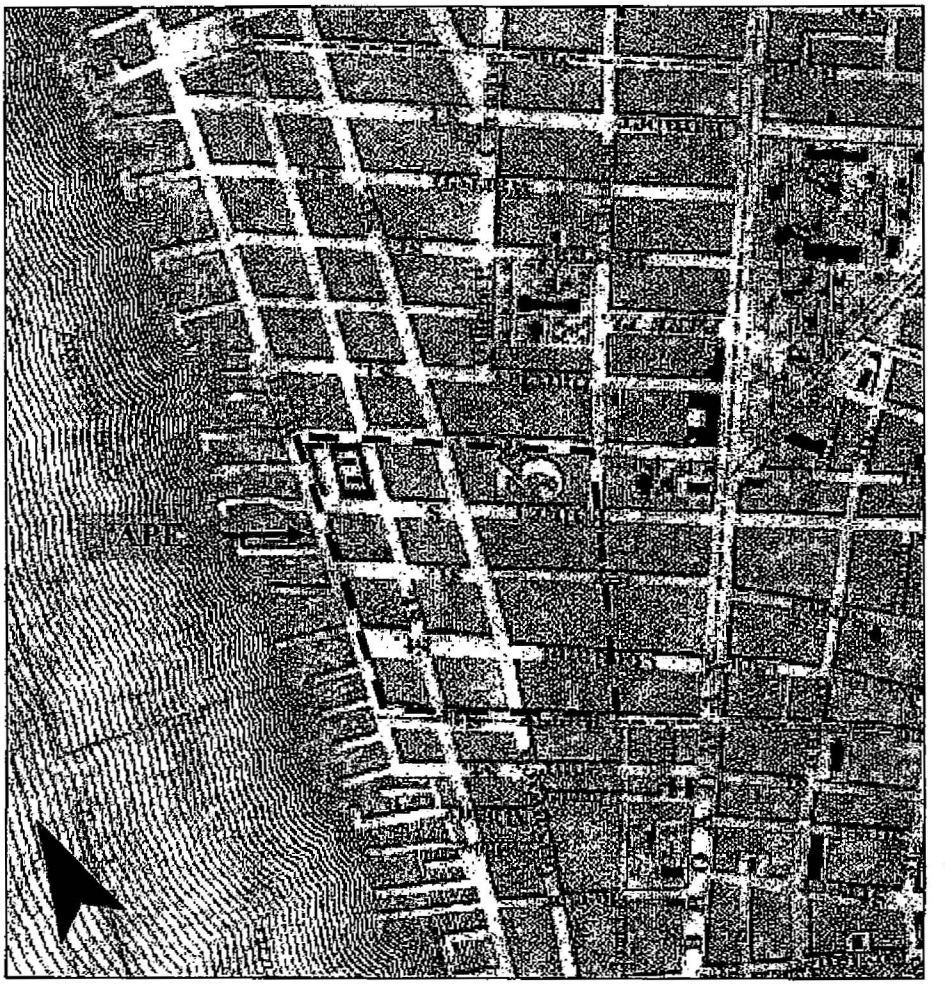

FIGURE 10

Topographical Map of the City and County of New-York, and the Adjacent Country.
Colton 1836.

World Trade Center Project Site.

