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Brooklyn Bridge - Montgomery Coastal Resilience Project

Phase IA Archaeological Documentary Study

NYC/EDC

New York city Economic Development Corporation
One Liberty Plaza
New York, NY 10006

CEQR Number: 19OOM011M

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125 Broad Street
New York, NY 10004

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EXECUTIVE SUMMARY

The New York City Economic Development Corporation (EDC) is proposing the Brooklyn Bridge-Montgomery Coastal Resilience (BMCR) Project for Lower Manhattan. The federal Department of Housing and Urban Development (HUD) has delegated lead federal agency authority to the New York City Mayor's Office of Management and Budget (OMB). The lead city agency is the Office of the Mayor of the City of New York (OOM), and the applicant is the EDC.

The BMCR Project is a part of the larger, Lower Manhattan Coastal Resiliency (LMCR) Project that spans approximately 3.5 miles along the Lower Manhattan coast from Montgomery Street on the East River to the northern end of Battery Park City on the Hudson River. The LMCR project is an integrated coastal protection initiative aimed at reducing flood risk due to coastal storms and sea level rise.

This Phase IA documentary study is concerned with the 0.82-mile-long BMCR segment of the larger LMCR project, which runs along the East River from Montgomery Street on its northern end to the northern side of the Brooklyn Bridge at its southern end. For this undertaking, project north corresponds to the north/south-oriented FDR Drive.

The BMCR Project aims to protect the Two Bridges neighborhood from flood events and sea level rise through a flood control system. This goal would be realized by using a combination of permanent flood walls, roller gates, and flip-up gates, including tie-ins to the existing floodplain boundary.

The BMCR Project would require extensive subsurface excavation to implement. Most of the alignment runs beneath the elevated FDR Drive, and connects inland at each end of the project where it meets the 100-year floodplain. The BMCR Project alignment is supported throughout its length by micropiles, which may extend to 60 feet below grade. The alignment also includes a seepage control system along the length of the alignment. The design of the foundation support of the seepage control system could utilize a 4-foot-wide slurry wall 30-foot deep or employ micropiles extending up to 60 feet below grade. Therefore, the entire alignment has the potential to impact archaeological resources.

Given the extent of subsurface disturbance through excavation that would be required for the implementation of the various elements of the BMCR Project, the archaeological APE is proposed to be the footprint of the proposed project area. The APE was subdivided into three sections in order to organize the large amount of data presented, and to continue with the organization seen in the archaeological documentary study prepared by Richard G. Schaefer, Ph.D. of Historical Perspectives, Inc. (HPI), titled *East River Waterfront Esplanade and Piers – Inboard Resources North of Brooklyn Bridge Phase IA Archaeological Assessment.*

Construction activities vary across the project area with respect to anticipated horizontal and vertical extents of disturbance, particularly in association with existing utility removal and installation of new utilities in new alignments. As noted in the following chapters of this report and noted in the project plans, the mapped locations of utility lines are tentative, and subject to verification by the utility owners prior to BMCR Project construction activities. It is also noted that the installation of certain utility lines have already impacted subsurface conditions across the project area, although likely not to depths that would completely eliminate

archaeological potential. However, verification of utility corridor locations may serve to refine the areas of potential sensitivity.

The BMCR Project Area includes modern landfill, historic landfill retaining structures, piers, wharves, and historic and modern landfill deposits. Recurring historic development, the installation of the modern bulkhead, 20th century urban renewal efforts, multiple utility installations, transportation infrastructure improvements such as the construction of the South Street Viaduct of the FDR Drive, and the construction of the East River Esplanade elements have impacted the project area. However, the research completed for this Phase IA documentary study suggests that there is potential for intact submerged Precontact resources, riverbottom remains, historic landfill retaining structures, piers, wharves and slips, and historic landfill deposits in discrete portions of the APE.

The following table is a summary of the categories of potential archaeological resources by APE section.

Archaeological Resource Category	SECTION 1 Roosevelt Street – Catharine Slip South	SECTION 2 Catharine Slip – Rutgers Slip South	SECTION 3 Rutgers Slip – Montgomery Street
Submerged Precontact	No Potential	Area within 42.5 feet of modern bulkhead, below 40 feet of mean height of water (mhw) has low potential	No Potential
Riverbottom Remains	Area between 19th century bulkhead and 42.5 feet landward of modern bulkhead, 23 to 39.5 feet below mhw has moderate potential	Area between 19th century bulkhead and 42.5 feet landward of modern bulkhead, 40 to 55.7 feet below mhw has moderate potential	No Potential
Landfill Retaining Structures, Wharves And Piers	Area below South Street from landward sidewalk line to 42.5 feet inland of modern bulkhead, to 40.1 feet below mhw has moderate potential	Area below South Street landward of 19th century bulkhead has moderate potential to 56 feet below mhw; no potential from 38 to 64 feet inland of modern bulkhead	Area under the landward 70 feet of South Street from Clinton Street to Montgomery Street has moderate potential; no potential from 17 to 57 feet inland of modern bulkhead
Landfill Deposits	Area under the landward 70 feet of South Street, landward of the 19th century bulkhead has moderate potential	Area under South Street landward from the 19th century bulkhead; and older bulkhead 110-112 feet across Catharine Slip and 71-74 feet across Market Slip have moderate potential	Area under South Street landward from the 19th century bulkhead has moderate potential; no potential from 19th century bulkhead outboard

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1 INTRODUCTION

The New York City Economic Development Corporation (EDC) is proposing the Brooklyn Bridge-Montgomery Coastal Resilience (BMCR) Project for Lower Manhattan. The federal Department of Housing and Urban Development (HUD) has delegated lead federal agency authority to the New York City Mayor's Office of Management and Budget (OMB). The lead city agency is the Office of the Mayor of the City of New York (OOM), and the applicant is the EDC. The BMCR Project is a part of the larger, Lower Manhattan Coastal Resiliency (LMCR) Project that spans approximately 3.5 miles along the Lower Manhattan coast from Montgomery Street on the East River to the northern end of Battery Park City on the Hudson River. The LMCR project is an integrated coastal protection initiative aimed at reducing flood risk due to coastal storms and sea level rise.

This Phase IA documentary study is concerned with the 0.82-mile-long BMCR segment of the larger LMCR project, which project runs along the East River from Montgomery Street on its northern end to the northern side of the Brooklyn Bridge at its southern end (Figure 1).

For this undertaking, project north corresponds to the north/south-oriented FDR Drive. The design flood elevation (DFE) for the BMCR Project may be up to 18.5 feet. The necessary heights of intervention (HOI) for the flood control system alignment elements will be calculated as the DFE minus the elevation of existing grade at the location.

1.1 Regulatory Framework

The Brooklyn Bridge-Montgomery Coastal Resilience (BMCR) Project is being prepared in accordance with federal, state, and local environmental and historic preservation regulations. Therefore, the project must comply with relevant federal, state, and local regulations described below. The federal Department of Housing and Urban Development (HUD) has delegated lead federal agency authority to the New York City Mayor's Office of Management and Budget (OMB). The lead city agency is the Office of the Mayor of the City of New York (OOM), and the applicant is the New York City Economic Development Corporation (EDC).

To implement the BMCR Project, New York City and HUD have partnered to fund this initiative. The City received a grant through the HUD Community Development Block-Grant National Disaster Resiliency competition. Additionally, the City has committed funding through City Capital Funds. Construction across the project site would be phased and is scheduled to commence in 2021 with completion by 2024.

1.1.1 Federal Regulations

The National Historic Preservation Act of 1966, as amended (NHPA), was enacted to integrate consideration of cultural resources into the early stages of projects that are funded, licensed, or permitted by the federal government, collectively, an "undertaking." Under Section 106 of NHPA (54 USC 306108), prior to execution of a project, a federal agency or federally funded agency is required to consider the project's impact on historic properties, including any prehistoric or historic district, site, building, structure,

or object that is included in, or eligible for inclusion in, the National Register of Historic Places (National Register). Implementing regulations for Section 106, established by the Advisory Council on Historic Preservation (ACHP), require that lead federal agencies consider the direct, indirect, and cumulative effects of their actions on any National Register-listed and/or National Register-eligible archaeological and historic architectural resources that have been previously identified within the Area of Potential Effect (APE), or identified within the APE as part of the Section 106 process.

The EDC and OMB in cooperation with OOM will prepare all documents required under Section 106, and provide them to the New York State Historic Preservation Office (SHPO) for review and concurrence. Under Section 106, if adverse effects to National Register-listed and/or National Register-eligible resources occur as a result of the undertaking, the regulation requires that lead federal agencies work toward resolving adverse effects and document that alternatives to avoid or minimize impacts have been considered. If adverse impacts cannot be avoided, these agencies would collaborate with the SHPO, the Advisory Council on Historic Preservation (ACHP), and other consulting parties to develop and implement measures to mitigate such effects.

1.1.2 New York State Regulations

New York's State Environmental Quality Review Act (SEQRA) requires all state and local government agencies to consider environmental impacts equally with social and economic factors during discretionary decision-making. The involved agencies must assess the environmental significance of all actions they have discretion to approve, fund, or directly undertake.

Section 14.09 of the New York State Historic Preservation Act (SHPA) of 1980 was established as a counterpart to NHPA and declares historic preservation to be the public policy of, and in the public interest of, the state. The SHPA created the State Register, the official list of resources significant in the history, architecture, archaeology or culture of the state, its communities, or the nation. Under Section 428.2(a) of the Section 14.09 regulations, the BMCR Project is being reviewed by SHPO in accordance with Section 106 and is therefore exempt from Section 14.09 review.

1.1.3 New York City Regulations

City Environmental Quality Review (CEQR) is New York City's process for implementing SEQRA. According to the 2014 *CEQR Technical Manual*, an assessment of archaeological and historic architectural resources is generally required for any project funded, directly undertaken or approved by a New York City agency which involves new construction, demolition, or any in-ground disturbance. In New York City, the New York City Landmarks Preservation Commission (LPC) functions as the city's expert technical agency for historic and cultural resources.

CEQR defines archaeological resources as physical remains, usually subsurface, of the prehistoric, Native American, and historic periods. CEQR defines architectural resources as historically important buildings, structures, objects, sites, and districts. These include Landmarks designated by the LPC, properties calendared for consideration as Landmarks by LPC; properties listed on the State and/or National Register, or contained within a district listed in the State/National Register; properties recommended for listing in the State/National Register by the New York State Board for Historic Preservation; National Historic

Landmarks (NHLs); and properties not identified by these programs, but that meet their eligibility requirements as determined by the SHPO.

If it is determined that a City project would significantly impact archaeological and/or historic architectural resources, OOM and EDC would collaborate with OMB, SHPO, LPC and other consulting parties to develop and implement measures to mitigate such effects, similar to the process described under Section 106 above.

1.2 General Project Description

The BMCR Project spans approximately 0.82 miles (4,330 linear feet) from Montgomery Street to the Brooklyn Bridge, incorporating the corridors of South Street, and the area beneath the National Register-eligible FDR Drive, adjacent to the East River Esplanade (Figure 1). The BMCR Project is located within the Two Bridges neighborhood of Manhattan, which takes its name from National Historic Landmark (NHL)/NYC Landmark Brooklyn Bridge and National Register-listed/NYC Landmark Manhattan Bridge, whose footings and, in the case of the Brooklyn Bridge, ramp network, are situated there.

The Two Bridges neighborhood consists of a combination of residential, commercial, educational and recreational development. The area near the waterfront consists largely of residential buildings, a significant number of which are owned and operated by the New York City Housing Authority (NYCHA). Educational facilities include P.S. 184 (Shuang Wen) at the intersection of Montgomery and Cherry Streets, and P.S. 126 (Jacob August Riis) at 80 Catherine Street. Commercial businesses are scattered throughout the area.

The South Street Viaduct of the FDR Drive and South Street run the length of the project, providing vehicular access both locally and city-wide. The East River Waterfront Esplanade is located under the FDR Drive along the East River. This park contains several recreational uses including a multi-use trail, benches and other seating areas, an outdoor workout facility/gym, and general open green space. Piers 35 and 36 are on the east side of the Esplanade, in the northern portion of the project area. Pier 35 recently opened as a park and both the New York City Department of Sanitation and New York City Fire Department have operational facilities on Pier 36.

In addition, the BMCR Project waterfront encompasses a major utility corridor beneath South Street, where several pieces of critical subsurface infrastructure remain largely vulnerable in the event of a storm.

1.3 Proposed Project Actions

The BMCR Project aims to protect the Two Bridges neighborhood from flood events and sea level rise through a flood control system. This goal would be realized by using a combination of permanent flood walls, roller gates, and flip-up gates, including tie-ins to the existing floodplain boundary. Figure 2 depicts the BMCR Project flood control system elements.

The BMCR Project would require extensive subsurface excavation to implement. Most of the alignment runs beneath the elevated FDR Drive, and connects inland at each end of the project where it meets the 100-year floodplain. The flood control system alignment is supported throughout its length by micropiles, which

may extend to 60 feet below grade. The alignment also includes a seepage control system along its length. The design of the foundation support of the seepage control system could utilize a 4-foot-wide slurry wall 30-foot deep or employ micropiles extending up to 60 feet below grade.

Elements of the BMCR Project are discussed below regarding their impacts.

1.3.1 Flip-Up Gates

Flip-up gates are proposed for a significant length of the alignment (approximately 80%), and would be installed under the FDR Drive, hidden when stored, and lie flat in the ground within a raised platform. These elements require deep pilaster supports and concrete below grade and are supported on micropiles. The flip-up gates are to be stored in concrete boxes 3-feet below grade. When deployed, the flip-up gates may be up to ±12.5 feet above grade, but designs are yet to be finalized.

Additionally, the flip-up gate sections would require a drainage system to manage any water that flows into the raised platform. Additional subsurface excavation would likely be required for the installation of drainage elements associated with the flip-up gates. The independent storm drainage system for the flip-up gates would consist of a network of small diameter drains and collectors, ranging from 6-inches to 12-inches in diameter, picking up the 4-inch drain line located in the center of each flip-up section. The system would discharge to existing or new catch basins and manholes that discharge to existing combined sewer overflow outfalls, or to separate drain outfalls outside of the line of protection.

The flip-up gates would also require a series of structural posts aligned with the gates so when deployed the gates can form a watertight seal against these posts during storm events. The height of the posts would be the same as the height of the gates as they form an integral part of the flood barrier system. A concentration of flip-up gates along the East River Esplanade would preserve the existing character, view corridor, and pedestrian and vehicular navigability of an important and heavily utilized waterfront public space. The flip-up gate sections would be concentrated at key view corridors along the waterfront including the following locations: Robert F. Wagner, Sr. Place; Catherine Slip; Market Slip; Pike Slip; and Rutgers Slip.

1.3.2 Fixed Flood Walls

Fixed cantilevered flood walls would be constructed of cast-in-place concrete. They would be supported on micropile foundations for design heights of up to ±12.5 feet above grade. It is anticipated that the flood walls will have pilaster supports and require an 8-foot-wide spread footing foundation located 3- to 6-feet below the wall and supported on micropiles. These walls would be situated within the northern portion of the alignment, north of Jefferson Street to Montgomery Street, and on the south side of Robert F. Wagner, Sr. Place and the north side of the Brooklyn Bridge in an area occupied by ramps that connect the bridge to the FDR Drive and South Street.

1.3.3 Isolation Gate Control House

The interceptor sewer isolation gate would require the construction of a control building in the southern portion of the project, north of the Brooklyn Bridge. A single-story, 50-foot-by-11-foot control house would be connected via hydraulic and electric lines to the subsurface isolation gate chamber. Designs for the

control house have not been finalized but would likely be similar to the infrastructure being designed for EDC's East Side Coastal Resiliency (ESCR) Project currently underway north of Montgomery Street.

1.3.4 Drainage Infrastructure Improvements

The BMCR Project proposes the installation of six parallel conveyance structures. Parallel conveyance structures sit below ground and provide a connection between the existing combined sewer and interceptor sewer that would be necessary during the design storm scenario. Their purpose is to mitigate the reduction of overflow capacity at the five project area outfalls during the design event by diverting storm water flow to the interceptor upstream of the five outfalls. The proposed sizes and locations of these structures are shown in the drainage plans submitted during the schematic design phase of the project.

1.3.5 Watermain Installation and Removal

The BMCR Project requires the abandonment/removal of an existing 30-inch watermain and its distribution mains that conflict in multiple locations with the BMCR Project. A new 36-inch watermain and its distribution mains are proposed for the full length of the project. The new main would be located inland of the existing 30-inch main and the flood alignment. The new main will also require the installation of new access manholes along its length. The installation of the new 36-inch watermain would entail a trench excavation of approximately 7-feet-wide and 9- to 10-feet-deep.

The BMCR Project also requires the removal or abandonment of a 12-inch watermain across most of the project corridor length. A replacement 12-inch watermain on a new alignment is proposed for the length of the project. This line will supply 6-inch lines for new valve box and hydrant connections. The installation of the new 12-inch distribution main would entail a trench approximately 3-feet-wide and 6-feet-deep.

Additional proposed watermain work along the project corridor includes replacement of sections of existing lines in tandem with the installation of the new 36-inch watermain. For example, connections with the new 36-inch line will require a replacement section of a 20-inch watermain, valve, and valve chamber in the area between Rutgers Slip and Clinton Street.

1.3.6 Other Actions

The BMCR Project would implement flood control infrastructure in tandem with program amenities along the waterfront. Construction of the BMCR Project would disrupt the East River Esplanade project program elements that are currently under construction or recently implemented. However, the BMCR Project would redesign the existing Esplanade fitness areas to accommodate the flood control system infrastructure, and the existing basketball courts would be relocated to the southern end of the project area where adequate space would be available. The BMCR Project would also include play spaces and other active recreation.

The BMCR Project would also require the following:

- Utilities shall be relocated to avoid the BMCR alignment.

- Any impacted existing surface features such as fire hydrants, signage/traffic posts or traffic signal/street lighting appurtenances shall be relocated and avoid the BMCR alignment.

- Excavation and pavement restoration and localized milling and resurfacing shall be designed to match existing conditions.
- Existing fencing under FDR shall be removed and replaced, if necessary.

1.4 Archaeology Area of Potential Effect (APE)

The area of potential effect (APE) is the area "within which an undertaking may directly or indirectly cause changes in the character or use of historic properties" (36 CFR Part 800.16[d]). Historic properties are districts, sites, buildings, structures, or objects that are significant in American history, archaeology, architecture, and/or culture, and have been listed in or determined to be eligible for listing in the National Register of Historic Places (National Register).

Archaeological resources are concerned with direct effects caused by subsurface disturbances to previously undisturbed soils associated with the execution of project actions. The Archaeological APE includes two components: the horizontal APE, which is the footprint of proposed ground disturbance; and the vertical APE, which is considered as the depth to which the proposed ground disturbance is anticipated to extend.

Given the extent of subsurface disturbance through excavation that will be required for the implementation of the various elements of the BMCR Project, the archaeological APE is proposed to be the footprint of the proposed project area. The APE is depicted on Figure 3.

1.5 Objectives and General Methodology

The main objectives of the Phase IA archaeological assessment are to determine the potential for encountering intact, potentially National Register-eligible archaeological resources that would be impacted by proposed project actions, and to determine the extent of prior subsurface disturbances to the project area.

The assessment is developed through the review of previously identified archaeological sites on and in the vicinity of the APE to determine if as yet unidentified archaeological sites in similar settings could be expected to be encountered within the APE, and through the development of a project site disturbance characterization that takes into account the extent of prior subsurface ground disturbance that has already directly impacted the APE. For example, Figures 4a, 4b, and 4c depict the existing underground utilities across the BMCR APE. Archaeological resources that have been directly impacted by prior actions are not expected to be intact, or retain stratigraphic integrity, or meet the eligibility criteria for listing in the National Register.

The completion of this assessment involved archival, documentary, and cartographic research, a visual inspection of the project corridor, communications with persons knowledgeable about the history of the area, and analysis of all collected information.

2 ENVIRONMENTAL SETTING

2.1 Geology

Manhattan Island lies within the Manhattan Hills subdivision of the New England Upland Physiographic Province. The Manhattan Hills, which include Manhattan and most of Westchester County, are low in elevation and developed on complex ancient rocks (Thompson 1977). More specifically, New York City lies at the extreme southerly tip of the Manhattan Prong, a northeast trending, deeply eroded sequence of metamorphosed rock that widens northeastward into New England (Mergeurian and Sanders 1991:5). The bedrock underlying Manhattan Island includes the Fordham Gneiss, Lowerre Quartzite, Inwood Marble and various schistose rocks formally included in the Manhattan Schist (Merguerian and Sanders 1991:15). The surface of Manhattan Island was impacted by multiple glaciations including the Kansan, Illinoian, and Wisconsin. These events scoured, covered and eroded the land surface as they advanced and retreated. During the glacial periods, the amount of water that was locked up by the glaciers caused world-wide sea level to drop ca. 400 feet, essentially exposing Manhattan, the present channel of the East River and much of the New York Metropolitan Area as dry land. During these glaciations the BMCR APE was also exposed dry land, not a shoreline location or river channel.