Approximate Scale: 1 inch= 600 feet

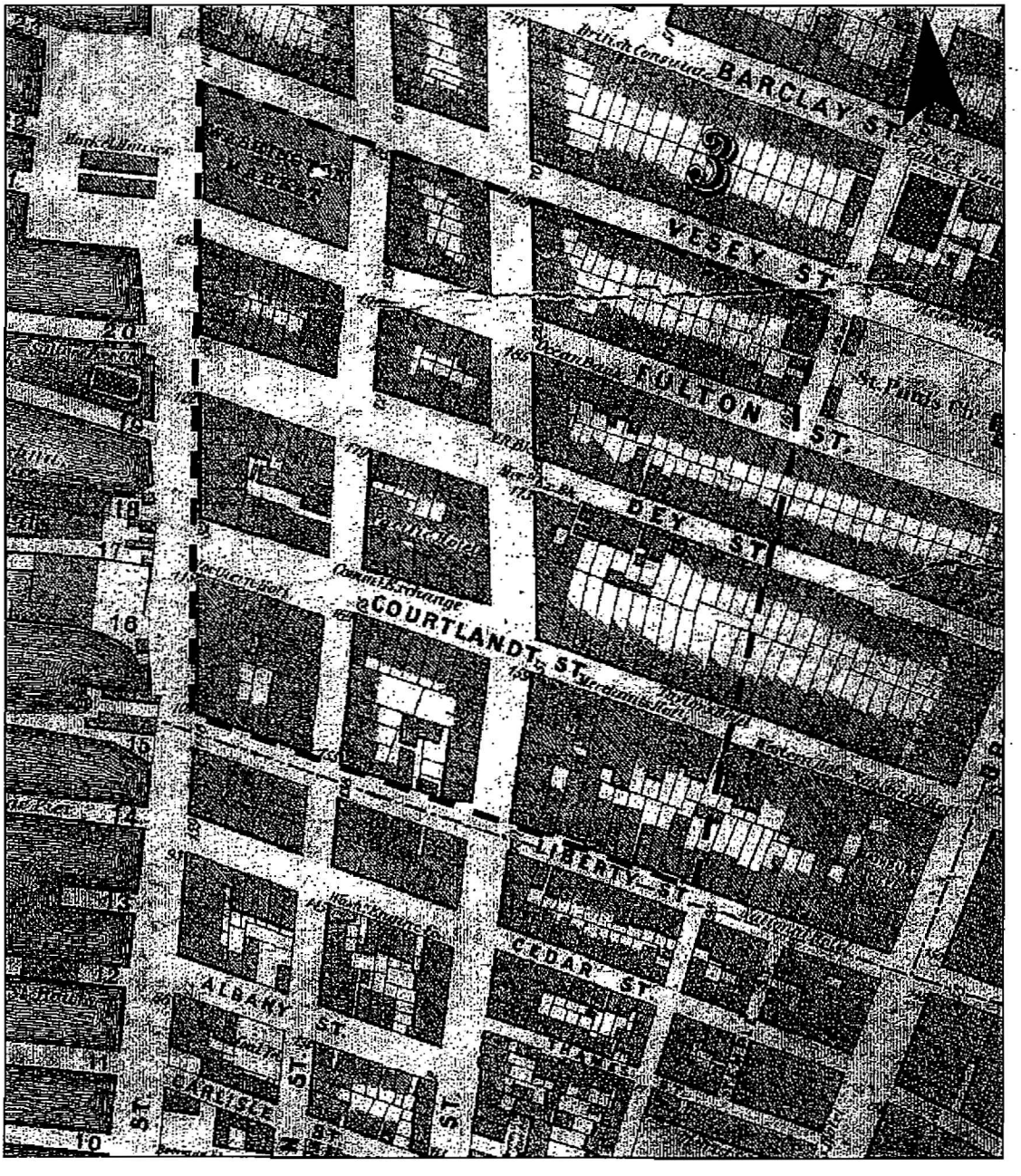

FIGURE 11

Map of the City of New York Extending Northward to 50th Street.
Dripps 1852.

World Trade Center Project Site.

Approximate Scale: 1inch= 200 feet

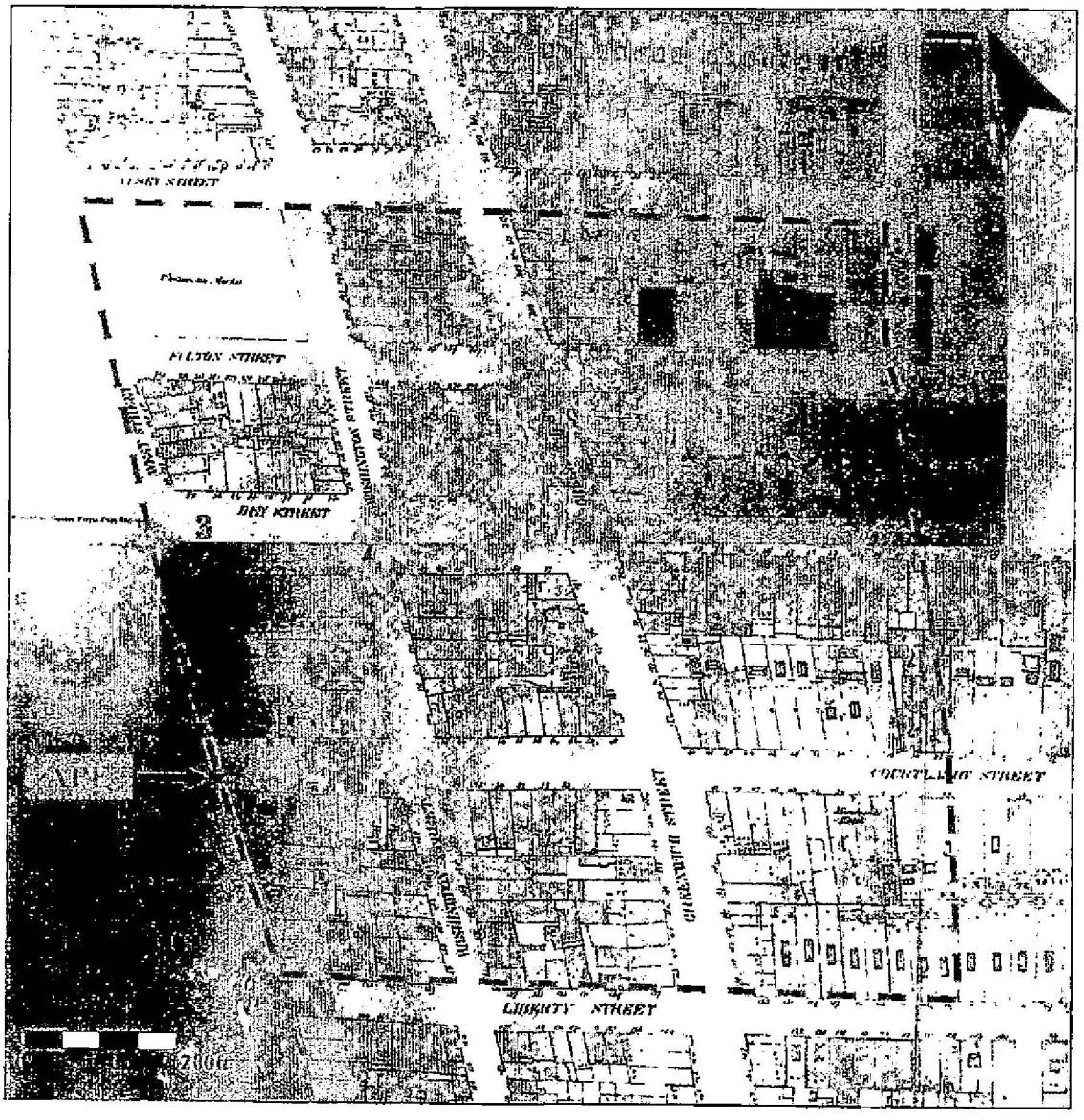

FIGURE 12

Maps of the City of New York.
Perris 1857-62.

World Trade Center Project Site.

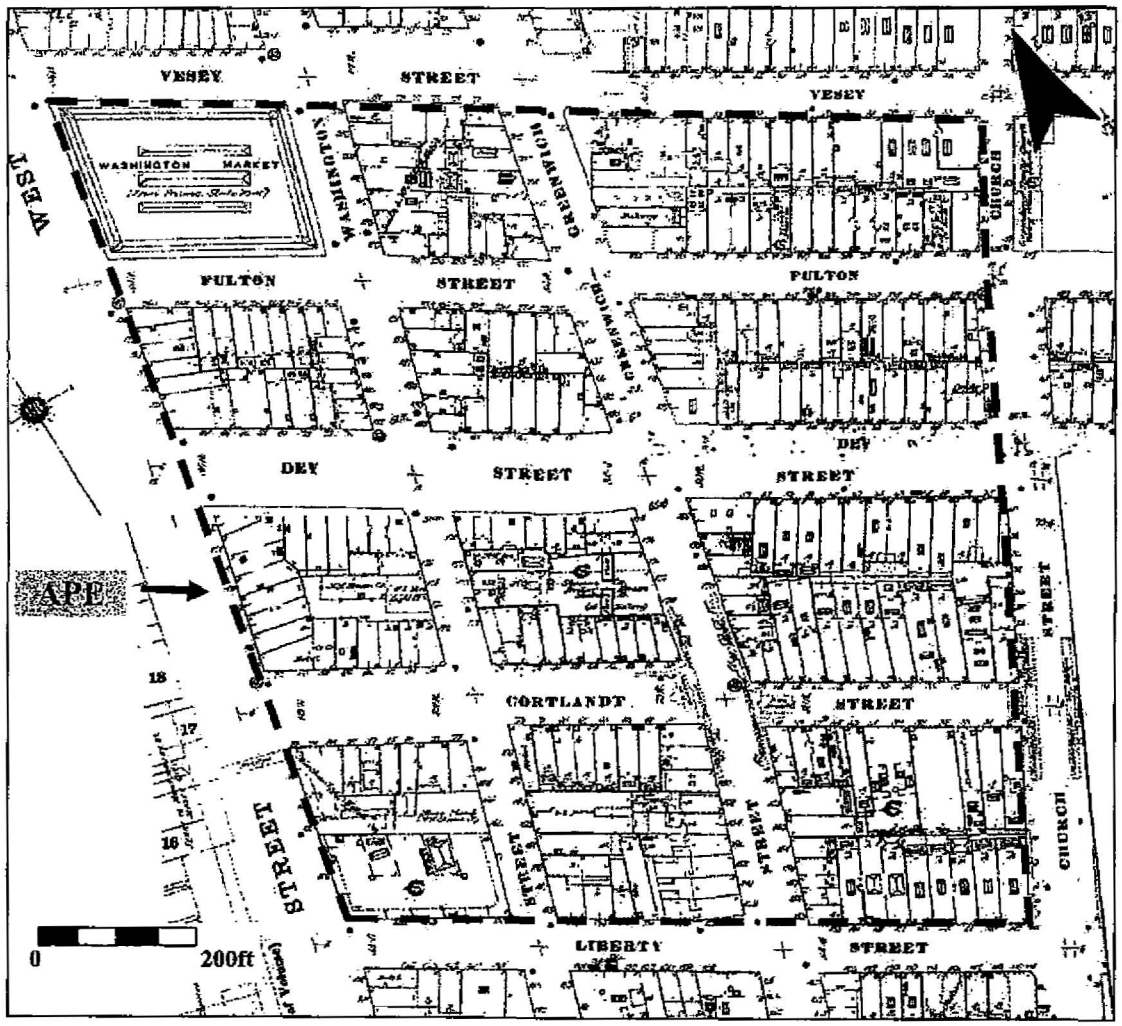

FIGURE 13

Insurance Maps.
Sanborn 1894.

World Trade Center Project Site.

FIGURE 14

Insurance Maps.
Sanborn 1923.

World Trade Center Project Site.

FIGURE 15

Insurance Maps.
Sanborn 1951.

World Trade Center Project Site.