Before the final retreat of the Wisconsin ice sheet at the close of the Pleistocene Epoch, ca. 12,500 years before present (BP), the melting ice formed a number of lakes in the East, Hudson, and Hackensack Rivers, created by dams formed of ice and glacial moraines. Much of Manhattan Island and the present East River channel were submerged beneath glacial Lake Flushing. Glacial Lake Flushing drained as melting continued and erosion breached the moraine dams. The release of meltwater due to the glacial retreat resulted in the worldwide rise of sea level from ca. 400 feet below current levels during the Late Pleistocene to about 10 feet below current levels between 4,000- and 2,600-years BP during the Holocene Epoch (Raber et al. 1984:10 in HPI 2007:4). This rapid rise of sea level during the Holocene has been named the Flandrian submergence (Mergeurian and Sanders 1991:53).

2.2 Topography

Precontact topography of Manhattan Island would have included high and low hills, many watercourses and their valleys, coves, inlets, coastal and interior swamps, tidal marshes, rocky coastal and beach areas. The island would have been for the most part forested, with wetland vegetation occurring in marginal areas bordering swampy tracts and marshes. The understory would have included brushy vegetation, bushes, and brambles. The 1865 Viele Map, *Sanitary & Topographical Map of the City and Island of New York* depicts the original Manhattan shoreline and topographic features of the project area prior to landfilling efforts, with the street grid superimposed (Figure 5).

Historic maps indicate that the high-water mark (maximum extent of water at high tide) along the original shoreline was located in the vicinity of present-day Cherry Street, and the low-water mark (level of water extent at low tide) was located in the vicinity of present-day Water Street (Department of Docks 1873 in AKRF 2017:14). Therefore, the entire BMCR APE lies within landfilled areas that were once part of the East River.

Native American trails have been identified across the island, some connecting Lower Manhattan settlements and then continuing northward toward the settlements in the interior. These trails have been identified and mapped by Reginald Pelham Bolton in his 1920 monograph *Indian Paths in the Great Metropolis* across the five boroughs. The Native American trails would have followed the high ground, skirted obstructions, and utilized easily fordable locations to cross watercourses. Many of these trails would subsequently be used by European settlers as some of the first roadways on the island.

2.3 Existing Conditions

The surface of present-day Manhattan Island is characterized by low hills and is surrounded by estuaries and tidal straits. Historic development has altered the much of the Precontact topography of the island, as forests were cut, swamp areas were filled, hills were leveled, streams were culverted or moved, and the shorelines were extended out into the rivers through land making efforts. As noted above, prior to the time of European colonization, the BMCR APE was submerged beneath the East River. Intentional bulkheading and land making episodes beginning in the 17th century extended the shoreline to what it is today by the early decades of the 20th century.

The Web Soil Survey maintained by the Natural Resources Conservation Service (NRCS) of the US Department of Agriculture (USDA) indicates that the soil profile of the BMCR project area is composed of ULA – Urban land-LaGuardia Complex, 0 to 3 percent slopes and UrA – Urban land, reclaimed substratum, 0 to 3 percent slopes (https://websoilsurvey.sc.egov.usda.gov).

The BMCR Project Area is characterized as a dense urban neighborhood including a highly utilized waterfront, with the National Register-eligible FDR Drive and a contemporary esplanade beneath it, two major historic bridges that connect Manhattan and Brooklyn across the East River, playgrounds, other recreational space, historic commercial and industrial buildings, and historic and contemporary high-rise residential buildings. Photographs 1-10 are representative views across the Project Area. In addition, the Project Area waterfront encompasses a major utility corridor beneath South Street, where several pieces of critical infrastructure remain largely vulnerable in the event of a storm.

3 SURVEY METHODOLOGY

Completion of this survey to determine the archaeological potential within the BMCR Project APE involved a visual inspection of the project area, the synthesis of information derived from previous archaeological survey work completed for the project area, additional project-specific archival, documentary, cartographic and photographic research, review of boring logs completed within the project corridor, and the analysis of all collected information.

The present chapter discusses the methods employed in the various levels of work effort necessary to accomplish the survey objectives.

3.1 Visual Inspection

The visual inspection of the BMCR project area was conducted to determine existing conditions across the proposed work area. Emphasis was placed on noting evidence of prior subsurface disturbance within the archaeology APE for the project. Project maps and design plans were utilized during the inspection and photographs were taken of existing conditions.

3.2 Synthesis of Previous Work

Given the extent of subsurface disturbance through excavation that will be required for the implementation of the various elements of the BMCR Project, the archaeological APE has been determined to be the footprint of the proposed project area as depicted on Figure 3. The archaeological APE was subsequently researched in the SHPO's CRIS website in compliance with Section 106 of the NHPA, SEQRA, and CEQR. The search area for historic archaeological resources surrounding the project area was a 0.25-mile-radius, and the search area for prehistoric archaeological resources surrounding the project area was a 0.5-mile-radius.

3.2.1 Previously Identified Sites

According to the CRIS search, a total of 12 historic archaeological sites and two historic cemeteries lie within a 0.25-mile-radius of the BMCR project area. In addition, two prehistoric archaeological sites have been documented within a 0.5-mile-radius of the project area. The site forms were downloaded from the CRIS website for future reference.

The sites are identified and described in Section 5.2.1 and Table 5-1 lists the sites, their locations relative to the project area, and relevant temporal and cultural attributes.

3.2.2 Previously Conducted Archaeological Surveys

According to the CRIS search, numerous cultural resources surveys have been previously conducted for part of, or in proximity to, the BMCR project area. Many of the surveys were Phase IA archaeological documentary studies concerned with major projects such as the East River Waterfront Esplanade and Piers Project, while others were concerned with block-specific commercial and residential development projects. Many of the Phase IA studies recommended Phase IB subsurface testing, archaeological monitoring during construction, and boring surveys.

All relevant reports were downloaded from the CRIS website or from the LPC archive of archaeological reports for reference.

Of particular relevance to the current BMCR Phase IA study is the 2007 Phase IA documentary study authored by Richard G. Schaefer, Ph.D. of Historical Perspectives, Inc. (HPI), titled *East River Waterfront Esplanade and Piers – Inboard Resources North of Brooklyn Bridge Phase IA Archaeological Assessment* documentary study report for the Lower Manhattan Development Corporation (LMDC). The archaeology APE for the BMCR study is included within the archaeology APE of the 2007 study. Extensive background and cartographic research was conducted for the 2007 study and the current BMCR Phase IA will rely on the results of that research. The current BMCR Phase IA will continue to use the same terminology as that of the 2007 Phase IA study for consistency. For example, the terminology for potential archaeological resources (riverbottom remains, sunken vessels, landfill retaining structures, landfill deposits, etc.) has been carried forward in the BMCR Phase IA.

The 2007 Phase IA and additional relevant survey reports completed for portions of the current archaeology APE and its immediate vicinity are summarized in Section 5.2.2.

3.3 Background Research

The current BMCR Phase IA largely relies on the research and results of previously conducted surveys. Additional project specific research was conducted at the following repositories/online resources:

- CRIS search for archaeological resources and survey reports completed post-2007.
- LPC archive of archaeological reports completed post-2007.
- NYPL Digital Archive
- The New York Public Library
- The New-York Historical Society

3.4 Review of Boring Data

Boring logs were included and reviewed in the 2007 HPI Phase IA Phase I survey. The logs were reviewed as part of the background research for the current BMCR Phase IA. In addition, a boring survey, recommended in the 2007 report, was conducted for portions of the 2007 archaeology APE in 2008. The report on the results of that boring survey titled *East River Esplanade and Piers, Archaeological Field*

Monitoring and Soil Boring Analysis, Borough of Manhattan, New York, New York report for the New York City Economic Development Corporation (EDC), was authored by Sara Mascia, Ph.D. and Richard G. Schaefer, Ph.D. of HPI, Inc. Portions of the 2008 boring survey were conducted within the current BMCR archaeology APE, and the logs were reviewed for the current Phase IA.

3.5 Archaeological Potential Determinations

A major goal of the Phase IA documentary study is to determine the archaeological sensitivity of the APE. As stated in the New York Archaeological Council's (NYAC) *Standards for Cultural Resource Investigations and Curation of Archaeological Collections*, sensitivity assessments should be categorized as low, moderate, or high to reflect "the likelihood that cultural resources are present within the project area" (NYAC 1994:2).

Factors to consider during the sensitivity assessment that affect the likelihood that Precontact and historic populations would have occupied a particular area within the APE include:

- The proximity to a permanent potable water source
- The presence of well-drained soils
- The availability of floral and faunal resources for subsistence purposes
- The availability of raw materials
- The documentation of transportation routes
- The density of known Precontact and historic sites documented for the general area
- The extent of documented prior subsurface disturbance within the APE

In consideration of the above listed factors, the Low, Moderate, and High archaeological sensitivity designations may be generally defined as follows:

Low Sensitivity:
Areas of low sensitivity include those areas within the APE where the original topography suggests that Precontact sites would not be present (i.e., no potable water source or the presence of tidal marsh or swampy ground); areas where no historic occupation occurred prior to the advent of municipal water and sewer networks; and areas that have seen extensive subsurface disturbances that would preclude the presence of intact archaeological resources.

Moderate Sensitivity:
Areas designated as possessing moderate sensitivity are those areas within the APE with topographical features that would suggest Precontact occupation and areas with documented historic activity that have seen some prior subsurface disturbance, but the disturbance was not extensive enough to completely eliminate the possibility for encountering intact archaeological resources.

High Sensitivity:
Areas of high sensitivity include those areas within the APE with topographical features that would suggest Precontact occupation and areas with documented historic activity that have seen minimal or no prior subsurface disturbance.

It is noted that areas initially determined to possess archaeological sensitivity based on background literature and cartographic research may in fact be areas proven through additional research to possess no sensitivity based on the extent of documented prior subsurface disturbance. Such instances would include large-scale transportation infrastructure improvement projects and urban renewal projects such as high-rise housing projects.

4 CONTEXTS AND RESEARCH DESIGN

4.1 Prehistoric Context

4.1.1 Introduction

The Precontact period on Manhattan Island and the surrounding area is divided by archaeologists into four basic periods largely based on adaptations to changing environmental conditions reflected in the artifact assemblages associated with each. The basic cultural sequence and chronology for New York State is based on Ritchie (1994 [originally published 1965, revised 1969, 1980]). The basic periods are the Paleo-Indian, the Archaic, the Woodland, and the Contact. The Archaic and Woodland Periods may be further divided chronologically, as shown in Table 4-1. Many archaeologists in the Northeast subscribe to a Transitional Period between the Archaic and Woodland Periods.

Table 4-1

Cultural Sequence and Chronology

Cultural Period	Time Period	Geological Age
Paleo-Indian	Ca. 12,000 - 9,000 BP (Ca. 10,000 - 7,000 BC)	Late Pleistocene
Early Archaic	9,000 - 7,000 BP (7,000 - 5,000 BC)	Early Holocene
Middle Archaic	7,000 - 5,000 BP (5,000 - 3,000 BC)	
Late Archaic	5,000 - 3,000 BP (3,000 - 1,000 BC)	
Early Woodland	3,000 - 1,950 BP (1,000 BC – AD 1)	
Middle Woodland	1,950 - 950 BP (AD 1 - 1000)	
Late Woodland	950 - 450 BP (AD 1000 - 1500)	
Contact	450 - 300 BP (AD 1500-1650)	

The following subsections provide summary information on this chronology organized by the major prehistoric adaptive trends (Paleo-Indian, Archaic, and Woodland) as they pertain to the project vicinity. The Contact period, a period of increasing contact and conflict between the native populations and European settlers, is also briefly summarized below.

4.1.2 Paleo-Indian Period

The Late Pleistocene period in southern New York was characterized by a peri-glacial or boreal environment, dominated by open spruce woodlands and stands of birch, popular, and willow. This was succeeded in the Early Holocene by closed canopy pine-birch-oak forests. Open woodland provided optimal grazing for fauna such as caribou, musk-oxen, mammoth, and horse, while the advent of closed-canopy forest created habitat for deer and small game. Paleo-Indian peoples in the New York City area would also have been able to exploit food sources such as shellfish along the shoreline. Archaeological evidence suggests that Paleo-Indian peoples were highly mobile hunters and gatherers who lived in small groups and did not maintain permanent settlements.

The distinctive artifact of the Paleo-Indian period is the fluted point, a clearly recognizable spear or projectile point type that is usually identified as having a deep flake or scar chipped vertically along the center section from the base. The diagnostic material culture of the Paleo-Indian period consists largely of projectile points, but also includes smaller numbers of knives, scrapers, flakes, choppers, and pounding tools. These tool kits indicate heavy dependence on hunting, probably of large game, and exploitation of local flint resources.

Of the few Paleo-Indian sites that have been identified in New York City, nearly all have been found on Staten Island. The most important Paleo-Indian sites were identified at Port Mobil. There is no evidence for Paleo-Indian occupation of the BMCR APE, however, the presence of deeply buried and currently submerged sites cannot be categorically ruled out. As mentioned in previous sections, the BMCR APE would have been exposed dry land when sea levels were 400 feet below current levels as a result of glaciation. These dry areas would be available for exploitation by human populations until glacial meltwater brought the sea levels back to approximately 10 feet below current levels and flooded the APE.

4.1.3 Archaic Period

The period ca. 9000 BP saw intense rises in temperatures and drying, lowering water tables and shrinking post-glacial lakes, with the expansion of pines and birches at the expense of deciduous species. Another result of this short-term change, and the retreat of the glaciers in general was rising sea levels. The rising sea levels in turn resulted in the inundation of many former coastal environments. The Early and Middle Archaic environment of coastal Manhattan may have been less favorable to specialized hunting than before but offered a variety of marine resources and small game along the new coastal environment, which included swamps and inland waterways, and in mixed forests, especially along forest margins.

Archaic settlements consisted of small, multi-component sites located on tidal inlets, coves, bays, and freshwater inland ponds and streams. Archaic tool kits indicate that a wider variety of food resources were being systematically exploited than during the Paleo-Indian period. The Archaic period tool kits include plant processing implements and fishing related artifacts. Generalized hunter-gatherers characterize the Archaic period, exploiting not only large game but also a wide variety of fauna such as small mammals and birds and riverine resources.

Archaic period sites do not provide evidence that agriculture was practiced. However, technological innovations, such as the emergence of stone bowls (steatite), evidently of Southeastern derivation, were important pre-adaptive features for the development of agriculture during the Woodland period.

4.1.4 Woodland Period

Important developments of the Woodland period include the practice of agriculture and the emergence of larger social units, including the predecessors of historically recognized tribes. In technological terms, the Early Woodland period is marked by the emergence of pottery, however, additional technological advancements that arose during the Woodland period include smoking pipes, the bow and arrow, and a wide variety of chipped and ground stone artifacts.

Woodland period sites across the region indicate that there was an overall shift toward permanently settled villages and full-time agriculture. However, hunting of both large and small game and exploitation of marine resources continued to provide the bulk of the subsistence base during the period. Woodland sites are often found near lakes, streams, and rivers.

4.1.5 Contact Period

The Late Woodland Period ended with the arrival of the first Europeans during the early-16th century. Giovanni de Verrazano, the Italian born explorer who was sailing under the French flag, reached New York Harbor on April 17, 1524. Eighty-five years later, in 1609, Henry Hudson's voyage in search of the Northeast Passage to the Orient took place, whereupon he re-discovered New York Harbor and the river that now bears his name. Almost immediately thereafter Dutch traders in great numbers began flooding into the area in search of furs and other materials.

Once contact had been established with the Europeans, the Native American way of life was forever changed. The Native Americans quickly began to suffer from the effects of European contact in that disease, alcoholism, and warfare began to decimate the populations of native groups. The Native Americans at first continued to occupy the village sites they had established near water sources. However, as the European settlements grew and subsequently required more land, the conflicts with Native Americans escalated. This was especially prevalent during the 1640s when Director-General Kieft ordered many unprovoked attacks on the native groups.

Peter Stuyvesant replaced Kieft as Director-General in 1647 and the relations between the Native American groups and European colonists were somewhat improved. However, the "Peach War" of 1655 renewed the hostilities between the groups and led to increased violence. The Peach War was precipitated when Attorney General van Dyck shot and killed a Native American woman who was picking peaches in his orchard (Federal Writers' Project 1939). The Peach War hostilities ended in 1657.

4.1.6 Precontact Populations on Manhattan Island

Multiple sites have been identified on Manhattan Island, most of which were located across the upper part of the island in Harlem, Kingsbridge, Spuyten Duyvil, Marble Hill, Fort Tryon, and Inwood. Since many of these sites were discovered and reported by avocational archaeologists during the early-20th century, there is limited temporal and cultural affiliation information available.

There is also limited descriptive historical information available regarding the existing Native American settlements at the time of European contact. Reginald Pelham Bolton, an avocational archaeologist working during the early decades of the 20th century, compiled much available information and wrote the monograph

New York City in Indian Possession for the Museum of the American Indian, Heye Foundation in 1920. Bolton wrote in 1920 "The paucity of historical information regarding the aborigines who occupied the Island of Manhattan seems remarkable, in view of its being the earliest point of contact between the white and red races in our vicinity." (Bolton 1920:340). In 1922, Bolton also authored a monograph *Indian Paths in the Great Metropolis* that identified Native American trails across the five boroughs and the settlements the trails connected.

In describing the Native American groups of Manhattan Island and vicinity, Bolton states, "From the fact that all the nearby islands in East River were owned by the *Mareckawick* group of the *Canarsee*, it seems probable that the southerly end of Manhattan may also have been occupied by the Indians of *Mareckawick* (or Brooklyn), which was much nearer and more accessible than the upper part of the island itself, reached only by a long tramp through a forest trail, or a long cruise over tidal waters." (Bolton 1920:342). Bolton continues to explain this rationale, "The *Reckgawawanc* Chieftaincy had distinct control and occupancy of the upper half of Manhattan and the westerly half of the Borough of the Bronx…There wasn't any important residential station in the middle part of the island – which coincides with the probability of its separate occupancy at each end, if not its complete division between two chieftaincies." (Bolton 1920:343).

There were two existing settlements in Lower Manhattan at the time of European contact within one-half-mile of the BMCR Project Area. The first of these sites is *Werpos*, which was located near the Collect Pond and City Hall. The area around this settlement is said to have been marked by extensive shell heaps, which suggests a settlement of some duration. The second site is *Rechtauck* or *Naghtogack*, located at Corlears Hook on the East River shore. Bolton indicates that the *Weckquaesgeek* fled to this settlement for shelter from the Mohawk but were massacred by order of Governor Kieft in 1643. Bolton also states, "It is more likely that the station at *Naghtogack* (Corlears Hook) was a *Mareckawick* than a *Reckgawawanc* settlement." (Bolton 1920:344). These sites are discussed in more detail in Section 5.2.1.

4.2 HISTORIC CONTEXT

4.2.1 East River Commerce

The East River was the main port of entry into New Amsterdam / New York City from its initial 17th century settlement up until the mid-19th century. The East River offered a gently sloping shoreline that was sheltered from strong winds, and had an average channel depth of 50 feet, which was more than adequate for 17th through 18th century ocean going vessels. As steam replaced sail and ships gradually grew larger during the 19th century, the center of commerce shifted to the Hudson River. By the 20th century, the vast majority of Manhattan's shipborne trade entered the City via the Hudson River (HPI 2007:10).

4.2.2 Development of the East River Shoreline

The East River was the center of activity in New Amsterdam and continued as such after the British takeover in 1664 and following the American Revolution. As trade and other ship-related industries expanded, and ships became larger, there was a great need for facilities and storage space. In response, piers, warehouses, and other facilities such as shipwrights and dry docks were constructed along the shoreline. These facilities were continuously expanded and modernized in order to keep pace or move ahead of other ports.

New York's waterfront development during the 17th and 18th centuries was different from those of other colonial harbors such as Boston, Philadelphia, or Newport. The focus of land making activities was different in New York. Rather than building piers out into the river, New Yorkers instead built slips. The process was as follows: As blocks of landfill were added along the East River waterfront, fill was added out into the water on either side of the ends of the larger streets that ran perpendicular to the shore, creating a slip or inlet where small boats could moor. In time, as subsequent blocks of landfill were added, the original slip was filled in and became an extension of the dry street and a new slip was created waterward. The filled in slips at the ends of the streets provided large pieces of public land that were often the sites of markets because they were close to landings where farmers could moor their boats and unload livestock and produce (Cantwell and Wall 2001:226).

The innovation that had the most profound impact on the changing shoreline of the East River was the Dongan Charter of 1686, which set the precedent of allowing the City government to raise revenue by selling "water lots," or the right to build wharves and "make land" out into the river between the low and high watermarks (Cantwell and Wall 2001:223). The City began to sell water lots to private citizens, providing that the new owner fill and build the street and wharf along the low water line. The Dongan Charter effectively extended the Manhattan shoreline 200 feet into the East River (Cantwell and Wall 2001; HPI 2007:10).

The Montgomerie Charter of 1730 granted the City the additional power to sell water lots extending beyond the low watermark, four hundred feet out into river. Along the East River, the Montgomerie Charter extended City boundaries from Whitehall to Corlears Hook another 400 feet beyond the old low water mark (HPI 2007:10). Under these charters, those who bought water lots were required to fill them in at their own expense.

At the time that the Dongan Charter was adopted, the East River shoreline was located at Pearl Street, three blocks inland from South Street, which forms the shoreline today. The filling of the water lots eventually formed block-wide ribbons of new land running parallel to the shore. By the late 1720s, land had been claimed up to today's Water Street, and by the end of the 18th century, the next ribbon of land between Water and Front Streets was completed (Cantwell and Wall 2001:226). The landfill process continued in the early-19th century and the ribbon of land between Front and South Streets was gradually completed. The 1865 Viele Map, Figure 5, depicts the original Manhattan shoreline and topographic features of the project area prior to landfilling efforts, with the street grid superimposed.

4.2.2.1 Landfilling Methods

Docks and wharves were constructed along the East River waterfront from the 17th century onward, and many of these structures came to be landfill retaining structures during the 18th and 19th centuries as the shoreline was extended even further into the river. Docks and wharves as well as older bulkhead lines are known to have existed throughout the current APE prior to the construction of present-day South and Marginal Streets. According to Schaefer (2007), historic cribbing, bulkheads, docks and wharves "All utilized similar construction techniques, which evolved from an almost vernacular tradition in the 17th and 18th centuries, to the recorded, standardized construction practices of the late-19th century." (HPI, Inc. 2007:18).

During the 17th century and continuing until the late-18th century, the most common method utilized for land making and pier and wharf construction in the New York City area was the construction of sheet-pile

seawalls. Logs stripped of bark and sharpened to a point would be driven side by side into the riverbottom mud with a log or stone drop hammer. Next, horizontal planking would be secured to the outboard side of the piles to anchor them together, and the planking would retain the fill that was deposited on the landward side (HPI 2007).

By the late-18th century, much of the East River waterfront was in need of repair following the years of British occupation during the Revolutionary War. At this time, the use of cribworks was introduced for land making and shore stabilization as well as for pier and wharf construction. The cribworks were wood-frame boxlike receptacles with solid bottoms and semi-open sides that were filled with loose stone, mud and silt and sunk to the riverbottom and provided larger and more robust supports for piers and wharves than sheet pile constructions. If the wood frame of the crib was tightly fitted on the bottom and four sides, it was known as a "solid filled crib" (HPI 2007).

A related construction form using notched unhewn logs and larger fill cells was known as a "cobb wharf" and the fill reportedly consisted entirely of stone. However, the fill often included other materials such as ballast rock and coral. Cobb construction had less accurate joints and was less durable and less stable than cribwork (HPI 2007).

Another type of wharf construction predating the use of cobb wharves was known as "block and bridge," which utilized a series of wooden blocks placed a certain distance apart that were spanned by plank bridges. The design, popular prior to 1780, allowed river currents to pass through the pier structure, thereby eliminating some of the mud and debris buildup which can occur when utilizing solid filled cribs or cobb wharves. As land filling episodes were extended beyond the pier line, the underwater spaces between the blocks were filled in with horizontal planking and became part of the landfill retention system (Cantwell and Wall 2001; HPI 2007).

Another type of 18th century wharf construction was known as the "grillage/raft" type, which utilized construction techniques that were similar to cobb wharf construction. The grillage used a solid raft type structure built of wooden timbers laid alternately as headers and stretchers incorporating layers of stone. The individual "raft" structures could be built and stacked until the necessary height was reached, floated to the intended pier location, filled with more stone, and sunk (HPI 2007).

The New York City Department of Docks was established in 1871, and this ushered in the era of the "modern" bulkhead system. Rather than utilizing one of the various forms of cribbing, piers were constructed with a deck of wood or concrete set atop wooden piles driven into the riverbottom or hardpan in various combinations. To ensure greater support and stability, the piles were often driven through riprap or broken stone placed for that purpose (Greene 1917:28-33 in HPI 2007:21).

4.2.2.2 Modern Bulkhead

The proposed modern bulkhead system project was initiated in 1871 by the New York City Department of Docks. The line of the modern bulkhead construction defines the river side boundary of the current APE. The modern bulkhead project included substantial landfilling along the river side of South Street, which itself was widened, and added the area for a "Marginal Street" to be located outboard of South Street to provide pedestrian and vehicular access to the piers and bulkhead. The width of this South/Marginal Street was originally proposed to be 200 feet but was later modified to 150 feet (HPI 2007). It is noted that the "Bulkhead Line 1871" depicted in the East River outboard of South/Marginal Street on late-19th century

and later maps represents the boundary line to maximum allowed bulkhead, and the waters outboard of this line are the navigable waters that are dredged and maintained by the U.S. Army Corps of Engineers.

Although the planning for the modern bulkhead system dates to 1871, very little of this construction was completed within the BMCR APE until the very late 19th century, and many areas were not completed until the first decades of the 20th century. The early modern bulkhead work was first completed further downtown, south of the Brooklyn Bridge.

The modern bulkhead sections were completed across the three sections of the BMCR APE as follows:

Section 1 – Roosevelt Street to Catharine Slip south

- 1914: Centerline of James Slip to Oliver Street
- 1924-1938: Roosevelt Street to James Slip; Oliver Street to Catharine Slip south

Section 2 – Catharine Slip south to Rutgers Slip south

- 1899-1906: Entire segment except across Catharine and Market Slips
- 1914: Across Catharine and Market Slips

Section 3 – Rutgers Slip south to Montgomery Street

- 1899: Across Rutgers Slip
- 1906: Jefferson Street to Montgomery Street
- 1924: Rutgers Slip north to Jefferson Street

4.2.2.3 South Street Viaduct of FDR Drive

The FDR Drive extends 9.44 miles north of the Battery Park Underpass to 125th Street/Robert F. Kennedy Bridge exit. It was constructed between 1934 and 1967 and is National Register-eligible under Criterion A for its association with mid-20th century transportation and community planning. The South Street Viaduct section of the FDR Drive is situated in the BMCR Project Area.

The Montgomery Street to Grand Street section of the FDR Drive was opened in 1940, and although the need to continue the corridor as an elevated roadway from Montgomery Street to South Ferry was recognized, construction on the South Street Viaduct was not begun until 1951. "The South Street Viaduct was designed to accommodate express traffic while attempting to keep the number of support columns to a minimum so that local traffic on South and Marginal Streets would not be interfered with." (HPI 2007:13). The viaduct includes ramps that were constructed in the 1960s that connect it to the Brooklyn Bridge.

During the 1980s, corroded portions of the steel viaduct were reconstructed after chunks of concrete fell from the supports to the street below. The corrosion of the highway supports was attributed to salt from de-icing measures over the years. The work done during the 1980s included a new deck, replacement of some structural supports, new drainage measures and new lighting. Reconstruction and widening of the ramps to the Brooklyn Bridge has also been ongoing. Numerous column footings for the original 90 spans of the South Street Viaduct were constructed in South and Marginal Streets. During a site inspection by HPI, Inc. in 2006, it was observed that more than one type of viaduct support column is present in the APE, suggesting

that additional support columns were added, or earlier columns were replaced during reconstruction in the early 1980s.

During the 2000s, part of the East River Waterfront Esplanade was constructed by the City of New York beneath and outboard of the South Street Viaduct within the BMCR Project Area. Improvements included hexagonal pavers in contrasting colors, waterfront benches, plantings, pedestrian paths, and bicycle lanes.

4.3 RESEARCH DESIGN

The primary objective of the Phase IA documentary study is to determine whether potentially National Register-eligible archaeological resources may be located within the project APE.

The goals of the current Phase IA survey are as follows:

- Determine whether the APE was occupied during the precontact and historic periods.
- Chronicle the historic development across the APE.
- Identify categories of potential archaeological resources that may be located within the APE.
- Identify locations of potential archaeological resources that may be located within the APE.
- Document the prior subsurface disturbances that have occurred across the APE and determine whether these disturbances have affected the locations of potential archaeological resources.
- Determine whether additional archaeological work is necessary, either by additional research, Phase IB subsurface testing, or archaeological monitoring during construction.

4.4 POTENTIAL RESOURCE TYPES

This section discusses the various categories of archaeological resources that could reasonably be expected to be encountered within the BMCR project area. Drawing upon the general history of the development of the East River shoreline and the results of multiple archaeological surveys in proximity to the BMCR APE, each category of resources is further evaluated for the likelihood to be present.

4.4.1 Submerged Precontact Resources

The BMCR APE lies completely on made land. The area was exposed dry land during the various periods of glaciation when sea level was considerably lower and was subsequently inundated following the retreat of the Wisconsin glaciers. As the post-glacial environmental conditions became favorable to support vegetation and game, precontact period populations may have utilized the area for settlement and/or subsistence activities. The area comprising the BMCR APE became the bed of the East River approximately 12,000 years before present (BP).

Submerged precontact resources would be expected to be found in the sandy stratum overlying the glacial till layer and underlying river deposits of mud and silt, as they would predate the inundation of the APE. These resources are vulnerable to tidal action, river currents and dredging activities.

4.4.2 Riverbottom Remains

These resources would include deliberately discarded as well as accidently lost cargo related to shoreline businesses. Before extensive landfilling activity created the modern East River shoreline, the area now underlying Water, Front, South and Marginal streets was part of the original course of the East River. As successive landfilling pushed the shoreline out into the river during the 17th, 18th and 19th centuries, shoreline deposits would likely accumulate within the river mud, silts and sands strata of the riverbottom. However, the provenience of such deposits cannot always be determined with certainty, as deposits could originate from shoreline businesses and/or households in the immediate vicinity, dumped illegally, or collected from other locations of the city and dumped at the shoreline.

Archaeologists Nan A. Rothschild and Arnold Pickman noted that a substantial number of 17th century artifacts recovered from the excavation of landfill deposits in the basement of the extant structure at 64 Pearl Street could have originated as deliberate and accidental shipping discards associated with a former dock (Pickman and Rothschild 1981).

Archaeologist Paul Huey studied the 1969 excavations of Cruger's Wharf at Old Slip and Water Street and prepared an article for *The Journal of Historical Archaeology* in 1984. The removal of an entire block of filled land for a new building revealed a sequence of soil deposits dating from circa 1690 to 1800. Successive periods of landfilling were identified before and after construction of Cruger's Wharf at this location in 1739 and 1740. Huey was able to correlate the artifacts and soil deposits with episodes of land filling and harbor activity in the neighboring area. Old Slip provided an example of Dutch-influenced waterfront development beginning in the late-17th century that differed from the waterfront development in other cities such as Boston and Philadelphia, which were initially settled by the English.

4.4.3 Sunken Vessels

These resources have been identified and excavated in early landfill sites in Manhattan in proximity to the BMCR APE. It is most probable that these vessels were deliberately put in place after sinking or burning at their moorings and filled as part of the landfilling process, perhaps being incorporated into the new bulkhead for the in-progress land making episode. Given the importance of useable slip and dock space along the East River from the 17th century onward, the presence of hulks or derelict vessels blocking access to such valuable commercial space would not have been tolerated. Slips, wharves and piers were both publicly and privately owned, and blockage of any would affect City as well as private revenue.

Richard G. Schaefer conducted a systematic examination of the New York City Common Council minutes from 1675 to 1776 and from 1784 to 1831 as part of the research for the *East River Waterfront Esplanade and Piers – Inboard Resources North of the Brooklyn Bridge Phase IA Report* (HPI, Inc. 2007). It is not the intent of the current study to reiterate the results of that research, but to offer a summary of its findings. Schaefer found reference to approximately 28 "hulks" or sunken vessels in slips and docks. The Common Council took action to have each of these hulks removed. It was revealed that only two cases had occurred prior to the American Revolution, which suggests that the state of the Manhattan waterfront had greatly deteriorated by the time the British occupation ended in 1783.

As the city embarked on rebuilding the war ravaged and neglected harbor facilities in an effort to revitalize trade after British occupation, the Common Council took steps toward a more proactive role in slip and

wharf maintenance. For example, in 1784, the Council ordered the aldermen to investigate the presence of "Old Hulks and other Incumbrances" in the slips in their wards (HPI, Inc. 2007:15). The importance to the city's economy of keeping the slips clear for trade was recognized and reinforced by the Common Council, when in 1805 it created the Standing Committee on Wharves, Piers and Slips. The Committee was made up of three aldermen who recommended action to the full Council (Ibid). Two courses of action were open to the Council when a hulk was identified as blocking access to a slip or wharf. The Council either ordered the owner of the derelict vessel to remove it or directed a municipal employee or official to remove it and bill the owner. In circumstances where the owner could not be found, the Council ordered the removal and absorbed the expense. In various entries in the Minutes of the Common Council, the presiding official of such actions was referred to as the "Corporate Wharfinger" in 1790, "Street Commissioner" in 1799 and 1818, and "Superintendent of Repairs" in 1810 and 1812 (Ibid).

Given the importance of slips and docks to the commerce of the City, it is highly unlikely that sunken vessels entered the archaeological record through accidental sinking or abandonment in a functioning slip. In addition, as Schaefer points out, as ships became larger with deeper drafts during the 19th century, slips were made wider and deeper by dredging, which would have resulted in the removal of any sunken vessel present.

One method of disposal of derelict vessels was to incorporate them into landfill by filling the vessels with earth and/or debris and sinking them. On the former East River shoreline, two examples of such vessels have been documented archaeologically. The first vessel was encountered in the basement fill of the standing structure at 209 Water Street in the South Street Historic District in 1978 during excavation for the installation of a sump pump to control chronic flooding. This resource was identified as an early- to mid-18th century vessel through the identification of its wooden members. Existing maps indicate that the filling of this block began no earlier than 1755 and ended between 1767 and 1789. During this time period the Water Street area was the scene of a shipyard, numerous wharves, and considerable waterfront activity. According to the Henn et. al., report (1978), there was very little metal found in association with the ship, suggesting that the vessel had been stripped of all reusable materials prior to sinking or abandonment. The report further states that from the remarkably good preservation of the timbers, the ship was sunk and buried soon after, perhaps acting as cribbing during the landfilling process (Henn et. al. 1978). It was determined that further excavation of the ship was not feasible at the time, and the remains were stabilized somewhat by covering with sand. The sump installation project was canceled.

The second archaeologically investigated vessel was encountered during the 1981 excavations of the 175 Water Street Site. This ship, named the *Ronson* after the site's developer, Howard Ronson, was determined to be a circa 1720 cargo vessel measuring 25-feet-wide by 90-feet-long. Maritime archaeologists Warren C. Riess and Sheli O. Smith were contracted to come to New York and lead the excavation of the Ronson Ship. This vessel had been purposely sunk parallel to the shoreline and covered with fill. The bottom of the hull was encountered at approximately 18 feet below grade. Teredo shipworms found embedded in the ship's outer hull pitch and horsehair sheathing suggest that it may have plied the waters of the Caribbean and the Indian Ocean. Research into the origin of this vessel conducted by Warren C. Riess during the years since the excavation has revealed her to most likely be the *Princess Carolina*. The Princess Carolina was built in 1717 in Charleston, South Carolina (Riess 2015).

The two vessels noted and discussed above were located a considerable distance inland from the BMCR APE of South and Marginal Streets. Found between Water and Front Streets, their locations are representative of an earlier East River shoreline and 18th century landfilling episodes. South and Marginal

Streets were created through land making processes dating to the 19th and 20th century. According to Schaefer (2007), "Although archaeological evidence records vessels incorporated into landfill as late as the 1760s, this practice had fallen from favor by the 1780s, and certainly by ca. 1800, by which time the New York waterfront had been renovated and rebuilding was proceeding." (HPI 2007:18).

Based on the above discussion, it is highly unlikely that sunken vessels would have been incorporated as bulkhead elements in landfill after 1800. Given the later 19th and 20th century dates for the filling of South and Marginal Streets that comprise the BMCR APE, these resources are not anticipated to be encountered.

4.4.4 Landfill Retaining Structures, Wharves and Piers

Cribbing and bulkhead devices for retaining fill during land making episodes have been archaeologically investigated for many decades, many of which have been located in proximity to the current BMCR APE. Docks and wharves are known to have been constructed along the East River waterfront from the 17th century onward, and many of these structures came to be landfill retaining structures during the 18th and 19th centuries as the shoreline was extended even further into the river. Docks and wharves as well as older bulkhead lines are known to have existed throughout the current APE prior to the construction of present-day South and Marginal Streets. According to Schaefer (HPI 2007), historic cribbing, bulkheads, docks and wharves "All utilized similar construction techniques, which evolved from an almost vernacular tradition in the 17th and 18th centuries, to the recorded, standardized construction practices of the late-19th century." (HPI 2007:18).

A bulkhead wall is "a retaining wall along a waterfront, which shores up the embankment in order to stabilize it for the construction of wharves and piers." (Bone 1997:272 in HPI 2007:18). According to Merriam-Webster, a wharf is a structure built along or at an angle from the shore of navigable waters so that ships may lie alongside to receive and discharge cargo. Some sources differentiate between a marginal wharf or quay, which is a parallel extension of the shoreline, and wharves which extend more or less perpendicular to the shoreline, usually called piers (HPI 2007:18).

Up until the late-18th century, the most common method utilized for land extension and wharf construction in the New York City area was through the construction of sheet-pile seawalls. Logs stripped of bark and sharpened to a point at one end and shaped at the other to receive a pile cap would be driven side by side into the riverbottom mud with a log or stone drop hammer. Heavy horizontal planking would be secured to the outboard side of the piles to anchor them together, and the planking would retain the fill that was deposited on the landward side. Sheet piling was also used for the construction of wharves and piers (Bone 1997:92-96 in HPI 2007:19).

Sheet piling was also used to surround riprap embankments, and combinations of piles, planks, stone embankments, and sheet piling were the most common construction methods utilized to the time of the American Revolution. In the late-18th century, during post-Revolutionary War rebuilding of the Manhattan waterfront, cribworks were introduced, which were wood-frame boxlike receptacles with solid bottoms and semi-open sides that were filled with loose stone and sunk to the riverbottom. These cribworks provided larger, more robust supports for retaining walls and wharves where pile-supported structures could not be constructed or would have been rendered unstable by river currents or ice (HPI 2007).

Use of a crib structure required the riverbottom to be dredged, thereby clearing the bottom of loose debris and mud down to the underlying bedrock or to a hardpan substratum. Optimally, the crib bottom was fitted to the river bottom's contours, and the cribwork was carefully filled with stone, mud, sand, and sometimes concrete, and pinned to the bottom. If the facing of the crib was constructed so tightly that earth alone could be used as fill, it was called a "solid-filled crib" (Bone 1997:96-99 in HPI 2007:19).

A less refined construction form using notched unhewn logs and larger fill cells was known as a "cobb wharf" and the fill reportedly consisted entirely of stone. However, it has been demonstrated that the fill often included other materials such as ballast rock and coral, brush and tree stumps, as noted by Louis Berger in the cobb structures excavated at the Assay Site (Louis Berger 1990 in HPI 2007:19). Cobb construction had less accurate joints and was less durable and less stable than cribwork (Bone 1997:96-99 in HPI 2007:19). A 1690s cobb structure was excavated at the Barclays Bank Site (75 Wall Street /100 Water Street) which was composed of rough logs joined to form a series of 5-foot-square compartments or cells, secured in place by pilings, and was filled with rock and coral (Louis Berger 1983).

Examples of cobb construction have been identified at several archaeological sites in Manhattan. Archaeological excavations conducted in 1969 on the block containing the site of Cruger's Wharf, located at Old Slip and Water Street revealed part of a wharf of cobb construction built 1739-1740 (Huey 1984). The cobb wharf components were encountered approximately 5 feet below the 1969 street grade and extended another 17 feet down to the 1739-1740 riverbottom. As the shoreline at this location was extended from Water Street to Front Street circa 1765, fill placed on the landward side of this L-shaped cobb wharf transformed it into a retaining wall / bulkhead (HPI 2007:20).