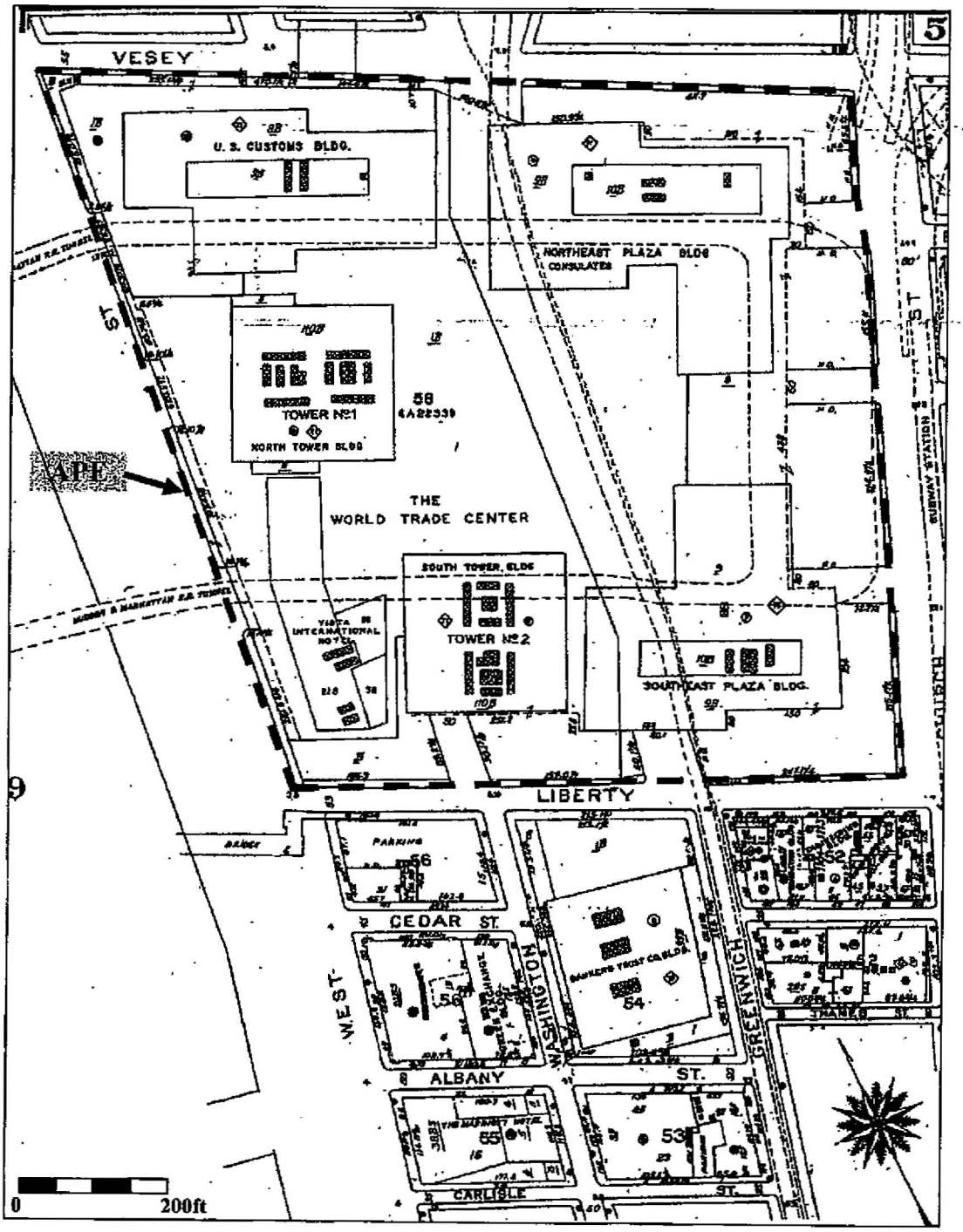

FIGURE 16

Insurance Maps.
Sanborn 2001.

World Trade Center Project Site.

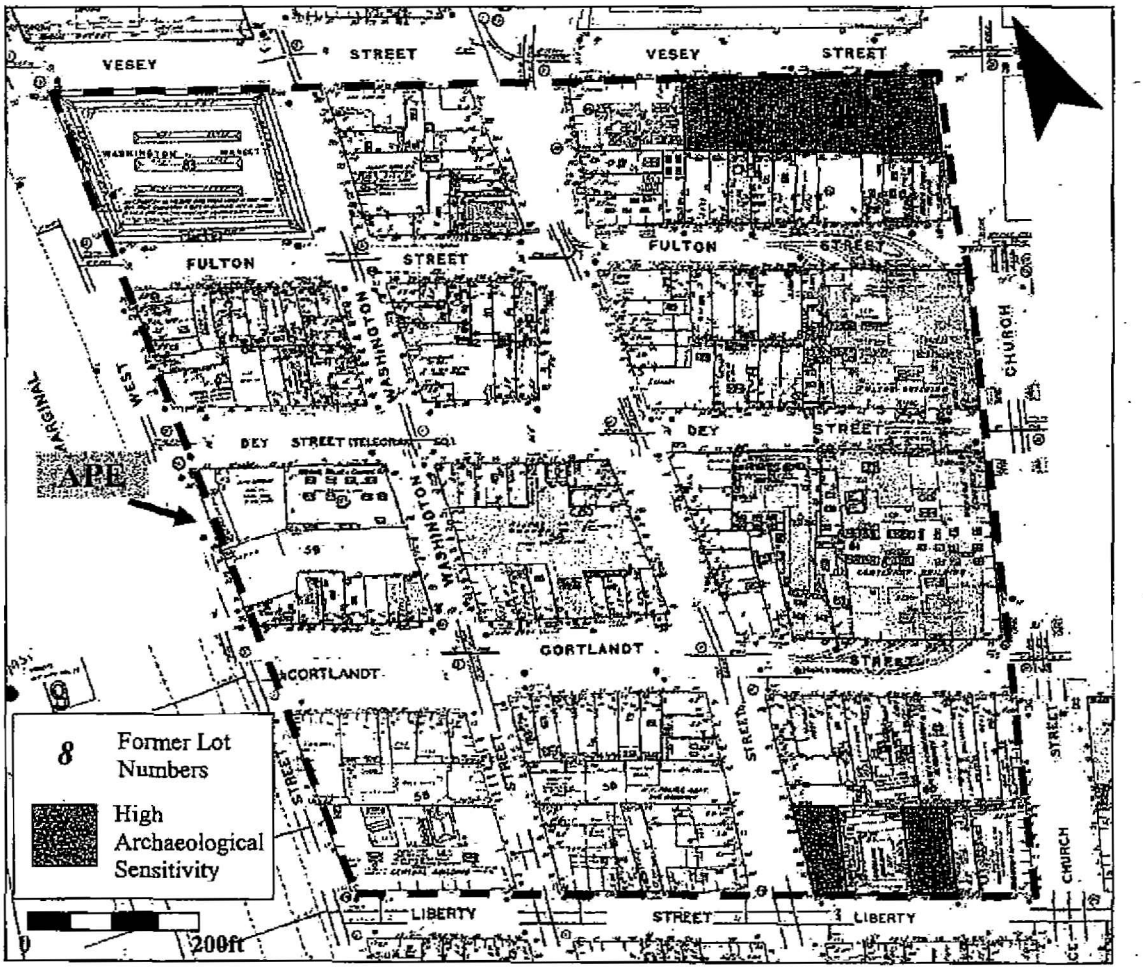

FIGURE 17

Area of Proposed Archaeological Sensitivity.
World Trade Center Project Site.
Sanborn 1951.

PHOTOGRAPHS

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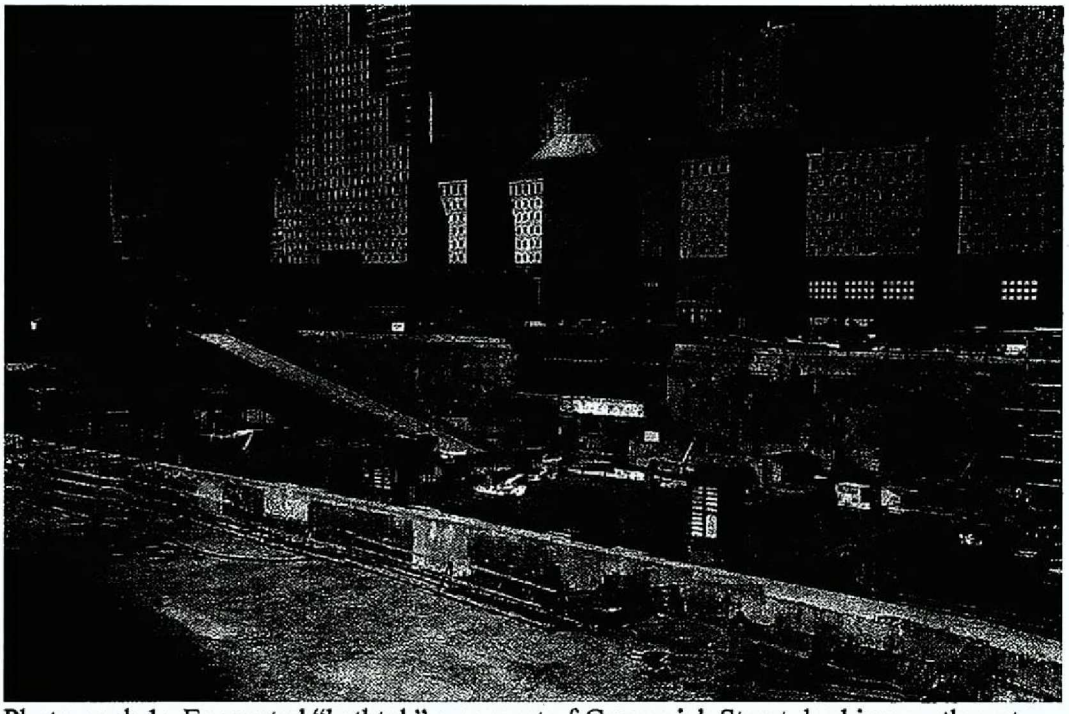
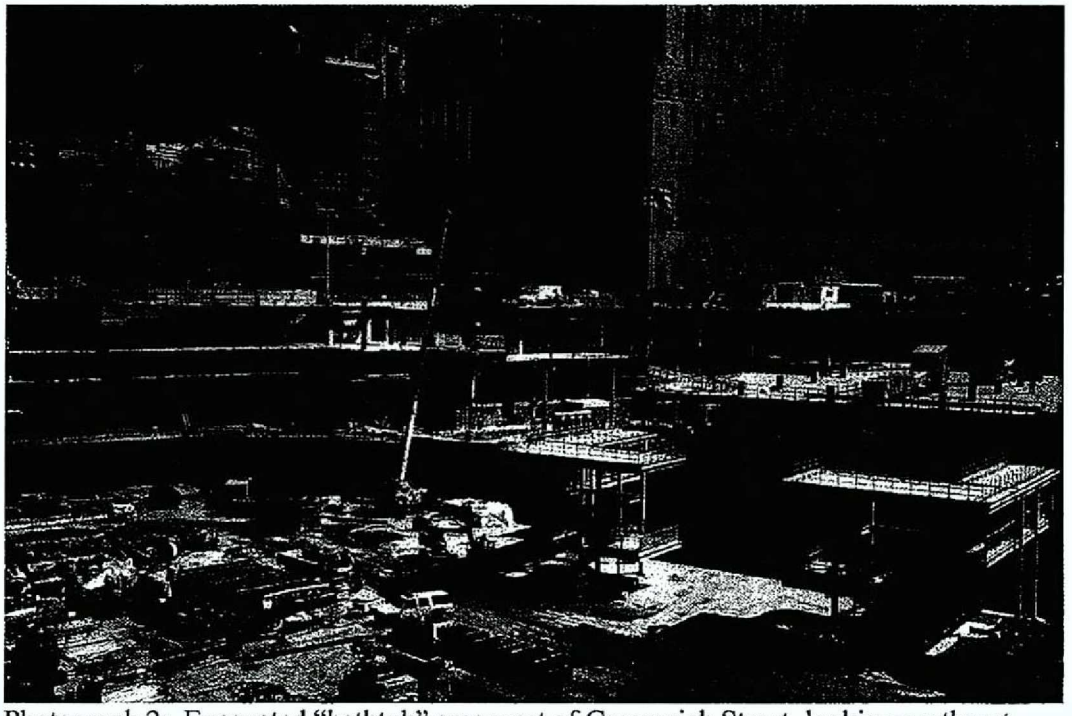
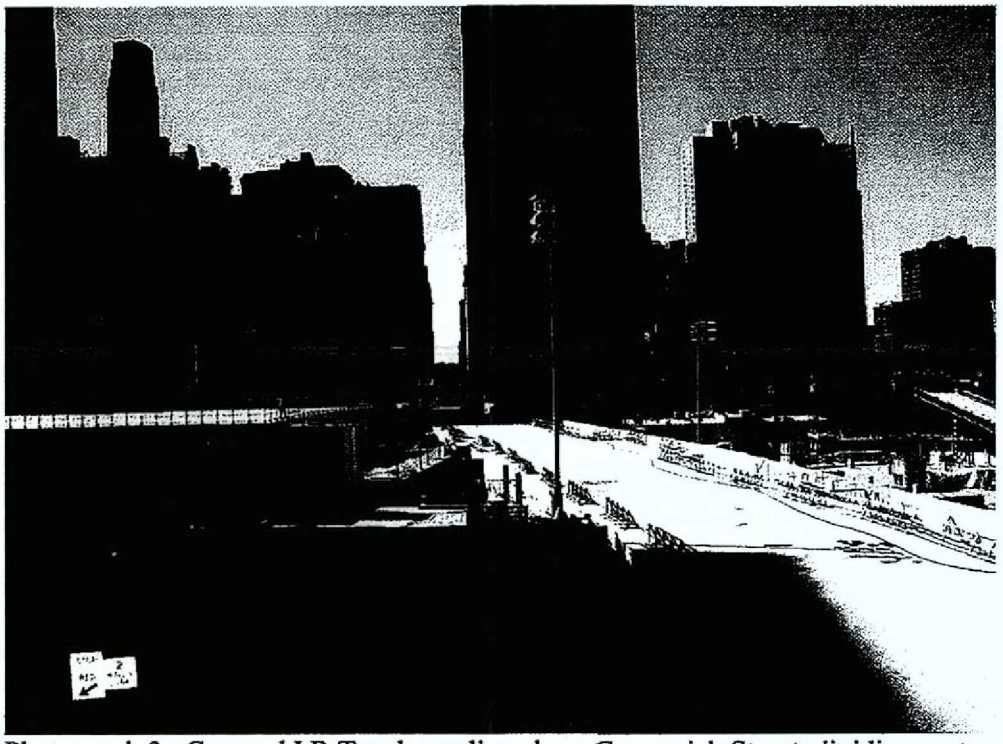