The Telco Block Site, located on the block bounded by Water, Fulton, Front and John Streets was excavated in 1982 prior to construction of a high-rise building. The tops of wooden members of a mid-18th century cobb wharf complex were consistently encountered at or below mean sea level, which was at 5.5 feet below the curb, and an exposed section extended to 9.5 feet below mean sea level, which was interpreted as the riverbottom at the time of construction. The fill within the cobb wharf was stone, as would be expected. Lines of plank bulkheading were added as the wharves were incorporated into the shoreline system (Rockman, Harris and Levin 1982:60, 64-68 in HPI 2007:20).

The most comprehensive study of these structures conducted in Lower Manhattan was completed for the Assay Office Block, located on the block bounded by Front and South Streets, Wall Street and Gouverneur Lane. Plank bulkheads and a cobb wharf complex dating to the 1790s were encountered below the basement floor levels of the demolished modern buildings. These elements represented multiple fill episodes and were encountered in a fill stratum located approximately 8 to 13 feet below the modern street grade. The cobb wharf frame utilized large logs approximately 1 foot in diameter and measured 15 feet high. The cells comprising the cobb wharf measured 4 feet by 8 feet and displayed well-constructed split timber floors. The various wooden elements were attached to each other through carefully executed wooden joinery and some also utilized metal fasteners (Greenhouse 1984; Louis Berger 1990; Cantwell and Wall 2001; HPI 2007).

A type of wharf construction that predates the use of cobb wharves was known as "block and bridge". This type of construction, common prior to the 1780s, utilized a series of wooden blocks placed a certain distance apart that were spanned by plank bridges. The block and bridge design allowed river currents to pass through the pier structure, thereby eliminating some of the mud and debris buildup which occurred with other types of more solid wharf construction. As land filling episodes were extended beyond the pier line,

the underwater spaces between the blocks were closed by planking and became part of the landfill retention system (Cantwell and Wall 2001; HPI 2007). Block and bridge wharf construction was also identified on the Assay Office Block. On this site, a series of wooden blocks 20 feet square were placed 40 feet apart and were spanned by plank bridges (HPI 2007:20).

Another type of 18th century wharf construction was known as the "grillage/raft" type. This type utilized construction techniques that were similar to cobb wharf construction. The grillage used a solid raft type structure built of wooden timbers laid alternately as headers and stretchers incorporating layers of stone. These "raft" structures were built and stacked until the desired height was reached. Next the stacked rafts would be floated to the intended pier location, filled with stone and sunk in place (HPI 2007:21). The 175 Water Street Site excavations uncovered a grillage/raft construction wharf which was dated to circa 1750 (Geismar 1983; HPI 2007).

The New York City Department of Docks was established in 1871, and this ushered in the era of the "modern" bulkhead system. Rather than cribbing, piers were built with a deck of wood or concrete atop wooden piles driven into the riverbottom or hardpan in various combinations. To ensure greater stability, the piles were often driven through riprap or broken stone placed for that purpose (Greene 1917:28-33 in HPI 2007:21).

Based on the above discussion, the remains of 19th century landfill retaining structures, wharves and piers may still survive within the BMCR APE. Soil borings conducted in South Street for the South Street Viaduct section of the FDR Drive encountered wooden beams, fill strata and wood fragments at various depths across the tested area. Three additional soil borings were conducted in 2008 for the East River Esplanade and Piers project. These borings were conducted within the current BMCR APE (East of Pike Street, West of Rutgers Slip and at Rutgers Slip), and the new logs record "large fill strata with wood and rocks recorded in and beneath the fill strata, as would be expected on made land which has undergone multiple pier crib/bulkheading construction and removal episodes." (HPI 2008:4).

4.4.5 Dry Docks

The East River shoreline between Catharine and Rutgers Slips was an important center for shipwrights during the 19th century, with several floating docks for the servicing of steamships. The floating dry dock was patented in 1816 by J. Adamson, which was a wooden dry dock with a gate at the stern. Balance dry docks were developed circa 1840, which were open at both ends. According to the research conducted by Schaefer (2007), "Pontoon-like chambers along the high sides of the dock could be flooded to sink the structure, and when the ship was floated over it, the chambers were pumped out, and the dry dock rose lifting the ship out of the water." (HPI 2007:21).

The sectional dry dock was a type of balance dry dock developed shortly after the balance dry dock. Sectional dry docks were made of identical segments that could be joined together to create dry docks of varying length to accommodate any vessel needing repair. The New York Sectional Dry Dock Company built a sectional dock just south of Rutgers Slip in 1839 (HPI 2007:21).

Screw docks and hydraulic or hydrostatic docks were also developed and constructed along the East River waterfront by 1835.

The floating docks were essential for the success and continuing growth of the maritime based economy of the City during the 19th century. Many of the technological advancements in shipbuilding and ship maintenance and repair were made by New Yorkers. However, from an archaeological standpoint, remains of these floating docks would not be distinguishable from the remains of other piers and wharves dating to the same time period. As Schaefer notes in the 2007 Phase IA discussion, "It is possible that artifacts associated with their use have survived, but as losses or discards from ship and shore, these would fall into the "Riverbottom Remains" category of potential archaeological resources." (HPI 2007:22).

4.4.6 Landfill Deposits

As described above, the BMCR APE of South and Marginal Streets was gradually filled in incorporating structures built using a variety of bulkhead and wharf building techniques. Given South Street's distance from the original shoreline of the East River at Pearl/Cherry Streets, landfill activities began to impact the current APE during the very late-18th and early-19th century and continued well into the 20th century. Piers, wharves and bulkheads were built, rebuilt, replaced, and slips and channels between piers were filled in as the shoreline was extended further out into the East River, eventually creating the land for South and Marginal Streets.

Previously conducted excavations for a variety of proposed projects within the search area surrounding the BMCR project area have demonstrated that the landfill is likely to contain an abundance of cultural material, and diagnostic artifacts are particularly common in in the strata closest to the surface (Schermerhorn Row, 7 Hanover Square, Telco Block, 209 Water Street, 175 Water Street, Barclays Bank Site, Assay Office Site). Such archaeological evidence can be useful in interpreting past lifeways as well as for dating when, how, and why the fill was deposited.

There has been discussion within the archaeological community regarding the interpretation of artifacts from landfill deposits. Noted in reports on previously conducted excavations was the idea that artifacts were representative of the material culture of New York City during the time of landfilling and could be used to examine social and economic processes that were taking place in the City (Pickman and Rothschild 1981; Greenhouse 1984). However, this idea is problematic because the provenience of landfill deposits cannot usually be determined with certainty. As stated above as a caveat for interpreting riverbottom remains, the landfill deposits could originate from nearby shoreline business or households, may have been dumped illegally, or may have been deliberately collected from other locations within the city and dumped at the landfill location. This idea had been touched upon in the 1982 Telco Block site report which reviewed the interpretation of the large amounts of leather and shoe fragments recovered from the excavations of six Lower Manhattan landfill deposit sites. For example, the 1981 analysis of the 17th century landfill excavated at the 64 Pearl Street site attempted to connect these leather artifacts to nearby tanners and shoemakers (Pickman and Rothschild 1981), but the data from the Telco analysis suggests that the 64 Pearl Street fill, which was a combination of domestic and commercial refuse, had been brought in from an unrelated outside source (Rockman, Harris, and Levin 1982:78 in HPI 2007:23).

Continuing the discussion on the same topic, the 1990 Louis Berger report on the Assay Office excavations recommended "that landfill soils be used only to describe the specific depositional histories of the sites under investigation," whereby the sampling of these soils is for the purpose of recording the landfill depositional history of the site as opposed to in-depth artifact analysis of the landfill content. The report qualifies this statement by explaining that if unusual artifact deposits are found such as a china dump or

rare artifacts are noted, these would be important for recovery as contributions to the study of the ranges and forms of available material culture in the City (Louis Berger 1990:14-15 in HPI 2007:23).

Landfill deposits that can be assigned a narrow date range based on documentary evidence can be useful analytical data sets. Recovery and analysis of such deposits may be able to further our understanding of past lifeways. For example, the documentary research completed for the 7 Hanover Square project excavations determined that the landfill episode occurred between 1687 and 1697. Supporting this date range was the identification of 17th century earthenware ceramic sherds from the Dutch potting center of Bergen op Zoom. Knowing this 1687 to 1697 time frame to be the history of the landfilling deposit on the site, the faunal remains recovered were analyzed to study foodways in late-17th century Manhattan (Rothschild and Pickman 1990).

4.4.6.1 Primary Landfill

Archaeologists have theorized two broad categories of fill strata within the landfill retaining structures discussed above. The first to be deposited and the thickest of the strata would be the landfill placed within the various types of support constructions. Susan Kardas and Edward Larrabee refer to this stratum as "Primary Landfill," and the process as "land-making" in their 1978 report on the excavations on Schermerhorn Row in the South Street Historic District. The landfill was composed of large and medium size rocks in a matrix of "dark gray to black muck with some clay." The report further states that the presence of clay was probably beneficial, as it could inhibit its being washed out of the cribbing (Historic Sites Research 1978:138-139; HPI 2007:23). However, this would depend on the type of support structure, since cobb wharves, for example, were designed only for bulky fill such as rocks (HPI 2007).

Primary landfill, like the superstructure which it filled, would bring the location's elevation to about mean sea level or a few feet below, but notably not above the high tide level (Historic Sites Research 1978:279 in HPI 2007:25). At Schermerhorn Row, the primary landfill extended from 5 to more than 20 feet below street grade (Historic Sites Research 1978:282).

The primary landfill at the Assay Office Site was identified from the presence of timbers and mud, which are the components and contents of landfill structures, interpreted from review of the soil boring logs. This stratum ranged from 10 to 20 feet thick, beginning at approximately 8 to 13 feet or more below street grade. During the subsequent site excavations, several types of wooden bulkhead and landfill retaining structures (discussed above) representing multiple fill episodes were identified from this stratum (Greenhouse 1984; Louis Berger 1990; HPI 2007).

For the Telco Block excavations, discussion of the encountered landfill also separated the fill strata into two groups. Fill category 1 was identified as the stratum that was found as high as 1 foot above sea level and extended down below the water table. This Fill category 1 corresponds to what Kardas and Larrabee termed secondary landfill. Fill category 2 at the Telco Block underlies Fill category 1 and extends to the former riverbottom. This corresponds to the primary fill stratum noted by Kardas and Larrabee at Schermerhorn Row. The Telco Block report also noted that, like Schermerhorn Row, the lower landfill stratum had a much lower artifact density than the upper fill stratum (Rockman, Harris, and Levin 1982; HPI 2007).

Based on the above discussion, few artifacts are to be expected in the primary landfill stratum found within the various types of landfill retaining structures. The use of fill with a high artifact density including organic

material would be avoided because as the fill decayed it would compress unevenly, settle at varying rates, and likely cause instability.

The primary landfill deposit identified at the 64 Pearl Street excavation did not fit the above pattern. The primary landfill appeared to have been composed of a combination of sterile subsoil and loads of artifact bearing topsoil/garbage deposits. The artifacts dated this landfill episode to the late-17th century. Of note was the lack of evidence for any type of landfill retaining structure in the fill deposit. Clean, rocky fill for landfill retaining structures was apparently not needed at this location.

During the 1790s, in response to a series of yellow fever epidemics, the City government mandated the use of clean, sterile sand for fill. This was due to the fear that decaying garbage often used in fill was a source of the disease (HPI 2007).

Although landfill procurement and deposition processes are poorly documented, various historic records suggest that clean fill was generally obtained from regrading and construction projects across Manhattan. An 1828 observation noted in Schaefer's research (2007) concerns the draining and subsequent filling of the Collect Pond in the City Hall vicinity. The observation reports "several large hills or mounds of earth that environed the pond…have all been leveled, and the ground thrown into the ponds" (Stokes 1926 in HPI 2007:25).

4.4.6.2 Secondary Landfill

In the 1978 excavations on Schermerhorn Row, Kardas and Larrabee noted a stratum of reddish-brown sand overlying the primary landfill, which they termed "Secondary Landfill" and theorized that it was utilized to cover the rocky surface of the primary landfill and provided a working surface for construction. This stratum contained much less rock than the primary landfill and yielded the majority of the artifacts recovered from the excavations (Historic Sites Research 1978:278-279 in HPI 2007:25). The archaeologists at the Telco Block termed this upper fill stratum "redeposited refuse" (Rockman, Harris, and Levin 1982:77).

Usually the secondary fill was deposited atop the primary landfill, which ended at or below mean sea level. At Schermerhorn Row, secondary fill extended from 2 to 5 feet below existing street grade (Historic Sites Research 1978:282). At the Assay Office site, the secondary fill stratum contained brick but no timbers, and extended between the modern pavement at street grade and as much as 13 feet below the street (Louis Berger 1990 in HPI 2007:26). On the Telco Block, the secondary fill stratum (Fill category 1 in report) was noted up to 1 foot above mean sea level and extended below the water table (Rockman, Harris, and Levin 1982:77).

4.4.7 Historic Infrastructure

4.4.7.1 Wooden Water Mains

Before the opening of the Croton Aqueduct system in 1842 supplied fresh water to Manhattan, water was distributed in Lower Manhattan through mains owned and operated by the Manhattan Company, a private enterprise which was the corporate ancestor of today's JP Morgan Chase (Geismar 2005). The Manhattan Company was in operation from 1799 to 1842, and the early mains were made of hollowed-out pine logs.

The distribution system was located south of City Hall, or as far north as the Brooklyn Bridge. Cast iron pipes replaced the wooden mains beginning in 1827 (Geismar 2005:3). The archives of JP Morgan Chase also indicate that it wasn't until 1836 that the distribution system was extended north of City Hall, by which time the mains would have been cast iron, not wood Geismar 2005:3; HPI 2007:27). Therefore, no wooden water mains are expected in the BMCR APE north of the Brooklyn Bridge, which was beyond the limits of distribution at the time such mains were utilized.

4.4.7.2 Land Transportation Elements

South Street was the terminus for several horse-drawn trollies and omnibuses during the 19th century. Many of these lines were electrified during the 20th century. The early horse-drawn trolley tracks were not able to support the weight of the later electrified trolley cars and were usually ripped up and replaced (HPI 2007). No remnants of the early horse-drawn system are anticipated to be present within the BMCR APE.

Electrified trolley tracks are commonly found throughout Manhattan, dating from the 1890s onward. They were common up through the 1940s and were normally modified and updated as necessary. The trolley era was over when buses were introduced into the surface transportation system, taking over many (and eventually all) of the routes formerly serviced by the trolley lines. In some locations the electrified trolley tracks were ripped up but in other locations they were simply paved over.

According to Tom Harrington, curator at the New York Transit Museum in 1997, extensive documentation on the former routes, technology and construction of Manhattan's trolleys already exists and the presence of trolley tracks alone is not sufficient reason to designate former routes as potentially sensitive (HPI 2007:26).

4.5 Types of Documented Subsurface Disturbance

Many forms of subsurface disturbance have affected the BMCR APE over time. The major categories of disturbance are discussed below.

4.5.1 Pier and Wharf Construction and Reconstruction

The earliest East River piers documented on historic maps had their bases in Pearl or Water Streets and did not extend far enough outboard to cross into the current BMCR APE. The earliest piers that reached the limits of the current BMCR APE date to the late-18th century, the time that saw the rebuilding of the City's pier facilities following the end of the American Revolution. As described above, construction methods entailed dredging of river mud and silt, followed by construction utilizing combinations of wooden piles and sinking of crib/cobb structures.

As the piers and wharves were constructed, slips and channels between piers were created for mooring of vessels. As the piers and wharves were rebuilt and/or replaced, the slips and channels between piers were filled as the shoreline was extended further out into the river, until the land for present-day South and Marginal Streets was created.

The removal of earlier piers prior to reconstruction of new piers would have involved dredging activity at the location, removing any early crib/cobb structures that would interfere with the sinking of new pier crib/cobb structures as well as mooring in the new slip location between piers. Driving of wooden piles for new piers would also have impacted the riverbottom and any archaeological resources that may have been present.

For a detailed discussion on the development of piers and wharves across the BMCR Project Area, see Section 5.3 History of Corridor Development.

4.5.2 Dredging

Dredging was and is a normal component of harbor and slip maintenance and would have been conducted within the BMCR APE during the late-18th century and early-19th century. According to the research conducted by Schaefer for the 2007 Phase IA report (as well as research conducted by this author for prior projects along the East River), accurate records of dredging or even maps of pier slip depths prior to 1857 are not available to document routine dredging impacts to now-filled sections of the APE (HPI 2007:38).

Dredging was an important component of preparation for construction of new piers and slips as land making efforts pushed farther outboard into the East River. As noted above, dredging would have been conducted to remove any obstacles to new construction and mooring capacity within the slips.

In addition, the removal of river mud and silt and earlier cobb/crib structures through dredging would likely have impacted archaeological resources that may have been present.

For a discussion on the dredging activities across the BMCR Project Area, see Section 5.3 History of Corridor Development.

4.5.3 Bulkhead Construction and Repair

Pier removal and the accompanying dredging across the BMCR APE during the early-20th century was documented in the Department of Docks reports in tandem with the construction of the modern bulkhead.

Civil engineer Carleton Greene's 1917 treatise on the construction of modern (late-19th to early-20th century) American piers and wharves describes the process for driving wooden piles and the site preparation necessary prior to driving (HPI 2007:29). Preparation included measuring the depth to the hard bottom in order to determine the length of piles necessary. Dredging to hard bottom was also advised.

The original bulkhead design of 1876 as well as modifications to 1899 indicated that the concrete and masonry bulkhead wall itself extended about 15 feet below mean low water, resting on wooden piles. Due to the great depth of mud along the shoreline, the piles could not extend to the hard bottom in all locations. According to Civil engineer Greene, prior to pile driving, the river mud was dredged "for a width of about 85 feet to a depth of 30 feet, more or less, depending on the consistency." (HPI 2007:31). According to Greene's drawings, the width of dredging extended the same distance on each side of the proposed bulkhead location. The piles were driven into the dredged surface, and the open spaces were filled with cobbles and riprap to serve as a base and support the concrete and masonry bulkhead (HPI 2007).

In locations where rock was located at 40 feet or less below mean high water, or when the hard bottom was sufficient to keep the piles in place without the addition of riprap, concrete was placed directly on the rock or around the piles in the hard bottom. These conditions still required dredging of mud, silt, sand, and clay for the construction to rest on a relatively clean and level surface (HPI 2007:31).

For a detailed discussion on the construction of the modern bulkhead across the BMCR Project Area, see Section 5.3 History of Corridor Development.

4.5.4 Subway Tunnel Excavation

There is a NYCTA subway tunnel that crosses under the BMCR APE, passing beneath Rutgers Slip. It is the F Line that continues under the East River to Brooklyn/Queens. This tunnel was dug in the early 1930s by the shield tunneling method, which utilizes a boring machine that does not disturb the soils above the limits of the tunnel or at the surface (www.trenchlesspedia.com). This type of tunnel construction would have had no effect on potential archaeological resources within the APE.

4.5.5 Utility Installations

Multiple utility installations have occurred in the BMCR APE during the 19th and 20th centuries (Figures 4a – 4c). These include water, sewer, storm water, gas, electric, telephone, telecommunications, and oil-o-static lines. The impact that these utility installations might have on archaeological resources depends on the width and depth of each trench required for installation.

On average, water lines are installed approximately 5 feet below grade; sewer lines are 10 feet below grade, gas lines are 2 to 3 feet below grade, electric lines are approximately 2 feet below grade, telephone and telecommunications lines are approximately 2 to 3 feet below grade, and oil-o-static lines are approximately 3 to 4 feet below grade (Rothschild & Dallal 1983; HPI 2007). The size of the main to be installed dictates the width and depth to which the trench needs to be excavated for safe installation and protective cover. Large diameter water, sewer, and storm water mains will create a larger disturbance footprint than smaller, service mains.

It is noted that installation of water lines includes not only the main itself, but also requires service connection lines, manholes, vaults, and valve boxes. These appurtenances create disturbance in specific locations along the route of the water main. Sewer lines include the sewer main, service connections, vaults, chambers, and regulators. These appurtenances also create disturbance in specific locations along the route of the sewer main. Storm sewer lines also require manholes, catch basins and connections to the storm sewer main along its route, all of which create additional disturbance.

For details on the types and locations of utility lines across the BMCR APE see Section 5.3 History of Corridor Development.

4.5.6 South Street Viaduct

The construction of the South Street Viaduct of the FDR Drive ca. 1951 has impacted the South/Marginal Street corridor. Support column sets #37 through #87 of the 90 original sets are located within the BMCR

APE. Ramps connecting the viaduct to the Brooklyn Bridge were added during the 1960s. During the 1980s, extensive work was done to stabilize the support columns and deck, and it is possible that new columns were added during the rehabilitation project. These actions have created subsurface disturbance to varying depths across the APE.