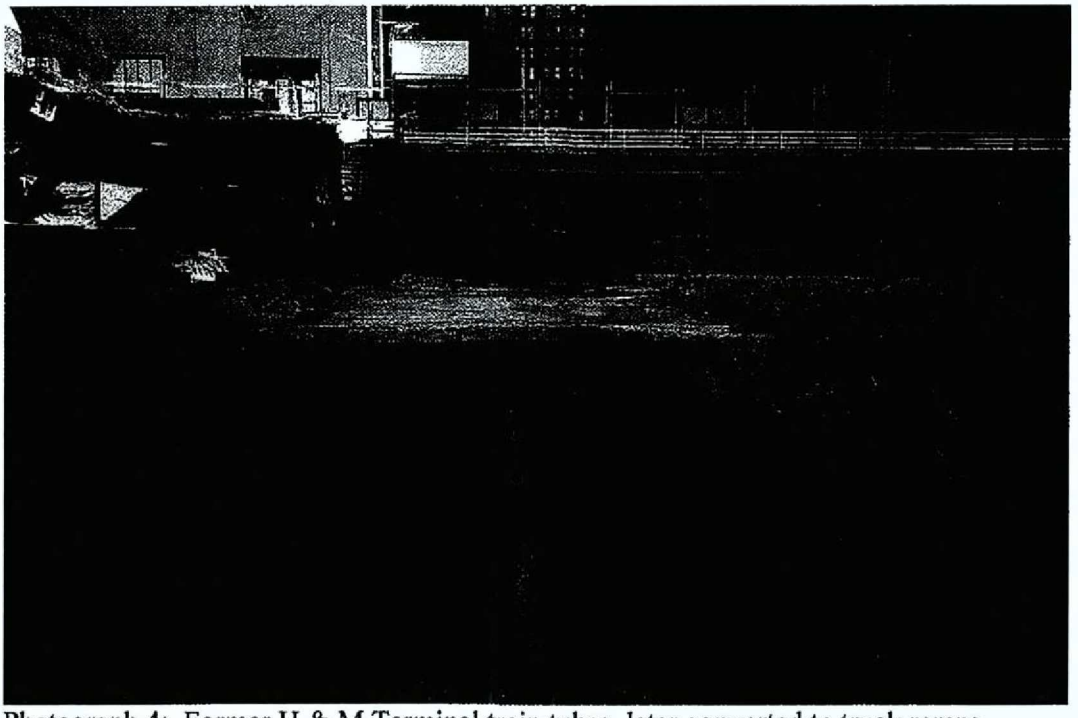
Photograph 1: Excavated "bathtub" area west of Greenwich Street, looking southwest. Covered I.R.T. subway along Greenwich Street in foreground. West Street in background.



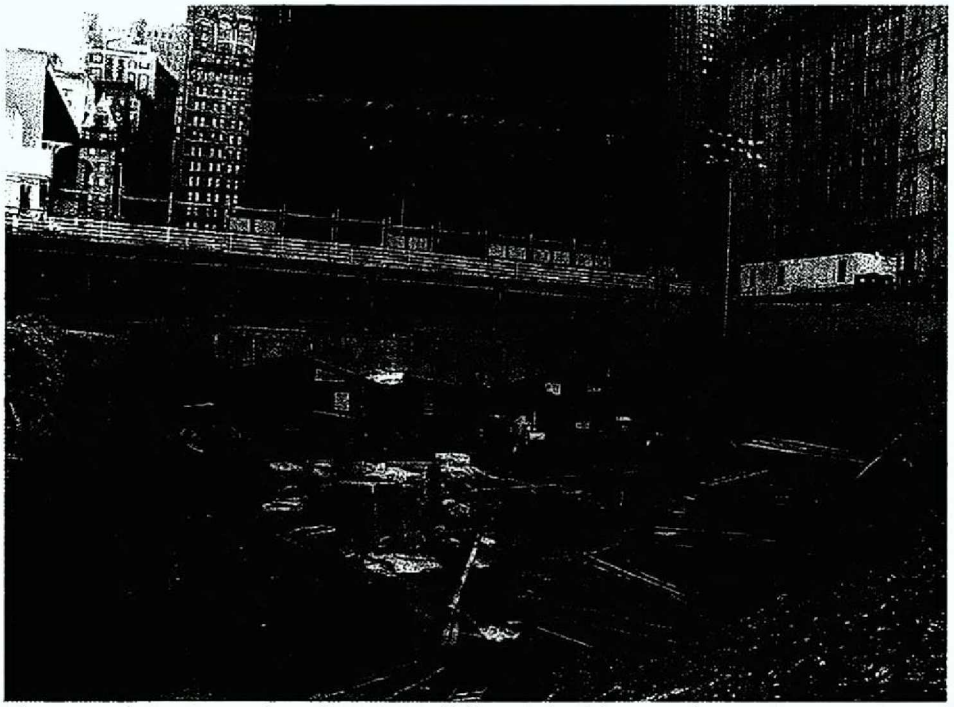
Photograph 2: Excavated "bathtub" area west of Greenwich Street, looking northeast. Vesey Street in background.