4.5.7 Roadway Construction and Improvements

Once landfilling and bulkheading efforts were completed for the land now including South and Marginal Streets, multiple episodes of paving and grading have occurred. Curb installations, plantings, and drainage improvements all contribute to subsurface disturbances associated with roadway improvements. In addition, shallow utilities such as concrete ducts for electric lines have been installed. The tops of these ducts are, on average, placed two feet below street level. It is probable that the top two feet across the BMCR APE has been previously disturbed.

5 RESULTS OF SURVEY

This chapter presents the synthesis of previous work that has been conducted relevant to the BMCR project area, provides the developmental history of the corridor by APE section, and concludes with the potential archaeological sensitivity for each of the three APE sections. The developmental history includes the disturbance characterization and potential archaeological resource categories for each APE section.

5.1 Synthesis of Previous Work

5.1.1 Previously Identified Archaeological Sites

The Archaeological APE was researched in the SHPO's CRIS website in compliance with Section 106, SEQRA, and CEQR. The search area for historic archaeological resources was a 0.25-mile-radius surrounding the project area, and the search area for prehistoric archaeological resources was a 0.5-mile-radius surrounding the project area. Table 5-1 presents the known archaeological sites.

According to the CRIS search, a total of 12 historic archaeological sites and two historic cemeteries, the African Burial Ground National Monument and the First Shearith Israel graveyard, lie within a 0.25-mile-radius of the BMCR project area. In addition, two prehistoric archaeological sites have been documented within a 0.5-mile-radius of the project area. As depicted in CRIS, nearly the entire project area lies within an Area of Archaeological Sensitivity.

Sites that were excavated in land created through 18th-century landfill activities include the Telco Block 74W Site and the 175 Water Street Site. The Telco Block excavations included backyard cisterns and privies associated with former 19th-century structures as well as evidence of the catastrophic 1816 fire that destroyed the structures on the block and immediate vicinity. The 175 Water Street excavations included multiple backyard features associated with former commercial structures and an 18th-century ship that was likely utilized as part of the landfill bulkhead. The excavations on these two sites were mitigation strategies for the respective properties. Today, high-rise buildings occupy the blocks.

Additional 18th-century landfill sites within the search area have been excavated. The cellar of the National Register-listed standing structure at 209 Water Street was archaeologically tested and revealed 18th and 19th-century cultural deposits, including portions of a ship. Timber bulkheads of former wharves constructed between 1756 and 1803 were encountered beneath former Burling Slip (John Street). This site, the National Register-eligible Burling Slip Walls – Codwise & Remsen Sections yielded 18th and 19th-century cultural material in the fill associated with the timber bulkhead. At the corner of Broadway and John Street, a truncated historic well was encountered beneath the foundation footing of the Corbin Building. This feature, the National Register-eligible Well Beneath the Corbin Building, dates to the late 18th-century or early 19th-century and was associated with occupation pre-dating the Corbin Building.

Table 5-1

**Known Archaeological Sites within Search Radius of
Brooklyn Bridge-Montgomery Coastal Resilience Project Area**

SHPO/NYSM SITE NUMBER	RESOURCE NAME	RESOURCE TYPE	LOCATION/ ADDRESS	DATE/TIME PERIOD	DESCRIPTION	NATIONAL REGISTER STATUS	REFERENCE
06101.000623	Telco Block 74W Site	18th century landfill; 19th century commercial	Front Street between Fletcher and John streets	Late-18th century -19th century	Excavation of backyard privies and cisterns; building remains of 1816 fire	Undetermined (Excavated)	SSI 1982 (Rockman, Harris & Levin)
06101.000604	209 Water Street	18th century landfill; cellar of standing structure; 18th century ship	209 Water Street	18th – 19th century	Early to mid-18th century partial ship; 18th and 19th century historic artifacts	Listed	CUNY 1978 (Henn et al)
06101.006763	Schermerhorn Row Block	Commercial Block	Fulton/Front/ South/John	18th – 19th century	1981-1983 archaeological excavations	Undetermined	Historic Sites Research 1991
06101.018115	Burling Slip Walls – Codwise & Remsen Sections	Timber bulkheads of former wharves	Burling Slip (John Street) between Front and South streets	Constructed 1756-1803	Timber bulkhead, historic period artifacts in fill; TPQ 1840-1850	Eligible	AKRF 2011
06101.001271	175 Water Street Site	18th century landfill; 19th century commercial; 18th century ship	175 Water Street	18th – 19th century	Multiple backyard area features associated with commercial structures; 18th century ship	Undetermined (Excavated)	SSI 1983 (Geismar)
06101.000001	District & Extension	Form Missing				Listed	
06101.000014	Schermerhorn Row Block	Form Missing	2-18 Fulton Street	Early 19th century		Listed	

Table 5-1

**Known Archaeological Sites within Search Radius of
Brooklyn Bridge-Montgomery Coastal Resilience Project Area**

SHPO/NYSM SITE NUMBER	RESOURCE NAME	RESOURCE TYPE	LOCATION/ ADDRESS	DATE/TIME PERIOD	DESCRIPTION	NATIONAL REGISTER STATUS	REFERENCE
06101.015825	Block 100 Lot 1	19th century mixed commercial and residential site	New York Downtown Hospital, Beekman & Spruce streets	19th century	Trenching did not encounter significant remains or cultural material	Not Eligible	Bergoffen 2006
06101.001304	City Hall Park Site		Southern portion of City Hall Park	Historic	Early 18th century cultural material	Undetermined	Grossman & Associates 1989
06101.017931	Well beneath Corbin Building	Structure	Beneath Corbin Building at 192 John Street, cor. Broadway	Historic; Late 18th or early-19th century	Truncated brick well beneath footing of building	Eligible	AKRF 2010
06101.006980	African Burial Ground	Cemetery	Main Building - 290 Broadway (Duane & Elk streets)	17th -18th century	Over 400 interments of free and enslaved Africans were encountered on the 6.6-acre former burial ground	National Monument	NPS 2006
06101.013335	Tweed Courthouse Area Deposits	Structural remains	Chambers Street – northern portion of City Hall Park	Historic	Stone, brick and wood structural remains	Listed	Hartgen Archeological Associates 1996-2001

Table 5-1

**Known Archaeological Sites within Search Radius of
Brooklyn Bridge-Montgomery Coastal Resilience Project Area**

SHPO/NYSM SITE NUMBER	RESOURCE NAME	RESOURCE TYPE	LOCATION/ ADDRESS	DATE/TIME PERIOD	DESCRIPTION	NATIONAL REGISTER STATUS	REFERENCE
06101.013335	Tweed Courthouse Area Deposits	Burials	Chambers Street – northern portion of City Hall Park	Historic	Human Remains	Listed	Hartgen Archeological Associates 1996-2001
NYSM #4060	ACP NYRK No# Nechtanc or Rechtauck	Village	Near intersection of Jefferson, Henry, Clinton, and Madison Streets	Prehistoric, Contact	Unnumbered Village location on Parker map; atop former sandy bluff at Corlears Hook	Undetermined	Parker 1922 Bolton1922
NYSM #4059	ACP NYRK #9 Shell Point, Werpoes, or Werpos	Village; shell middens	North of Leonard Street and east of Mulberry Street	Prehistoric, Contact	…overlooking small lake, called Shell Pt. large deposits of shell…near Canal Street	Undetermined	Parker 1922 Bolton 1922
N/A	First Shearith Israel Graveyard; Chatham Square Cemetery	Cemetery	55-57 St. James Place	1683	Land purchased in 1682; first interment in 1683	Not known	CRIS
N/A	Area of Archaeological Sensitivity	N/A	N/A	Prehistoric and Historic Potential	Nearly the entire BMCR Project Area	N/A	CRIS

Archaeological sites have also been designated by SHPO that are associated with National Register-listed standing structures. Close to the project area, the Schermerhorn Row Block at 2-18 Fulton Street is such a site, dating to the early 19th-century. Farther from the project area, but still within the 0.25-mile search radius, is the National Register-listed Tweed Courthouse Area Deposits Site. This multi-component site includes historic structural remains as well as historic human remains.

Two prehistoric sites have been identified within the 0.5-mile-radius. Both sites were the locations of Precontact villages, first reported during the early-20th century. The first, NYS Museum site #4059, also known as Shell Point or Werpoes was located north of City Hall Park and is depicted in CRIS as a very large polygon covering several square blocks. Limited information is available for this site, which is described in the NYSM files as a Native American village and multiple shell middens. According to Bolton (1922), the native place name was noted in a grant from the Dutch government to Augustine Heermans in 1651, which described "the land called Werpoes" containing about 50 acres, extending from the north side of the Kolch Hoek, or Collect Pond and its adjoining ponds. "According to Tooker, this name should have been more correctly written "Werpos", or "the thicket", a designation which describes the known conditions of the locality, the hillsides around the ponds being covered in bygone times with bushes and blackberry brambles." (Bolton 1922:43).

The second village site, NYS Museum site #4060, was identified by Bolton (1922) as Rechtauck or Rechtanck, and as Nechtanc by Grumet (1981). Bolton, in describing the Native American trails of Lower Manhattan, states that from the area of Bowery and Division Street, a branch pathway led to the neighboring village of Rechtauck or Rechtanck, which was situated on Corlears Hook. Bolton further describes a location near Jefferson Street where a brook fed a fresh water pond located on the block bounded by Jefferson, Henry, Clinton, and Madison Streets, which was likely the only source of fresh water in the area. The name of the village signifies "at the sandy town" or "sandy river" (Bolton 1922:57). This suggests that the village was likely located at Corlears Hook atop the sandy bluffs formerly located along the East River. During the Contact Period the site became a refuge for Native Americans from across the area during the brutal wars with the Dutch during the 1640s. However, Native Americans who had taken refuge there were massacred during a nighttime attack by Dutch soldiers on the orders of Governor William Kieft in 1643.

5.1.2 Previously Conducted Surveys

Over the past several decades, numerous surveys have been conducted in the vicinity of the BMCR project area in association with new development for office and commercial space, transportation infrastructure improvements, as well as urban renewal plans, including housing, commercial, and retail developments. Many of the projects on nearby blocks included Phase IA surveys, and some of these surveys involved Phase IB subsurface investigations. While disturbed subsurface conditions were noted on portions of many project areas, the tenacity of archaeological resources has been demonstrated in recent years with the documentation of significant intact historic archaeological resources beneath paved streets, sidewalks and 19th-century buildings within a quarter mile radius of the BMCR project area.

In 2007, Richard G. Schaefer, Ph.D. of Historical Perspectives, Inc. (HPI) completed the *East River Waterfront Esplanade and Piers – Inboard Resources North of Brooklyn Bridge Phase IA Archaeological Assessment* documentary study report for the Lower Manhattan Development Corporation (LMDC). The APE researched for this study runs along present-day South and Marginal Streets roughly from Whitehall Street adjacent to Battery Park, north and east to Jackson Street along the East River shoreline for

approximately two miles. The 2007 APE was broken down into ten segments corresponding to discrete project elements. The current BMCR APE falls within the APE for the 2007 study. More specifically, the BMCR APE lies within the 2007 study segments #7 – north of Pier 15 between Fletcher and John Streets to Montgomery Street, and #8 – Pier 35.

This extensively researched Phase IA documentary study included the following:

- Identified categories of potential archaeological resources in the APE.
- Examined the construction history of the APE in order to determine the probability that any potential archaeological resources have survived post-depositional disturbances and remain in situ.
- Determined whether additional study or testing regarding potentially surviving archaeological resources is necessary (HPI 2007:2).

Research included examination of primary and secondary sources, review of cartographic sources, and review of boring records.

The Phase IA concluded that potential archaeological sensitivity was eliminated in Segment 7 of the 2007 APE (which coincides with the current BMCR APE) within 42.5 feet of the modern bulkhead, due to the extensive dredging that was required for its construction. This dredging was confirmed by the results of the soil boring survey conducted in 1965. This would eliminate most of present-day Marginal Street as archaeologically sensitive. In some portions of Segment 7, the archaeological sensitivity determination was further limited to the landward 70 feet of present-day South Street, based on the documented 20th century date for the bulkheading and land filling of the land on the river side of the historic bulkhead.

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

In 2008, Sara Mascia, Ph.D. and Richard G. Schaefer, Ph.D. of HPI completed the *East River Esplanade and Piers, Archaeological Field Monitoring and Soil Boring Analysis, Borough of Manhattan, New York, New York* report for the New York City Economic Development Corporation (EDC). The APE for this report follows that of the 2007 Phase IA documentary study discussed above. The report was prepared in response to new subsurface data from a new set of borings conducted in the APE and from monitoring the excavation of two test trenches. The stated purpose of the test trenches was to determine the depth and extent of disturbance of the existing FDR Drive column footings. The surveyed locations include South and Marginal Streets between Broad Street and Coenties Slip, Wall Street and John Street, and Pike Street and Rutgers Slip. Only the Pike Street to Rutgers Slip portion of the 2008 survey is relevant to the current BMCR APE.

Three new borings (ERW-L3, L4, and L5) and one test trench (ERW-T7) were excavated within Segment 7 of the 2007 APE, which is also included in the current BMCR APE. However, the new borings and test trench were in areas that were determined to be not archaeologically sensitive in the Phase IA study. The data obtained through the new borings was very similar to that of nearby borings evaluated in the 2007

Phase IA study (Appendix A). It was concluded that extensive dredging had occurred as would be expected on made land that has undergone multiple pier/crib/bulkhead construction and removal episodes.

Trench ERW-T7 was located south of Rutgers Slip, approximately 15-feet beyond the area of archaeological sensitivity as determined by the 2007 Phase IA. It was located adjacent to a FDR Drive support column. The footing was encountered at approximately 1 meter (3.28 feet) below ground surface and was 76 centimeters (2.49 feet) thick, extending to 1.8 meters (5.91 feet) below the surface. Following the removal of the asphalt pavement, two former concrete surface pads were identified before a fill level was encountered. The support column footing was within a stratum composed of dark brown to black miscellaneous fill. The fill contained a significant amount of gravel as well as fragments of brick, mortar and sewer pipe in addition to a few ceramic sherds, bottle glass, and oyster shell fragments. Excavation was stopped when water was encountered approximately 0.6 meters (2 feet) below the base of the footing.

The footing size measured 3.35 x 2.74 meters (11 feet x 9 feet) aligned with the longer dimension parallel to South/Marginal Streets and the FDR Drive. Excavation surrounding the footing did not extend deeper than 1 meter (3.28 feet) beyond the footing, therefore it was not possible to determine the origin of the fill encountered. The fill may have been redeposited from the excavation for the footing itself or may have been brought in from elsewhere. No evidence of prehistoric or historic features or artifact concentrations was encountered during the monitoring of Trench ERW-T7.

In 2017, Elizabeth D. Meade, MA, RPA of AKRF, Inc. (AKRF) completed the *Two Bridges Large Scale Residential Development, Site 4 (4A/4B) (Block 248, Lots 15, 70, and 76); Site 5 (Block 247, Lots 1 and 2); and Site 6A (Block 246, Lots 1 and 5), New York, New York Phase IA Archaeological Documentary Study.* The report was prepared for Cherry Street Owner, LLC and Two Bridges Senior Apartments LP, Two Bridges Associates, LP and LE1 Sub LLC.

The study is concerned with the proposed development of three new mixed-use buildings within the existing Two Bridges Large Scale Residential Development (LSRD) along the East River Waterfront in Lower Manhattan within the boundaries of the former Two Bridges Urban Renewal Area (TBURA). The three proposed projects are unrelated, with separate developers, approvals, and financing. However, they were evaluated together for environmental review purposes. The three sites are as follows:

1. Site 4 (4A/4B) is located south of Rutgers Slip, between Cherry Street and South Street on Block 248, Lots 15, 70, and 76. Almost entirely landfill, wharf built in 1797, filled by 1836. By mid-19th century the site was completely developed.

2. Site 5 is located between Cherry Street, South Street, Rutgers Slip and the de-mapped former alignment of Jefferson Street on Block 247, Lots 1 and 2. Originally Rutgers water lots. Northern portion filled 1766-1797; southern half filled 1820s and 1830s. Developed by mid-19th century.

3. Site 6A is located on the south side of Clinton Street at South Street on Block 246, Lots 1 and 5. Northwest portion may have been dry land. Originally Rutgers water lots, filling begun in 1797, completed by 1836. Developed by mid-19th century.

The Phase IA documentary study had four major goals: (1) to determine the likelihood that the project sites were occupied during the precontact (Native American) and/or historic periods; (2) to determine the effect of subsequent development and landscape alteration on any potential archaeological resources that may have been located within the project sites; (3) to make a determination of the project sites' potential archaeological sensitivity; and (4) to make recommendations for further archaeological analysis, if necessary (AKRF 2017).

The Phase IA concluded that Site 4 (4A/4B) has low sensitivity for landfill and landfill retaining structures due to the former 18th-19th century buildings with documented basements. This site also has low sensitivity for encountering wooden water mains and artifacts in historic streetbeds as well as historic shaft features. It was recommended that an Archaeological Unanticipated Discoveries Plan be developed for Site 4 (4A/4B).

The Phase IA concluded that Site 5 possesses moderate to high sensitivity for landfill and landfill retaining structures in the southern portion of the site, the former Rutgers Slip area below the level of the former basements. This site also has low to moderate sensitivity for wooden water mains and artifacts in historic streetbeds, and low sensitivity for historic shaft features. The development of an Archaeological Monitoring Plan was recommended.

The Phase IA concluded that Site 6A has moderate to high sensitivity for landfill and landfill retaining structures below former basements. This site also has low to moderate sensitivity for wooden water mains and artifacts in streetbeds, and low sensitivity for historic shaft features. The development of an Archaeological Monitoring Plan was recommended.

In 2009, Elizabeth D. Meade, RPA of AKRF completed the *Phase IA Archaeological Documentary Study, Rutgers Slip, Between Cherry and South Streets, New York, New York* for the LMDC as part of the Environmental Assessment (EA) for the East River Waterfront Access Project. The APE for the project included the streetbed of Rutgers Street, between Cherry and South Streets. Project actions included new crosswalks across Rutgers Street at Cherry and South Streets, new curbs along both sides of Rutgers Street and new tree plantings, new catch basins and storm sewers at the intersection of Rutgers Slip and South Street, new storm sewer connections to existing manholes, relocation of other manholes, and installation of benches. The vertical APE was expected to be 1 to 2 feet throughout most of the project area, with some areas extending 4 to 5 feet.

The Phase IA report concluded that the sidewalk along the north side of Rutgers Street from Cherry to South Streets should be tested because impacts are expected to be deeper than 2 feet. In addition, at the intersection of Rutgers and South Streets, including the existing sidewalk and paved South Street, are two rectangular-shaped area recommended for testing. A Phase IB subsurface testing plan or an Archaeological Monitoring Plan was recommended.

During 2012, AKRF completed the report *Archaeological Monitoring Addendum, Phase IA Documentary Study, Rutgers Slip between Cherry and South Streets, New York, New York* for the LMDC. The excavation work for the new catchbasins of the Rutgers Slip project was conducted in 2011, and possible a landfill retaining structure was observed on-site by the monitoring archaeologist in the excavation on the northwest

corner of Rutgers Slip and South Street. Timbers had been encountered by the contractor which were found in association with cobbles. Samples of the timbers were taken in 2011 for further analysis.

The timbers in the catchbasin excavation were identified as pitch pine and white pine by the Tree-ring Laboratory of the Lamont-Doherty Earth Observatory at Columbia University (AKRF 2012:2). Attempts to date the timbers through dendrochronological analysis were unsuccessful. Attempts to identify the geographical location of the trees at time of harvest were also unsuccessful.

The landfill retaining structure could not be tightly dated and the remains did not meet the criteria for a determination of National Register eligibility. However, the presence of an intact landfill structure at the corner of Rutgers Slip and South Street supports the conclusions of the Phase IA documentary study that determined that such remains may be present and *in situ* below the pavement of Rutgers Slip and have likely been only minimally disturbed by subsequent utility installations.

In 2009, Elizabeth D. Meade, RPA of AKRF completed the *Phase IA Archaeological Documentary Study, Montgomery Street, Between Madison and South Streets, New York, New York* for the LMDC as part of the Environmental Assessment (EA) for the East River Waterfront Access Project. The APE for the project included the streetbed of Montgomery Street, between Madison and South Streets. Project actions included the installation of benches, lighting, new paving, riparian trees, and a landscaped raised center median. In several locations, new catch basins and storm sewers were proposed and were to be connected to existing sewer lines to improve the street's drainage. The vertical APE was expected to be 1 to 2 feet throughout most of the project area, with some areas extending 4 to 5 feet.

The project site was determined to have no sensitivity for precontact archaeological resources. Although it was likely that Native Americans used the project site as a habitation or resource exploitation location, the extensive landscape modifications that began in the 18th century in addition to the excessive development of the area that occurred during the 19th and 20th centuries would have destroyed the integrity of any precontact resources once present.