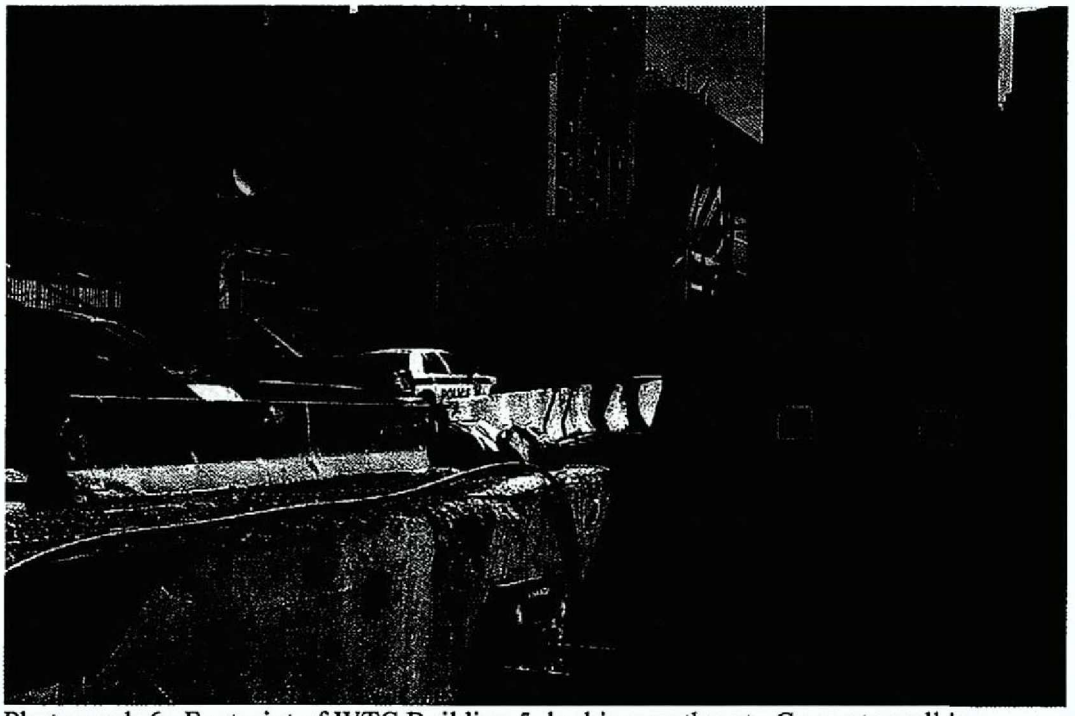
Photograph 3: Covered I.R.T. subway line along Greenwich Street, dividing east and west halves of APE, looking south. Liberty Street in far background.



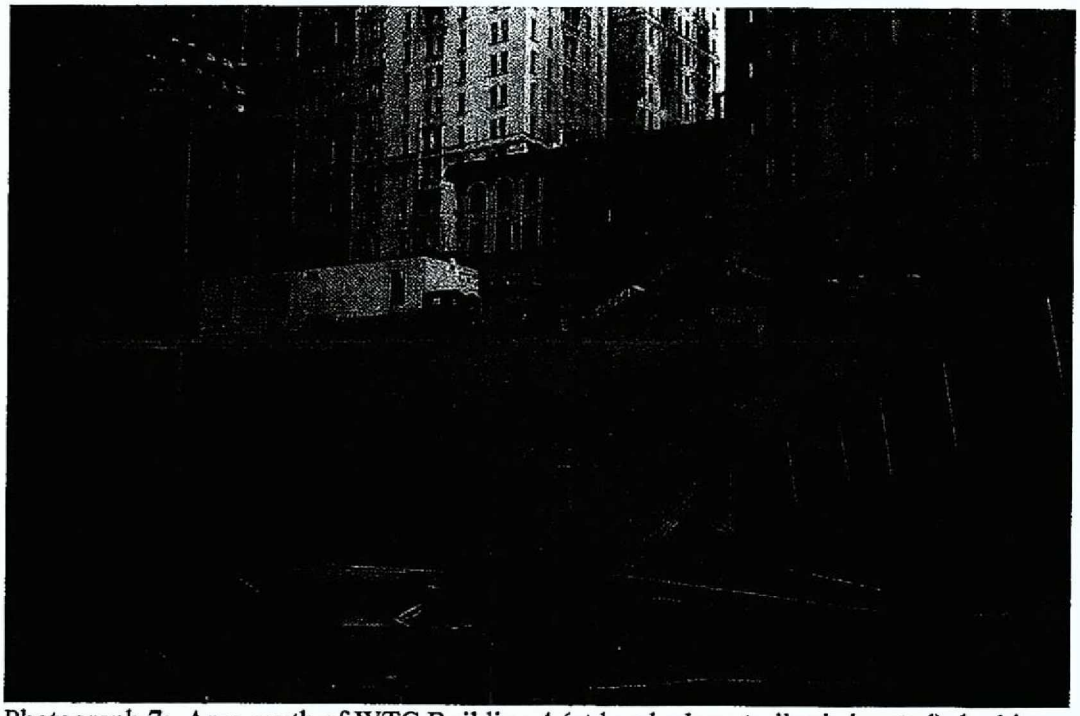
Photograph 4: Former H & M Terminal train tubes, later converted to truck ramps, looking east. Church Street in background.



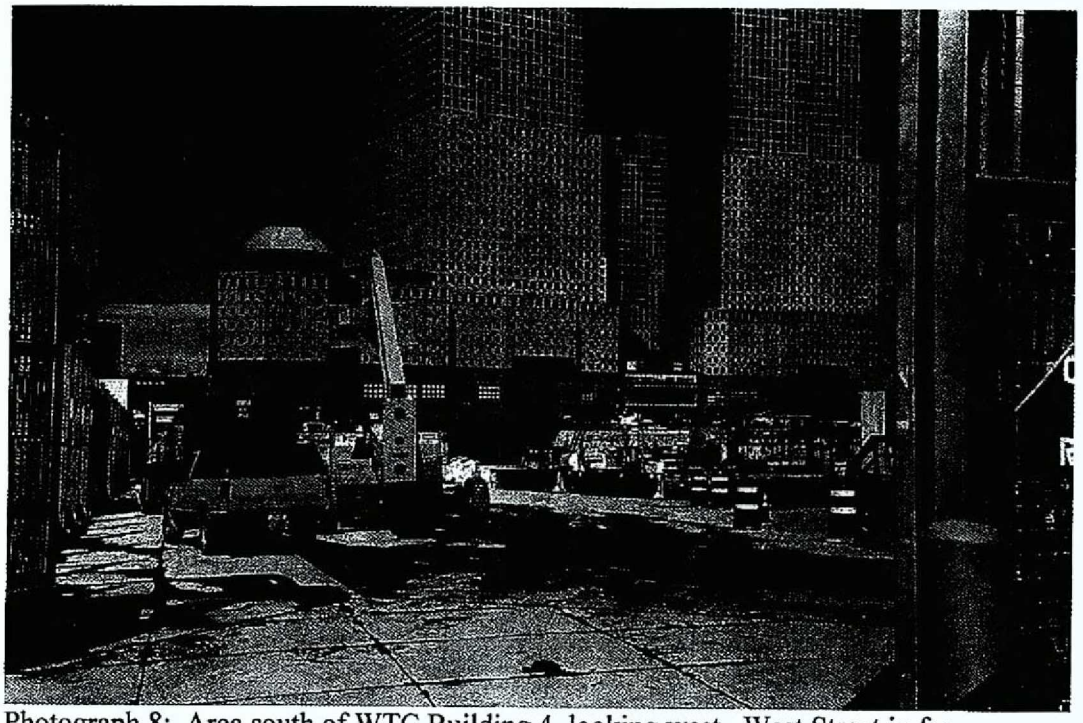
Photograph 5: Footprint of WTC Building 4, looking southeast. Intersection of Liberty and Church Streets in background.