The Montgomery Street APE was determined to possess moderate sensitivity for historic period resources in the vicinity of former rear yard areas. Due to the subsurface disturbances caused by street construction, grading, and utility installation, it was assumed that historic period resources may be intact at depths greater than two feet below grade.

Most of the work associated with the proposed project will require excavation in previously disturbed levels, anticipated to extend to a maximum depth of 1 to 2 feet. No additional archaeological research is recommended for these areas.

Phase IB archaeological investigation or archaeological monitoring is recommended for former rear yard or landfill areas where excavation for the proposed project will exceed 2 feet below the ground surface.

In 2009, Elizabeth D. Meade, RPA of AKRF completed the *Phase IA Archaeological Documentary Study, Catherine Slip, Between Madison and South Streets, New York, New York* for the LMDC as part of the Environmental Assessment (EA) for the East River Waterfront Access Project. The APE for the project

included the streetbed of Catherine Slip between Madison and South Streets. Project actions included streetscape improvements such as installation of new benches, crosswalks, parking spaces, lighting, and pavement. In addition, the existing raised median and areas to the east were re-landscaped with riparian trees and vegetation. The proposed project was expected to disturb approximately 1 to 2 feet below the ground surface throughout most of the APE, although certain locations may have required excavation of up to four feet.

The project site was determined to have low sensitivity for precontact resources due to former environmental conditions and historic dredging. The Catherine Slip streetbed was determined to have low to moderate potential for historic resources. The resources could include historic landfill, landfill retaining devices, wharves, docks, piers, bulkheads, and structural remnants and refuse from 18th and 19th century infrastructure.

Phase IB survey or archaeological monitoring was recommended for all previously undisturbed areas that would be impacted by construction to depths exceeding two feet.

5.2 History of BMCR Project Corridor Development

The following section on the historic development of the project corridor, or BMCR APE, has been taken in large part from the extensive research conducted by Richard G. Schaefer, Ph. D., for the 2007 *East River Waterfront Esplanade and Piers-Inboard Resources North of Brooklyn Bridge Phase IA Archaeological Assessment* report prepared for AKRF, Inc. and the Lower Manhattan Development Corporation. As noted above, the APE for the 2007 project included the entire APE for the current BMCR project.

The BMCR APE has been divided into three sections to present the results the 2007 and current research concerning the historical usage, documented disturbance, and potential archaeological sensitivity of each section. The three APE sections follow those used in the 2007 report to organize the data.

5.2.1 Section 1: Roosevelt Street to Catharine Slip South (West)

This section from project south to north includes the former Roosevelt Street, James Slip, Oliver Street, and the south side of Catharine Slip.

The origins of the names for the former and current streets within the project area are explained in the Henry Moscow publication, *The Street Book, An Encyclopedia of Manhattan's Street Names and Their Origins*, published in 1978. Research indicates that Roosevelt Street was named for the Roosevelt Family, early settlers of New Amsterdam. Most of its former corridor was taken for the present-day Governor Alfred E. Smith Public Houses. The namesake for James Slip/Street was James DesBrosses, who operated a distillery on the East River shore during the 18th century. Its former corridor in proximity to the project area was taken by the present-day Governor Alfred E. Smith Public Houses. The namesake for Oliver Street was Oliver de Lancey, colonial politician and soldier, and the brother of James de Lancey (namesake for Delancey Street). Loyal to the crown during the American Revolution, de Lancey was a Brigadier General in British army, and his property was confiscated. The former Oliver Street corridor is the present-day location of the Governor Alfred E. Smith Public Houses and PS 126 Jacob Riis School. The namesake for

Catharine Slip/Street (present-day Catherine Street) was Catharine Rutgers, nee DePeyster, who married Henry Rutgers in 1732. Rutgers owned the farm through which the street was cut.

5.2.1.1 Historic Development

This section of the APE was submerged beneath the East River when the first settlers arrived in the 17th century. The shoreline was irregular and there was a cove shown between Dover Street (just south of the Brooklyn Bridge and the BMCR APE) and James Slip, which extended inland to the line of today's Pearl Street, as seen on the 1865 Viele map (Figure 5). The cove appears filled in by 1776, as it is not seen on the Ratzer map (Figure 6). The cove was filled as far inland as today's Front Street by 1797, as indicated by the 1797 Taylor Roberts map (Figure 7).

South Street was conceived as a 70-foot-wide street by 1798 when the Common Council ordered the owners of water lot grants along the future route of South Street from Coenties Slip to Catharine Slip to fill in the lots "with good and wholesome Earth" by January 1799 (Stokes 1926:1,350 in HPI 2007:34). This did not occur as ordered by the Council because in 1815, South Street north of James Slip was noted as only 40-feet-wide (MCC 1917: VIII 255 in HPI 2007:34).

The 1811 Commissioners Plan depicts South Street, then labeled Front Street, extending from Roosevelt Street to Catharine Slip, with a break at James Slip. This is likely a projection showing the proposed route of South Street, since the Common Council minutes record South Street ending at Dover Street in 1819 (MCC 1917: X 443 in HPI 2007:34).

Due to the natural curve in the shoreline in the vicinity of Roosevelt Street and James Slip, the planned extension of both Front and South Streets northward was met with difficulty, as the streets would not run parallel, but intersect at James Slip, as seen on the 1828 Goodrich map (Figure 8a). The Common Council was intent on continuing South Street north to the pier at the foot of Roosevelt Street, and in 1819 ordered the owners of the water lots to have the bulkhead made (MCC 1917: X 443-444, 502 in HPI 2007:35). This left a sharp inland turn at Roosevelt Street in order to continue northward on South Street. This was the street layout until between 1851 and 1857, when South Street was extended to James Slip, intersecting with Front Street and creating a triangle-shaped intersection between Roosevelt Street and James Slip (HPI 2007). This area was never lotted as it had been reserved by the City as a public slip as early as 1817, before it was filled in (MCC 1917: IX 257-258, X 244 in HPI 2007:35).

North of James Slip, the street known as Front Street was renamed South Street and ordered widened from 40 to 70 feet in 1815. The lot owners between James Slip and Catharine Slip were ordered by the Common Council to build a new bulkhead 30 feet outboard by May 1816 (MCC 1917: VIII 255 in HPI 2007:34). Catharine Slip was ordered filled in and bulkheaded at the outboard line of South Street in 1814 and 1829, and James Slip was ordered filled in and bulkheaded in 1830 (MCC 1917: VII 785, XVIII 137-138, 619-610 in HPI 2007:34).

The earliest measurements of South Street north of James Slip were made under the supervision of City Surveyor Daniel Ewen in 1849. The survey showed that the Common Council's orders for South Street to be a 70-foot-wide corridor had been followed, as the street varied in width from 72.8 feet to 81.7 feet from the inland side to the bulkhead along the outboard side (HPI 2007:35).

Bulkhead construction during this period probably utilized the cobb or cribwork method. The minutes of the Common Council often recorded the phrase "sinking a Bulkhead" (HPI 2007:35).

Piers and Wharves

The earliest piers and wharves constructed between Roosevelt Street and Catharine Slip are depicted on the 1776 Ratzer map and 1797 Taylor Roberts map; however, these structures had their bases in Cherry Street, and did not extend into the current BMCR APE (Figures 6 and 7).

The earliest documented piers and wharves built within the section of the APE between Roosevelt Street and Catharine Slip were constructed along the water side of Front Street (renamed South Street in 1815) in circa 1810, and also following its widening from 40 to 70 feet in circa 1816 (HPI 2007:35). It is noted in the 2007 report that given the 70-foot width of early Front/South Street, and the current width of South/Marginal Street of as great as 210 feet in the section south of Catharine Slip, much of the area covered by former pier locations is now filled in and forms part of the current BMCR APE.

It is noted that the 1849 Alvord survey provided the standard pier numbering system which was valid until the construction of new piers circa 1900 (HPI 2007:36). The Alvord survey provides information of the extensions and lengthening of early piers.

Six piers were formerly located in Section 1 of the BMCR APE, as depicted on the 1828 Goodrich map. These were at the foot of Roosevelt Street, midway between Roosevelt Street and James Slip, on each side of James Slip, at the foot of Oliver Street, and on the south side of Catharine Slip (Figure 8a**).** As noted in the 2007 report, given the early date of construction for these six piers, they would have been constructed using the cobb/crib method, with platforms bridging the cells. Common Council resolutions for lengthening piers at this time recommended "adding a Block and Bridge" (HPI 2007:36).

As discussed above, the basin or slip between Roosevelt Street and James Slip was public property circa 1819. The pier at the foot of Roosevelt Street marked the southern boundary of the basin. This pier was privately owned, known as Minturn & Champlin's Wharf, and was mentioned as early as 1810. Minturn & Champlin was an importer of British goods and later a shipping and ship-owning enterprise, which operated throughout Europe and later the Pacific. The company went out of business in 1815, and its wharf is shown on maps of the 1830s but is gone by the 1840s. A new pier slip was created in the same location by 1849 as shown on the Alvord survey map, suggesting that the earlier cribwork was removed and the location was dredged. The Bridge Street Ferry utilized the slip during the 1850s. The 1860 Buckhout map depicts new Pier #29 at the foot of Roosevelt Street, which is labeled Ferry to Williamsburg (Figure 9a). By the 1870s, Pier #29 is shown extending to one of the Brooklyn Bridge abutments (HPI 2007:36). The 1893 Robinson atlas labels Pier #29 "Clyde's S. S. Line."

Pier #30 was located midway between Roosevelt Street and James Slip, marking the north side of the area reserved by the Council as a public basin proposed and approved in 1824 (HPI 2007:36). By 1849, Pier #30 had been extended and was 308 feet beyond the bulkhead on the south side of the street (Alvord 1949 in HPI 2007). By the 1850s the slip to the south of the pier was used by the Bridge Street Ferry as shown on the 1857 Harbor Commissioners map. The 1860 Buckhout map labels Pier #30 as the Ferry to Williamsburg (Figure 9a). The 1891 Bromley atlas shows a triangle-shaped pier into the East River from the water side of South Street between Roosevelt and James Streets labeled "Ferry to Brooklyn." (Figure 11a).

Piers # 31 and #32 were located on either side of James Slip, contracted for construction in 1813, and completed circa 1814 (MCC 1917: VII 599, 787 in HPI 2007:36). Both were lengthened in 1830 by the addition of a block and bridge to each (HPI 2007:36). Pier #31 on the south side of James Slip was extended to 261.5 feet. Pier #32 on the north side of James Slip was extended to 257 feet. The 1860 Buckhout map depicts these piers and James Slip, which is labeled Ferry to Williamsburg (Figure 9a). The 1891 Bromley atlas depicts Pier #31 from the water side of South Street labeled "Long Id. Express (Ferry)." (Figure 11a).

Pier #33 located at the foot of Oliver Street was ordered built in 1818 and planned as "three blocks and three bridges" making 190 feet (MCC 1917: IX 769 in HPI 2007:36). A 70-foot extension was authorized in 1830 by the addition of a fourth block and bridge (MCC 1917: XIX 301 in HPI 2007:36). Pier #33 is depicted as 255-feet-long on the Alvord survey map. Pier #33 is depicted on the 1860 Buckhout map but is not labeled (Figure 9a). The 1893 Robinson atlas has Pier #33 labeled "Clyde's Phila & NY Line."

Pier #34 located on the south side of Catharine Slip and serving the Catharine Ferry was contracted in 1814 (HPI 2007:36). The ferry lessee, Rodman Browne, complained that the slip itself was not large enough to accommodate both the ferry and market boats. The slip was ordered filled in and a 130-foot-long pier ordered for each side (MCC 1917: VII 285, VIII 15 in HPI 2007:36). It was extended with a block and bridge when the slip was again ordered to be filled in and bulkheaded in 1829 (MCC 1917: XVIII 138 in HPI 2007:36). Pier #34 was extended another 90 feet to the pierhead line during the 1850s, as depicted on the 1857 Harbor Commissioners map. The 1860 Buckhout map shows Pier #34 extending nearly to the Pierhead Line on the south side of Catharine Slip, and is labeled Catharine Ferry (Figure 9a). The 1893 Robinson atlas labels Pier #34 "Ferry to Main St Bklyn."

East River Bulkhead

The next major development in this section of the current APE was the construction of the modern bulkhead system, which was initiated in 1871 by the New York City Department of Docks. The modern bulkhead line defines the river side boundary of the current APE. According to an 1873 Department of Docks map, the modern bulkhead project also involved substantial landfill along the river side of South Street. The bulkhead project included the widening of South Street and a "Marginal Street" to be added to provide pedestrian and vehicular access to the piers and bulkhead. The combined width of South and Marginal Streets was initially proposed as 200 feet, but this was modified to 150 feet "to provide an additional 50 feet for piers in the somewhat narrow East River" (HPI 2007:37).

There were few changes across this section of the current APE during the 19th century because most of the modern bulkhead work was taking place further downtown. The 1879 Bromley atlas indicates that South Street was between 73 and 78-feet-wide between James and Catharine Slips, which was not much different from what was seen on the 1849 Alvord map (Figure 10a). The last pier and wharf maps made during the first decade of the 20th century before the modern bulkhead work was performed show the same area with a width to bulkhead of 83.5 feet (HPI 2007:37).

The major alterations or improvements to the APE during the late-19th century were the construction of ferry terminals, waiting rooms, and warehouses outboard of the old crib bulkhead, outboard of what was then the river line of South Street, but which falls within the current BMCR APE. These structures were built on the piers, on pile-supported platforms, and on "bridges" between the piers (HPI 2007:37).

The proximity of the Roosevelt Street to Catharine Slip section of the current APE to Brooklyn and Long Island City made this area a natural location for commuter ferries, as shown on many historic atlas maps of the latter half of the 19th century. The Williamsburg Ferry occupied the slip south of Pier #30, the ferry to Broadway in Brooklyn used the slip between Piers #30 and #31, and a large terminal for both passengers and freight had been built along the landward side of the two piers, from Roosevelt Street to just south of James Slip. The ferry to Hunters Point, Long Island City docked in the slip between Piers #31 and #32 and had its own terminal building. The Bridge Street Ferry, displaced by the construction of the Brooklyn Bridge abutment, utilized the slip on the north side of Pier #32 and had a large terminal building outboard of the South Street bulkhead. Pier #33 was leased by the Philadelphia & New York Steamship Company, and Pier #34 by Lorillard & Company, each with a structure covering most of their respective piers and extending to the outboard line of South Street. The Catharine Ferry, which also served Brooklyn, utilized the slip adjacent to the north side of Pier #34 and had a structure built out beyond the bulkhead and depicted on the 1860 Buckhout map and the 1879 Bromley map (Figure 9a; Figure 10a).

Department of Docks reports record modern bulkhead construction both to the south of this section of the APE (south of Dover Street) and north of this section of the APE (north of Catharine Slip) between 1899 and 1904 but no construction took place in the Roosevelt Street to the south of Catharine Slip section of the current APE during this time period (HPI 2007:37). It is probable that the City was reluctant to disrupt the commuter ferries that were concentrated in this area. As late as 1906, modern bulkhead expenditures for the area between Roosevelt Street and Catharine Slip had only proceeded as far as plans and land acquisition (Docks 1906:179, 213 in HPI 2007:37).

According to the 1914 Department of Docks report, the modern bulkhead wall had been completed from the centerline of Pier #31 south of James Slip, through the upper side of old Pier #33 at Oliver Street. In addition, old Pier #33 had been removed and replaced with new Pier #25. The only expenditures noted for the section between Oliver Street and Catharine Slip were for plans and specifications for the proposed new Pier #26, which did replace old Pier #34 by 1919 (HPI 2007:38).

The remainder of the modern bulkhead construction in this section of the current APE was completed between 1924 and 1938. Old Pier #31 on the south side of James Slip was renamed Pier #22, and old Piers #30 and #32 had been removed completely. A 1938 WPA utility map records the pier reconfiguration, as well as a combined South/Marginal Street width to the bulkhead as between 207 and 215 feet, measured at James and Catharine Slips (WPA 1936-1940 in HPI 2007:38).

5.2.1.2 Disturbance

Bulkhead Construction

Due to the great depth of riverbottom mud in BMCR APE Section 1, which in some areas was 170-feet-deep, the modern bulkhead had to rest on piles, even though the piles could not extend to the hard bottom in all cases. According to Schaefer (2007), in quoting Carleton Greene (1917), the river mud was dredged "for a width of about 85 feet to a depth of 30 feet, more or less, depending upon the consistency." Schaefer's research examined Greene's schematic drawings and determined that this width of dredging extended an equal distance on each side of the proposed bulkhead location, therefore, approximately 42.5 feet into the current APE on present-day South/Marginal Street and to a depth of 35 to 40 feet below mean height of water (mhw). The piles were driven into the dredged surface and the open spaces filled in with cobbles and riprap, which served as a base and support for the concrete and masonry modern bulkhead. "The new street

area created would have been further filled with "earth, ashes, &c" as Greene notes in his 1876 bulkhead drawing." (HPI 2007:38).

In summary, the impact of the modern bulkhead construction in BMCR APE Section 1 (completed 1914; 1924-1938), would have had a horizontal inland extent of 42.5 feet under present-day South/Marginal Street to a vertical depth of 35 to 40 feet below mhw.

Dredging

By necessity, dredging was and is a normal component of harbor and slip maintenance and would have been conducted within Section 1 of the BMCR APE during the early-19th century. According to the research conducted by Schaefer for the 2007 Phase IA report (as well as research conducted by this author for prior projects along the East River), accurate records of dredging or even maps of pier slip depths prior to 1857 are not available to document routine dredging impacts to now-filled sections of the APE (HPI 2007:38).

Pier removal and the accompanying dredging across Section 1 of the BMCR APE during the early-20th century was documented in the Department of Docks reports in tandem with the construction of the modern bulkhead. The only exception that can be noted was that of the early-19th century Minturn & Champlin Wharf (discussed above), formerly located at the foot of Roosevelt Street, which was removed during the 1830s and its location was undoubtedly dredged for use as a pier slip (HPI 2007).

Buried Utility Lines

Multiple underground historic and recent utility lines are present across BMCR APE Section 1. These include water, sewer, storm water, gas, electric, telephone, telecommunications, and oil-o-static lines, and are plotted on project plans (Figure 4a). Most of the major water and sewer lines traverse the entire APE. The impact that these utility installations might have on archaeological resources depends on the width and depth of each trench required for installation.

At the southern end of Section 1, Robert F. Wagner, Sr. Place intersects with South Street. Two electric lines, one water main, one telephone line, and a 72-inch-round brick sewer run beneath Wagner Place, and gas mains are noted running under the sidewalk of the Alfred E. Smith Houses.

Numerous utility lines are documented running below South Street including:

- Electric – at least five lines are noted.
- Gas – one 8-inch abandoned line under sidewalk in front of Alfred E. Smith Houses.
- Oil-o-Static – two 8-inch lines.
- Telephone – one line noted near sidewalk in front of Alfred E. Smith Houses.
- Water – one 30-inch to 24-inch main; one 12-inch main run across Section 1.

- Sewer – one 96 x 72-inch flat top line installed in 1967 runs below South Street approximately 10-feet from the Alfred E. Smith Houses sidewalk; one 24 x 42-inch brick line running in front of Alfred E. Smith Houses; one unknown 36-inch line running perpendicular to South Street across APE; one 48-inch circular brick line installed in 1889 begins near Catharine Slip and runs northward under South Street.

In addition to the main utility lines, there are numerous underground appurtenances such as sewer vaults, catch basins, electric vaults, valve boxes, manholes, fire hydrants, and service lines, all of which have created subsurface disturbance across Section 1.

5.2.1.3 Potential Archaeological Sensitivity

Review of Soil Boring Logs

Review of soil borings conducted within BMCR APE Section 1 between Roosevelt Street and Catharine Slip in 1950 shows fairly consistent results (WPA 1965 Sheet 5: #149-#168 in HPI 2007:40). Appendix A of this report includes the soil boring logs and boring location maps gathered for the 2007 HPI Phase IA report. A substantial fill stratum was identified below the pavement generally to depths between 23 and 40 feet below mhw. Ten of the boring logs record timbers and wood in the fill stratum in scattered locations across this section of the APE, which would be expected across an area for which multiple episodes of bulkheading and pier construction have been documented since the early-19th century. The timber/fill stratum extends to depths of 31 to 40 feet below mhw, suggesting that this was the depth to a hard sandy riverbottom, upon which wooden cribs could be sunk and stabilized. River mud and silt is recorded in the stratum containing the timbers but is not present in the stratum below the timbers, suggesting that the riverbottom was dredged prior to the sinking of the crib structures. River mud/silt is noted in only eight of 19 boring logs amid the timber/fill, but only three logs record these deposits directly beneath a fill stratum, suggesting the removal of river mud by dredging prior to filling activity in general (HPI 2007:40).

Categories of potential archaeological resources in BMCR APE Section 1 include submerged precontact resources; 19th century riverbottom remains, 19th century landfill retaining structures, wharves and piers; and 19th century landfill.

Submerged Precontact Resources

Precontact resources would be expected to be found overlying the glacial till layer and underlying river deposits of mud and silt, as they would predate the inundation of the APE.

Despite the fact that specific early dredging episodes and depths are not documented in the historical record, the soil boring data indicate that much of the river mud and silt stratum in the Roosevelt Street to Catharine Slip section of the APE was removed in preparation of the riverbottom for the sinking of cribworks for piers and bulkheads during the first half of the 19th century (HPI 2007:40). The removal of the mud and silt stratum in all likelihood would have destroyed the integrity of any precontact resources that may once have been present.

Another major historic disturbance that would have affected the integrity of precontact resources was the construction of the modern bulkhead. As Schaefer noted during his 2007 Phase IA research, the dredging

depth associated with the modern bulkhead was between 35 and 40 feet below mhw (HPI 2007:40). This action would have impacted the pre-inundation surface across the area within the APE within 42.5 feet of the modern bulkhead, destroying the integrity of any precontact resources that may once have been present.

19th Century Riverbottom Remains

Riverbottom remains such as accidental or deliberate discards and losses from both shore facilities and ships would be expected within the river mud and silt strata that represent historic shoreline deposits which have accumulated since the construction of bulkheads, piers, and wharves. Although the soil boring data suggest that dredging has taken place prior to the construction of historic bulkheads and piers during the first half of the 19th century, the data also identify several locations in which river mud and silt accumulated after the bulkhead and piers were built. These potentially sensitive strata are noted between 23 and 39.5 feet below mhw (HPI 2007:41).

As discussed above, the area within 42.5 feet of the modern bulkhead is not sensitive for archaeological resources. However, the remainder of the BMCR APE Section 1 from Roosevelt Street to Catharine Slip possesses moderate sensitivity for riverbottom remains. These remains may be present in the river mud and silt stratum at depths below 23 feet below mhw (HPI 2007:41).

19th Century Landfill Retaining Structures, Wharves and Piers

Bulkhead construction and landfilling work for the route of South Street across this section of the BMCR APE did not occur until circa 1814, when the first 40-foot-wide section of the street between James and Catharine Slips was built, then widened to 70 feet after 1815. Further bulkheading and filling continued the route of South Street from Roosevelt Street to James Slip in circa 1819 and the triangular section north of Roosevelt Street was bulkheaded and filled between 1851 and 1857 (HPI 2007:41).

Six piers were constructed within this section of the APE between circa 1810 and 1824, some of which were built earlier than the completion of South Street. Therefore, the cribworks of these piers would have been preserved when South Street was further filled and widened around them (HPI 2007:41).

As indicated in the soil boring logs, timbers were encountered in ten of 18 borings conducted in this section of the APE. It is not possible to distinguish landfill retaining structures from wharves or piers from the presence of timbers or wood in the soil borings, particularly since many of the same techniques were used for both, and piers and wharves were often incorporated into retaining structures. The timbers were noted in fill and mud strata ranging between 4.4 feet above mhw (immediately underlying 1.5 feet of surface paving) and 40.1 feet below mhw (HPI 2007:41).

The preparation for the construction of the modern bulkhead involved dredging from 35 to 40 feet below mhw. Given the relative shallow depths of the cribworks recorded in the soil boring logs, they would have been removed prior to construction, as was standard practice (Docks 1914:172 in HPI 2007:41).

Multiple subsurface utility installations would also have impacted the upper sections of landfill retaining structures and piers in the remaining portions of BMCR APE Section 1 from Roosevelt Street to Catharine Slip, depending upon their diameters and the depths to which they were installed. However, buried utilities could not have completely eliminated potential sensitivity for this category of remains given their great depths. These resources may be encountered basically from the surface to as much as 40 feet below mhw.

As a rule, utility maps do not provide the accuracy necessary to pinpoint their locations, and many of the utility companies/agencies do not rely solely on them to locate their own lines (HPI 2007:41).

Section 1 of the BMCR APE from Roosevelt Street to Catharine Slip is therefore considered to possess moderate sensitivity for 19th century buried landfill retaining structures, wharves, and piers beyond 42.5 feet inland of the modern bulkhead.

19th Century Landfill Deposits

As noted in the above discussion, South Street was filled to 40-feet-wide between James and Catharine Slips by circa 1814 and widened to 70 feet after 1815. South Street was built from Roosevelt Street to James Slip circa 1819, and the triangular intersection north of Roosevelt Street was bulkheaded and filled by 1857 (HPI 2007:42).

Six piers were constructed within the APE between circa 1810 and 1824, and some were built before South Street was completed. The cribworks associated with these early piers would have been filled and sunk at the time of their construction, and then surrounded with later fill as they were incorporated into the street widening beyond 70 feet by 1900 (HPI 2007).

Soil borings note "miscellaneous fill" in association with timbers or wood throughout this section of the APE. The timbers and wood indicate evidence of landfill retaining structures and/or piers. The historic fill noted ranges in depth from 4.4 feet above mhw (immediately underlying 1.5 feet of pavement fill) to 40.1 feet below mhw. Primary and secondary fill have been defined under the Potential Resources section of the current report, and although it is not possible to distinguish been the two from the descriptions offered by the soil boring logs, secondary fill was defined as extending from the surface to a few feet below mean low water. Mean low water in this section of the APE is approximately 4.85 feet below mhw. The fill strata beneath secondary full would be considered primary landfill.

Construction of the modern bulkhead in the 20th century involved dredging from 35 to 40 feet below mhw. The relative shallowness of the fill strata encountered in the boring logs indicates that these strata would have been removed prior to construction along with the earlier cribworks, as was standard practice (Docks 1914:172 in HPI 2007:42). This dredging would have eliminated potential sensitivity for this category of potential remains in portion of the APE within 42.5 feet of the modern bulkhead. As noted earlier in this report, any fill placed beyond the old 19th century bulkhead during the construction of the modern bulkhead would not be considered to possess archaeological potential (HPI 2007:43).

Utility installations have likely impacted the upper strata of landfill (likely the secondary landfill deposits) in the remaining portions of the BMCR APE Section 1 from Roosevelt Street to Catharine Slip, depending on the size of the main and the depth of installation. Although some areas of potential sensitivity may have been destroyed, buried utilities would not have completely eliminated this category of remains, given their depth from the surface to as much as 40 feet below mhw.

Therefore, the remaining areas of this section of the APE are considered moderately sensitive for 19th century landfill deposits. Following more in-depth review of the subsurface utility locations, as the current project design plans progress, these areas may be more precisely defined or eliminated from consideration.

5.2.2 Section 2: Catharine Slip North (East) to Rutgers Slip South (West)

This section from south to north includes the north side of Catharine Slip, Market Slip (formerly George Slip), Pike Slip (formerly Charlotte Slip) and the south side of Rutgers Slip.

The origins of the names for the former and current streets within the project area are explained in The Henry Moscow publication, *The Street Book, An Encyclopedia of Manhattan's Street Names and Their Origins*, published in 1978. The namesake for Market Slip/Street was the Catharine Market, established in 1786 between Catharine Slip/Street and what is now Market Street; however, until 1813, Market Street was known as George Street. Market Slip, an extension of Market Street, was a port of entry for the produce sold in Catharine Market. The namesake for Pike Slip was Zebulon Montgomery Pike, soldier and explorer. Pike's Peak in Colorado was also named for him. Rutgers Slip/Street was named for Henry Rutgers, son of Henry (Hendrick) and Catharine DePeyster Rutgers. Rutgers was a member of the Class of 1766 at Kings College (Columbia), and fought as a captain in the American Army at the Battle of White Plains. New Jersey's Queens College was renamed Rutgers in his honor. The Rutgers Family traces its ancestry back to Rutger Jacobson van Schoenderwoert, who arrived in New Amsterdam in 1636 and grew rich as a brewer, merchant and Manhattan landowner.

5.2.2.1 Historic Development

This section of the APE was submerged beneath the East River when the first settlers arrived in the 17th century. The shoreline was irregular between the inland side of present-day South Street at Catharine Slip, receding to the outboard side of present-day Water Street at Market Slip, and running along the inland side of present-day Water Street from Market Slip to Rutgers Slip, as depicted on the 1865 Viele map (Figure 5). As mentioned above, South Street was ordered filled in 1798 as far as Catharine Slip, and east of James Street it was only 40-feet-wide, not the ordered 70 feet (MCC 1917: VIII 255 in HPI 2007:43).

The 1811 Commissioners Plan depicts South Street (labeled as Front Street) extending through this section of the APE from Catharine Slip to Rutgers Slip with breaks at Catharine Slip, Market Slip (then called George Slip), Pike Slip (then called Charlotte Slip) and Rutgers Slip. This depiction is more likely a projection, since the Common Council minutes record South Street ending at Dover Street in 1819 (MCC 1917: X 443 in HPI 2007:34) and Front Street was not ordered built from James Slip to Market Slip until 1814 (MCC 1917: VIII 28 in HPI 2007:43).

Catharine Slip was ordered filled in and bulkheaded along the outboard line of South Street in 1814 and again in 1829 (MCC 1917: VII 785, XVIII 137-138 in HPI 2007:43). However, the 1828 Goodrich map depicts Front Street (South Street) already crossing the bulkheaded Catharine Slip and running to the south side of Market Slip. On the 1828 Goodrich map, the future route of South Street was still underwater and beyond the existing pierhead line, as the bulkhead is shown across Water Street (one block inland) from Market Slip to Rutgers Slip. The early piers between Market Slip and Rutgers Slip extended out from Water Street to distances short of the inland side of the future route of South Street, beyond the current APE (Figure 8b**)**.

Between 1834 and 1836, South Street from Pike Slip south to Rutgers Slip north had been bulkheaded, leaving gaps from Market Slip north to Pike Slip south. Between Market Slip north and Pike Slip south

three existing piers from Water Street had been extended into the APE by 1836. Subsequently, all the gaps were filled, and South Street was completed to Rutgers Street by 1842 (HPI 2007:44).

The earliest measurements of South Street north of James Slip were made under the supervision of City Surveyor Daniel Ewen in 1849. The survey showed that the Common Council's orders for South Street to be a 70-foot-wide corridor had, for the most part, been followed, as the street varied in width between 61 and 87 feet from the inland side of the street to the bulkhead along the outboard side (HPI 2007:44). The narrowest section was immediately north of Catharine Slip, which was between 61 and 68-feet-wide, and the widest was north of Pike Slip, which was between 82 and 87-feet-wide.

Bulkhead construction during this period probably utilized the cobb or cribwork method. The minutes of the Common Council often recorded the phrase "sinking a Bulkhead" (HPI 2007:44).

Early Piers and Wharves

In 1849, there were eleven piers extending from the outboard side of South Street which were numbered 35 through 43 (Alvord 1849 in HPI 2007). The earliest pier in this section of the APE was #35, built along the north side of Catharine Slip in 1814. The pier was ordered by the Common Council at the same time it ordered that the slip itself be filled in and bulkheaded to the outboard side of 70-foot-wide South Street (MCC 1917: VII 785 in HPI 2007:44). Originally 130-feet-long, it was lengthened to 319 feet by 1849 (Alvord 1849 in HPI 2007). The 1860 Buckhout map shows this pier on the north side of the slip labeled Catharine Ferry (Figure 9b). The 1891 Bromley atlas depicts "Bridgeport Line" at head of pier in South Street (Figure 11b), and the 1893 Robinson atlas labels Pier #35 as "Bridgeport S. S. Line."

Pier #36, located midway between Catharine Slip and Market Slip, was constructed between 1843 and 1849, and is recorded as 309-feet-long (HPI 2007:44). The 1891 Bromley atlas labels Pier #36 as "Central Vermont RR" at head of pier in South Street (Figure 11b). A smaller, unnumbered pier is depicted halfway between Piers #35 and #36 in 1857 (Harbor Commissioners Map 1857 in HPI 2007) and on the 1860 Buckhout map (Figure 9b). This smaller pier was present on 1873 maps, but is gone by 1879, as it is not depicted on the 1879 Bromley atlas (Figure 10b).

Pier #37 was built on the south side of Market Slip between 1831 and 1836 (HPI 2007:44). The slip itself is noted in 1817 and a resolution to pave South Street between Catharine Slip and Market Slip was passed in 1831 (MCC 1917: IX 70, XIX 619 in HPI 2007:44). The 1849 Alvord survey notes the pier as 230-feet-long, and in 1852 it contained two buildings utilized by the Housatonic Railroad (HPI 2007:44). Pier #37 was extended to 359-feet-long by 1857 as depicted on the Harbor Commissioners map. The 1860 Buckhout map depicts this extended pier nearly to the Pier Line.

The earliest piers constructed along the Market Slip to Pikes Slip section of the BMCR APE Section 2 shoreline were built along the outboard side of Water Street during the first decades of the 19th century. As mentioned above, this section of the East River shoreline contained a number of ship building and ship repair establishments as early as the 1760s, which were still in operation in the 19th century (HPI 2007). As initially constructed, the associated piers did not extend to the future line of South Street and were therefore not within the current APE. By 1834, three of these piers had been lengthened and did cross into the current APE (HPI 2007:45).

Pier #38 along the north side of Market Slip was constructed on the outboard side of Water Street between 1821 and 1828 and did not extend into the current APE (Figure 8b). By 1834 the pier was extended and did cross into the current APE, and in 1836 a short section was added at the tip of the pier, which extended to the south into Market Slip, parallel to Water and South Streets. This odd, L-shaped configuration is likely related to the filling in of Market Slip at this time and extending the bulkhead outboard. With the bulkheading and completion of South Street accomplished by 1842, new Pier #38 was constructed in 1843, extending across the current APE and 200.2 feet into the East River. The pier was lengthened to 350 feet by 1857, as shown on the 1857 Harbor Commissioners map (HPI 2007:45). The 1860 Buckhout map depicts this pier extending to the Pier Line (Figure 9b).

Pier #39 was located midway between Market Slip and Pike Slip and was constructed in 1828 by the Screw Dock Company, which had buildings on the adjacent block. As South Street was not filled in between Market and Pike Slips in 1828, the dock was built from the outboard side of Water Street. The Common Council mandated that Pier #39 "to be composed of Block and Bridges…not extend into the river more than Two hundred and fifty feet beyond the Southerly line of South Street" (MCC1917: XVII 213 in HPI 2007:45). The pier is seen on maps in 1834, 1836, and 1838, extending into the landward 70 feet of the proposed route of South Street. With the bulkheading and completion of South Street accomplished by 1842, a new 344-foot-long Pier #39 was built by 1849 from the outboard side of South Street extending across the current APE. The 1849 Alvord survey notes this pier and three smaller piers to the north, identified on a later map as "Hydrostatic Lifting Docks." (HPI 2007). The 1891 Bromley atlas labels these piers as "Screw Docks." In the adjacent slip to the north, between Piers #39 and #40, was the "Floating Church of Our Savior." (HPI 2007:45). The 1891 Bromley atlas labels this as "Free Chapel." (Figure 11b)**.**

Pier #40 was originally constructed in 1810 from the outboard side of Water Street on the south side of Pike Slip for the firm Dunlap & Grant. The Common Council had ordered the water lot grantees to construct a pier in 1804, but the piers were only "sunk and filled with stones to the low water mark" by August 1810 (MCC 1917: III 452, IV 124, V 583, VI 324 in HPI 2007:45). Pier #40 did not extend into the current APE until it was lengthened between 1828 and 1834 (HPI 2007:45). Following the completion of South Street by 1842, new Pier #40 was built with its base in the current APE, extending 341 feet into the East River by 1849 (Alvord 1849 in HPI 2007). The 1860 Buckhout map shows this pier extending nearly to the Pier Line (Figure 9b). The 1891 Bromley atlas labels this pier as "NY & Northern RR." (Figure 11b).

Pier #41 was originally constructed from the outboard side of Water Street on the north side of Pikes Slip by 1804 by Isaac Clason (HPI 2007). The pier was originally 120-feet-long and did not cross into the current APE until it was lengthened between 1828 and 1834 (HPI 2007:45). By 1836 the area from Pike Slip to Rutgers Slip had been bulkheaded and filled, and the pier was removed. This removal was likely in preparation for a new Pier #41, which was completed between 1838 and 1843 (HPI 2007:46). The 1849 Alvord survey records a 311-foot-long pier extending across the current APE and into the East River (Alvord 1849 in HPI 2007).

Pier #42 was located midway between Pike and Rutgers Slips. A number of piers were constructed in this vicinity by 1828 but none crossed into the current APE (Figure 8b). A new 342-foot-long pier was constructed with its base on South Street, within the current APE, between 1843 and 1849 (Alvord 1849 in HPI 2007). Between 1847 and 1852, a balance dry dock was built in the pier slip south of Pier #42 and a sectional dry dock was located on the north side, partially within the current APE (HPI 2007). The 1860 Buckhout map depicts these dry docks (Figure 9b). These dry dock structures persist until 1891, as they are depicted on the 1891 Bromley atlas (Figure 11b**)** but are gone by 1905 (Sanborn 1905 in HPI 2007).

The building of Pier #43 along the south side of Rutgers Slip was discussed and approved by the Common Council in 1810 (MCC 1917: VI 205 in HPI 2007:46). However, Water Street was not completed at this location until circa 1816 when the water lot grantees were ordered to build wharves and piers "to the southerly line of South Street" by May 1817 (MCC 1917: VIII 587 in HPI 2007:46). The "southerly line of South Street" would be within the current APE. One large, backward L-shaped pier was constructed on the south side of Rutgers Slip that extended into the current APE by 1828 (Figure 8b). The pier was rebuilt when South Street was completed in this section between 1834 and 1836 (HPI 2007:46). Pier #43 was lengthened again by 1849 with the addition of a straight section to the existing L-shaped section, creating an irregular, zigzag-shaped pier extending 344 feet into the East River with its base within the current APE (Alvord 1849 in HPI 2007). A sectional dry dock was constructed in the pier slip to the south of Pier #43 between 1847 and 1852, partially within the current APE (HPI 2007:46). The 1860 Buckhout map depicts this zigzag-shaped pier (Figure 9b). The dry dock persists until at least 1891, as it is depicted on the 1891 Bromley atlas (Figure 11b) but is gone by 1905 (Sanborn 1905 in HPI 2007).

East River Bulkhead

The next major development in this section of the current APE was the construction of the modern bulkhead system, which was initiated in 1871 by the New York City Department of Docks. The modern bulkhead defines the river side boundary of the current APE. According to an 1873 Department of Docks map, the modern bulkhead project also involved substantial landfill along the river side of South Street. The bulkhead project included the widening of South Street and a "Marginal Street" to be added to provide pedestrian and vehicular access to the piers and bulkhead. The combined width of South and Marginal Streets was initially proposed as 200 feet, but this was modified to 150 feet "to provide an additional 50 feet for piers in the somewhat narrow East River" (HPI 2007:37).

As noted for Section 1 of the current APE, there were few changes in Section 2 of the current APE as the modern bulkhead work was taking place further downtown. The 1879 Bromley atlas records the width of South Street as between 70 and 91 feet in the section from Catharine Slip north to Rutgers Slip south, a slight increase in width since that noted in the 1849 Alvord survey (HPI 2007:46).

The major alteration to the APE during the late-19th century was the construction of a number of pier sheds and warehouses outboard of the old crib bulkhead, outboard of the line of South Street, but within the current APE. These structures were built on the piers, bridging between piers, and on pile-supported platforms adjacent to the piers. The Catharine Ferry to Brooklyn docked in the slip south of Pier #35, and a large passenger terminal was built at the foot of the former slip by the 1850s, which was still operational in 1906. The Bridgeport Steamship Line occupied Pier #35 and its building was constructed in the 1870s, which abutted the Catharine Ferry terminal building. The Long Island Railroad occupied a freight structure at the foot of the slip between Piers #35 and #36 in 1879 (Figure 10b), which was taken over by the Central Vermont Railroad and Steamship Line by the 1890s (Figure 11b). The Central Vermont occupied the south side of Pier #36, sharing the pier with Lawrence, Son & Gerrish, proprietors of U.S. Bonded Warehouses on the north side of the pier (HPI 2007:47).

Pier #37 was a City pier along the south side of Market Slip and did not contain any structures. Pier #38 along the north side of Market Slip was occupied by the Maine Steamship Line which erected a small building at the head of the slip on the south side during the 1880s. Pier #39 was used by the New Bedford & New York Steamship Line, and later by the Old Colony Steamboat Line and a small structure was built at the head of the slip on the south side by the 1870s. In the slip to the north of Pier #39 the screw or

hydrostatic docks were extant in the 1890s as well as the floating church adjacent to Pier #40. Pier #40 on the south side of Pike Slip was occupied by the Mediterranean Steamship Company in the 1870s and then by the New York and Northern Railroad in the 1890s. A small building was constructed at the foot of Pike Slip on the north side of Pier #40 (Figure 10b; Figure 11b) (HPI 2007:47).