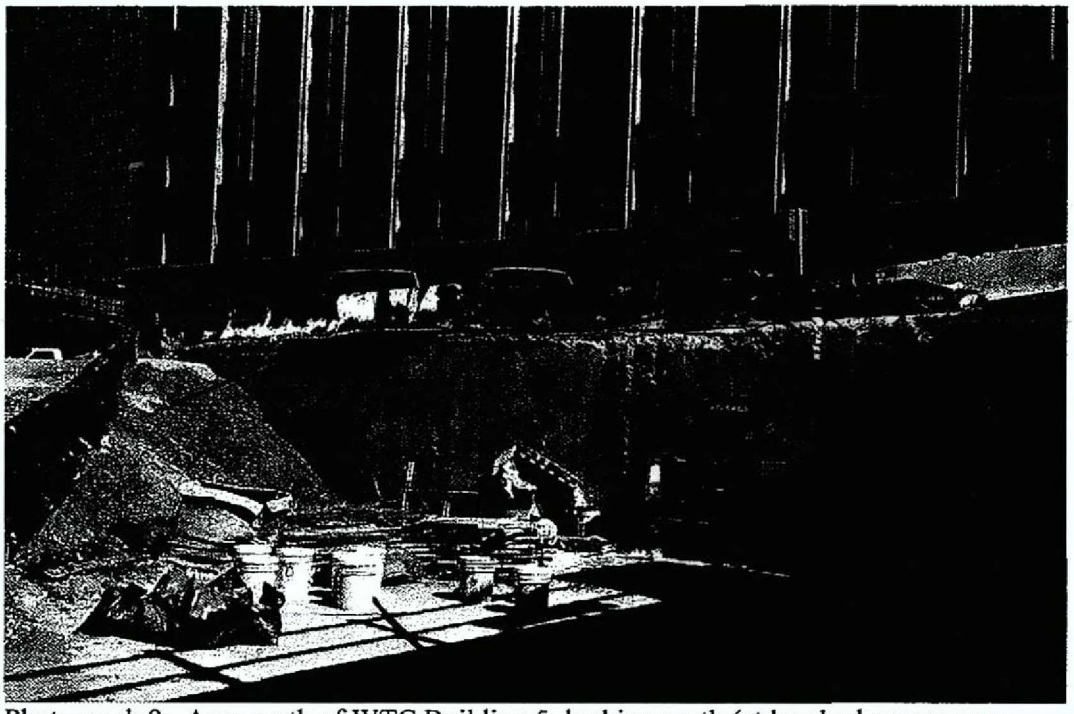
Photograph 6: Footprint of WTC Building 5, looking northeast. Concrete wall is northern extent of building. Intersection of Vesey and Church Streets in background.



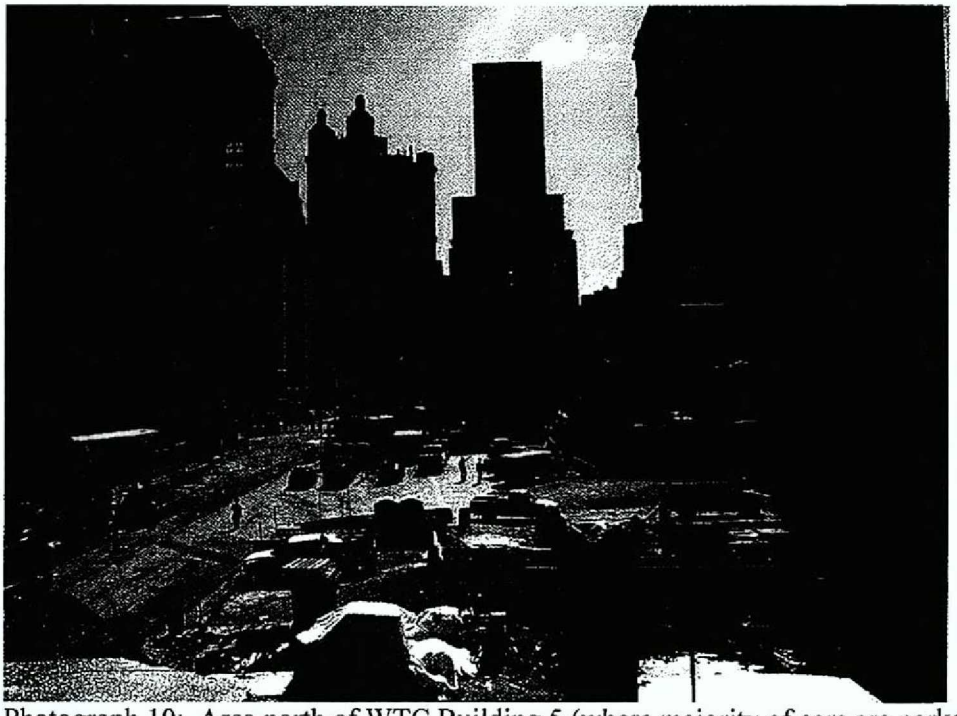
Photograph 7: Area south of WTC Building 4 (at level where trailer is located), looking south. Liberty Street in background.



Photograph 8: Area south of WTC Building 4, looking west. West Street in far background.



Photograph 9: Area north of WTC Building 5, looking north (at level where cars are parked). Vesey Street in background.



Photograph 10: Area north of WTC Building 5 (where majority of cars are parked), looking east. Intersection of Vesey and Church Streets in background.