The remaining piers in this portion of APE Section 2 from Pike Slip north to Rutgers Slip south were Piers #41, #42, and #43. These were City piers with very few or no structures. The slips in this portion of Section 2 still contained three dry docks in the 1890s (Figure 11b).

Modern bulkhead construction between Catharine and Rutgers Slips removed all the additional structures within and straddling the old bulkhead within the current APE. Department of Docks reports record that modern bulkhead construction began before 1899, starting with the replacement of old Pier #35 with new Pier #27 at the foot of Catharine Slip north and the preparation for the construction of new Piers #31, #32, and #33 (roughly between Pike Slip south and Rutgers Slip south) which included the removal of old Piers #40 through #43 and the dredging of their locations as well as the adjoining slips to between 30 and 37 feet below mhw (Docks 1899:82, 115, 212 in HPI 2007:47). In 1905, old Pier #36, located midway between Catherine and Market Slips, was the only remaining 19th century pier (Sanborn 1905). However, after the standard removal of "old work", dredging, and laying of a riprap foundation, old Pier #36 was replaced with new Pier #28 in 1906 (Docks 1906:179-181 in HPI 2007:47). Only the old crib bulkhead across Catharine Slip (100 to 112 feet in width) and a small section south of Market Slip (width 71 to 74 feet) remained in 1906 (HPI 2007:47). By the 1914 Department of Docks report, the modern bulkhead wall had been completed in this section of the current APE, creating a South/Marginal Street with a combined width of 125 feet. Expenditures noted were mostly related to the paving of new Marginal Street (Docks 1914:173-174 in HPI 2007:47).

5.2.2.2 Disturbance

Bulkhead Construction

The riverbottom conditions across BMCR APE Section 2 were comparable to those discussed under bulkhead construction in Section 1. Due to the great depth of riverbottom mud (up to 170 feet), the modern bulkhead was built on piles and supported by placement of cobbles and riprap as a base for the modern concrete and masonry bulkhead. The riverbottom was dredged for a width of 85 feet parallel to the shoreline, with the dredging extending an equal distance on each side of the proposed bulkhead location to a depth of 35 to 40 feet below mhw. Therefore, as was documented for BMCR APE Section 1, the impact of the 1899 to 1906 and 1914 modern bulkhead construction for BMCR APE Section 2 would have had a horizontal inland extent of 42.5 feet under present-day South/Marginal Street to a vertical depth of 35 to 40 feet below mhw.

Dredging

As discussed above under dredging of BMCR APE Section 1, dredging was and is a normal component of harbor and slip maintenance and would have been conducted within Section 2 of the BMCR APE during the early-19th century. According to the research conducted by Schaefer for the 2007 Phase IA report (as well as research conducted by this author for prior projects along the East River), accurate records of dredging or even maps of pier slip depths prior to 1857 are not available to document routine dredging impacts to now-filled sections of the APE (HPI 2007:38).

No instances of pier removal and accompanying dredging within Section 2 of the BMCR APE can be documented until the period 1899 to 1906, and again in 1914, when the dredging occurred at the same time as modern bulkhead construction (HPI 2007). Recorded depths of dredging in 1899 along the old crib bulkhead at Rutgers and Pike Slips were between 30 and 37 feet below mhw (Docks 1899, 1906 in HPI 2007:48).

Buried Utility Lines

Multiple underground historic and recent utility lines are present across BMCR APE Section 2. These include water, sewer, storm water, gas, electric, telephone, telecommunications, and oil-o-static lines. Most of the major water and sewer lines traverse the entire APE. The impact that these utility installations might have on archaeological resources depends on the width and depth of each trench required for installation.

Multiple electric lines, telephone, water, storm sewer, and one 32 x 48-inch sewer line are noted running beneath Catherine Slip.

The same large diameter water and sewer lines noted for Section 1 continue northward across Section 2, past Market Slip, Pike Slip and the Manhattan Bridge to Rutgers Slip. The 96 x 72-inch sewer line transitions to a 108-inch line near Market Slip. Multiple electric lines, a gas line under the sidewalk, and an unknown 54-inch sewer are noted running beneath Market Slip. Two 12-inch water lines, a gas line, telephone line, and multiple electric lines are noted beneath Pike Slip.

In addition to the main utility lines, there are numerous underground appurtenances such as sewer vaults, catch basins, electric vaults, valve boxes, manholes, fire hydrants, and service lines, all of which have created subsurface disturbance across Section 2.

5.2.2.3 Potential Archaeological Sensitivity

Review of Soil Boring Logs

Review of soil borings conducted in the BMCR APE Section 2 from Catharine Slip to Rutgers Slip provided a consistent picture (WPA 1965: Sheet 5 #169-#172, Sheet 10: #79-#116 in HPI 2007). Appendix A of the current report includes the soil boring logs and boring location maps gathered for the 2007 HPI Phase IA report. A substantial fill stratum was noted extending below the pavement to between 18.5 and 55.7 feet below mhw. Eighteen of the boring logs record timbers in and below the fill stratum and another seven note "wood" and their locations are scattered across this section of the APE (HPI 2007:49). This would be expected in this section of the APE where multiple episodes of bulkheading and pier construction using timber crib structures have been recorded since the early-19th century. Three logs note combinations of timber and boulders, and a fourth records timber and riprap. These strata extend to more than 50 feet below mhw directly onto sand, suggesting that the riverbottom was dredged of mud to prepare for crib sinking (HPI 2007:49). An exception to this observation is seen in one boring that recorded timber and boulders to 34.4 feet below mhw overlying 11 feet of river mud and silt, suggesting that crib sinking was not done in a uniform manner for each water lot or pier. In a few locations, there is evidence of multiple fill sources/events: two fill strata separated by a sand or silt layer indicating that fill operations halted and started again after a long enough time period during which silt could accumulate (HPI 2007:49).

The deepest recorded fill strata, to depths greater than 50 feet below mhw, rest directly on sand and the deepest recorded mud/silt strata range from about 40 feet to as much as 65.7 feet below mhw. This would suggest that the sand beneath the river mud could represent the pre-inundation ground surface now below the East River (HPI 2007:50).

Categories of potential archaeological resources in BMCR APE Section 2 include submerged precontact resources; 19th century riverbottom remains, 19th century landfill retaining structures, wharves and piers; and 19th century landfill.

Submerged Precontact Resources

Precontact resources would be expected in the sandy strata overlying the glacial till layer and underlying river deposits of mud and silt, as they would predate the inundation of the APE.

Despite the fact that specific early dredging episodes and depths are not documented in the historical record, the soil boring data indicate that much of the river mud and silt stratum in the Catharine Slip to Rutgers Slip section of the APE was removed in preparation of the riverbottom for the sinking of cribworks for piers and bulkheads during the first half of the 19th century. However, the boring data also indicate that much of it remains, extending to depths between 35.7 and 65.7 feet below mhw (HPI 2007:40).

A major historic disturbance that would have affected the integrity of precontact resources was the construction of the modern bulkhead. As Schaefer noted during his 2007 Phase IA research, the dredging depth associated with the modern bulkhead was between 35 and 40 feet below mhw (HPI 2007:40). This action would have impacted the pre-inundation surface across the area within 42.5 feet of the modern bulkhead, likely destroying the integrity of any precontact resources that may once have been present. Although the depth of dredging may have impacted some areas of the pre-inundation surface, the great depth of the top of this stratum (35.7 to 65.7 feet) indicates that some areas may have survived within this section of the APE (HPI 2007:50).

This section of the BMCR APE possesses low potential. If potential submerged precontact resources have survived the effects of inundation, tidal action, and river currents (which is unlikely), this section of the BMCR APE is potentially sensitive for deeply buried precontact resources (HPI 2007).

19th Century Riverbottom Remains

Riverbottom remains such as accidental or deliberate discards and losses from both shore facilities and ships would be expected within the river mud and silt strata that represent historic shoreline deposits which have accumulated since the construction of bulkheads, piers, and wharves. Although the soil boring data suggest that dredging has taken place prior to the construction of historic bulkheads and piers during the first half of the 19th century, the data also identify several locations in which river mud and silt has accumulated apparently dating to both before construction of the piers and after the piers were completed. These potentially sensitive strata are noted between 18.5 and 55.7 feet below mhw (HPI 2007:50).

Because preparation of the riverbottom for the construction of the modern bulkhead required dredging from 35 to 40 feet below mhw, and given that the recorded pier channel depths in 1857 in this section of the BMCR APE are all shallower than 30 feet below mhw, it is highly unlikely that 19th century riverbottom remains would be encountered (Harbor Commissioner 1857 in HPI 2007:51). Therefore, there is no

potential sensitivity for this category of remains within 42.5 feet of the modern bulkhead across this section of the APE.

The remainder of this section of the APE from Catharine Slip to Rutgers Slip possesses moderate sensitivity for 19th century riverbottom remains, which could be encountered at depths of 40 to 55.7 feet below mhw (HPI 2007:51).

19th Century Landfill Retaining Structures, Wharves and Piers

Bulkhead construction and landfilling work for the route of South Street (then Front Street in this part of the APE) Catharine Slip south to Market Slip south was first ordered in 1814. Further bulkheading and street construction continued South Street from Market Slip south to Pike Slip south between 1838 and 1842, and from Pike Slip south to Rutgers Slip south between 1834 and 1836 (HPI 2007:51).

Eleven piers were constructed across this section of the APE between circa 1814 and 1859, some earlier than the completion of South Street itself. The cribwork associated with these piers would have been preserved when South Street was further filled and widened around them (HPI 2007:51).

Review of the soil boring logs indicates that timbers and wood were encountered in 25 of the 42 borings completed in this section of the APE. Three soil logs note combinations of timbers and boulders, the components of log cribs and their fill. As discussed above for Section 1, it is not possible to distinguish between landfill retaining structures and piers or wharves in soil borings because many of the same techniques were employed for both, and piers were often incorporated into retaining structures as land making efforts continued. The timbers and wood were encountered in fill and mud strata, ranging between 3.2 feet above mhw (immediately underlying 1.5 feet of surface paving) and 56 feet below mhw (HPI 2007:51).

The area of BMCR APE Section 2 from Catharine Slip to Rutgers Slip beyond the limits of the late-19th century bulkhead would not be considered sensitive for this 19th century resource because landfilling did not occur here until the modern bulkhead was constructed. Preparation for construction of the modern bulkhead involved dredging and removal of river mud and old cribworks, as was standard practice (Docks 1914:172 in HPI 2007:51). The dredging would have eliminated potential sensitivity of this portion of the APE for this category of remains. As the width of 19th century South Street varied from 61 to 87 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between 38 and 64 feet inland from the bulkhead (HPI 2007:51).

Multiple subsurface utility installations would also have destroyed the upper sections of landfill retaining structures and piers in the remaining portions of BMCR APE Section 2 from Catharine Slip to Rutgers Slip, depending upon their diameters and the depths to which they were installed. However, buried utilities could not have completely eliminated potential sensitivity for this category of remains given their great depths, basically from the surface to as much as 56 feet below mhw. As a rule, utility maps do not provide the accuracy necessary to pinpoint their locations, and many of the utility companies/agencies do not rely solely on them to locate their own lines, as they routinely excavate test pits for this purpose (HPI 2007:52).

The remaining portions of Section 2 of the BMCR APE from Catharine Slip to Rutgers Slip are therefore considered to possess moderate sensitivity for buried 19th century landfill retaining structures, wharves, and piers dating from circa 1814 to the end of the 19th century (HPI 2007:52).

19th Century Landfill Deposits

As noted in the above discussion, landfill for construction of South Street (then known as Front Street in this section) from Catharine Slip south to Market Slip south was ordered in 1814. Further bulkheading and landfilling for street construction continued South Street from Market Slip south to Pike Slip south between 1838 and 1842, and from Pike Slip south to Rutgers Slip south between 1834 and 1836 (HPI 2007:52).

Eleven piers were constructed within this section of the APE between circa 1814 and 1859, some earlier than the completion of South Street, and therefore their cribworks would have been preserved when the street was further filled and widened around them (HPI 2007:52).

Soil borings note "miscellaneous fill" was encountered, often with timbers and wood in association, across this section of the APE. The timbers and wood are indicators of remains of landfill retaining structures and/or piers. The historic fill ranges in depth from 3.2 feet above mhw (immediately underlying 1.5 feet of surface paving) to 60.6 feet below mhw. Except for three of 42 soil borings which note combinations of timbers and boulders, the components of log cribs and their primary landfill, it was not possible to distinguish between primary and secondary fill deposits based on the general descriptions provided in the boring logs (HPI 2007:52).

The area of this section of the APE from Catharine Slip to Rutgers Slip beyond the limits of the late-19th century bulkhead are not considered sensitive for this 19th century resource because landfilling here did not occur until the modern bulkhead was constructed. As 19th century South Street varied in width from 61 to 87 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between 38 and 64 feet inland from the modern bulkhead (HPI 2007:52).

Installation of underground utilities would have impacted some of the shallower landfill deposits in the remaining portions of APE Section 2 from Catharine Slip to Rutgers Slip, depending on the size of the main and the depth of installation. However, buried utilities would not have completely eliminated the potential sensitivity of this category of remains given their depths from the surface to as much as 60 feet below mhw (HPI 2007:52).

Therefore, the remaining areas of this section of the APE are considered to possess moderate sensitivity for 19th century landfill deposits and following more in-depth review of the subsurface utility locations as the current project design plans progress, these areas may be more precisely defined or eliminated from consideration.

5.2.3 Section 3: Rutgers Slip North (East) to Montgomery Street

This section from project south to north includes the north side of Rutgers Slip, Jefferson Street, Clinton Street (formerly Warren Street), and the south side of Montgomery Street.

The origins of the names for the former and current streets within the project area are explained in The Henry Moscow publication, *The Street Book, An Encyclopedia of Manhattan's Street Names and Their Origins*, published in 1978. Jefferson Street was named for Thomas Jefferson, President of the US 1801-1809. Before being named for Jefferson, the street was known as Washington Street. Part of the former corridor is the present-day location of the La Guardia Houses and adjacent to the project area, its route has

been demapped as a result of later urban renewal efforts. Clinton Street was named for George Clinton, Revolutionary War general and first governor of New York under the post-Independence state constitution. George Clinton was the Governor of NY 1777-1795; 1801-1804, and the Vice President of the United States 1804-1812, and the uncle of Dewitt Clinton. Clinton Street was named in 1792 and was previously known as Warren Street. The namesake for Montgomery Street was Brigadier General Richard Montgomery, who led New York State troops on a raid of Quebec in 1775, where he was killed. Montgomery Street was first laid out in 1765 as Little Division Street, as it was the dividing line between the Rutgers' and DeLancey farms. Brigadier General Montgomery is buried in St. Paul's Chapel on Broadway.

5.2.3.1 Historic Development

The historic shoreline of the East River in this section of the current APE ran along the inland side of Water Street from Rutgers Slip to Clinton Street and from Clinton Street to Montgomery Street it ran slightly inland from the inland side of South Street (Figure 5). During the late-18th century there were a number of shipyards along the shoreline northward to Corlears Hook. The presence of these shipyards seems to have been an impediment to filling in and bulkheading of Water Street and South Street through this section (Figure 6). In 1826, remonstrance was presented to the Common Council against the proposed opening of Water Street from Clinton Street to Corlears Hook because it would "be the cause of breaking up the Ship Yards, which afford employment and profit to so many of the Citizens in that portion of the City." (MCC 1917: XV 216 in HPI 2007:53). Nevertheless, by April 1828, the Common Council was considering a petition to open Front (now South) Street from Clinton Street to Corlears Hook (MCC 1917: XVII 101 in HPI 2007:53), and the section of Front (South) Street from Clinton Street to Montgomery Street appears on the 1828 Goodrich map (Figure 8c).

It is likely that the Rutgers Slip to Clinton Street section of South Street was filled in and bulkheaded at a later date than the adjacent sections due to its topography as well as the fact that it was adjacent to the Rutgers Estate, which basically blocked north/south public traffic near the shoreline (HPI 2007:53). In 1817 Col. Henry Rutgers requested the water lot grant from Rutgers to Clinton Streets and was given the grant to the inland side of future South Street, which was to be 70-feet-wide when built. The Common Council reserved the shoreline there for use as a public basin (MCC 1917: IX 70, 231, 234 in HPI 2007:53). South Street was not opened from Rutgers Slip to Clinton Street until 1831, and the last section of South Street to be filled in and bulkheaded was Rutgers Slip itself, which was completed between 1838 and 1843 (HPI 2007:53).

The 1849 Alvord survey notes that South Street was between 68 and 76-feet-wide to the south side of Clinton Street, but at the Clinton/South Street intersection it had been widened to between 107 and 108 feet as far as the north side of Montgomery Street (Alvord 1849 in HPI 2007). An earlier survey performed for the Common Council showed South Street to already be 70-feet-wide with additional filled area outboard of the street housing three short piers separated by two short slips. These locations were incorporated into the widened South Street by 1838 and are within the current APE (HPI 2007:53).

Early Piers and Wharves

The pier on the north side of Rutgers Slip was noted as needing repair as early as 1809 and this pier must have been built on the outboard side of Cherry Street and did not extend into the current APE (MCC 1917: V 683 in HPI 2007:53). Another pier was ordered built in 1816 and is depicted on the 1828 Goodrich map as extending from the outboard side of Water Street and was also not long enough to extend into the current

APE (Figure 8c) (MCC 1917: VIII 625 in HPI 2007:53). With the completion of South Street along Rutgers Slip in 1831, a pier was extended from the outboard side of the 70-foot-wide street on the north side of the slip and eventually labeled Pier #44 (HPI 2007). The 1849 Alvord survey notes this pier was 250-feet-long. The base of Pier #44 is in the current APE, and based on its construction date, the crib/cobb method would have been employed (HPI 2007:53).

Pier #45 was located midway between Rutgers Street and Jefferson Street. It was a short pier built from the outboard side of South Street between 1834 and 1836 with its base in the current APE (HPI 2007:53). Based on the time period of its construction, the crib/cobb method was likely employed (HPI 2007). By 1849, Pier #45 had been lengthened to 316 feet (Alvord 1849 in HPI 2007:53). The 1860 Buckhout map depicts this lengthened pier extending past the Pier Line (Figure 9c).

Pier #46 was located at the foot of Jefferson Street, built from the outboard side of South Street between 1834 and 1836 with its base in the current APE (HPI 2007:54). Based on the time period of construction, the crib/cobb method was likely used. By 1849 Pier #46 had been lengthened to 340 feet (Alvord 1849 in HPI 2007:54). The adjacent slip to the north hosted a balance dry dock by 1852 and appears on maps until the 1860s, including the 1860 Buckhout map (Figure 9c) (HPI 2007:54).

Pier #47, located midway between Jefferson and Clinton Streets, was built between 1849 and 1852. The 1849 Alvord survey shows this pier as proposed construction, extending 356 feet from the outboard side of South Street with its base in the current APE. The pier is depicted on the 1852 Dripps map (HPI 2007:54) and on the 1860 Buckhout map (Figure 9c).

Pier #48 was built at the foot of Clinton Street between 1828 and 1836 (HPI 2007:54). The 1849 Alvord survey depicts the pier extending 282 feet into the East River from the Clinton/South Street intersection. At the intersection, South Street is 76-feet-wide on the west side and 108-feet-wide on the east side (Alvord 1849 in HPI 2007). By 1857, as shown on the Harbor Commissioners map, Pier #48 was lengthened an additional 72 feet (HPI 2007:54).

Pier #49 was built approximately 120 feet north of Clinton Street between 1843 and 1849, when it is recorded as 326-feet-long extending from the outboard side of South Street, at a point where the street was 108-feet-wide (Alvord 1849 in HPI 2007). A balance dry dock had been constructed in the adjacent pier slip to the south of Pier #49 by 1852, and the dry dock appears on historic maps through the 1860s (Figure 9c) (HPI 2007:54). The 1891 Bromley atlas labels Pier #49 "New York, Maine & New Brunswick Steamship Co." (Figure 11c).

Pier #50 was located along the south side of Montgomery Street on the 1828 Goodrich map (Figure 8c). It appears to be a short pier extending from the outboard side of Front (South) Street and would be in the current APE. The 1860 Buckhout map shows a pier extending from the foot of Montgomery Street over 300 feet into the East River, with an adjacent slip on the south. The width of the slip, which extends to the south line of Montgomery Street, suggests that the pier depicted on the 1828 map has been removed, and a new Pier #50 was constructed immediately to the north (Figure 9c). The removal of the earlier pier and the widening of the slip would have involved dredging activity at the location, removing any early crib/cobb structures that would interfere with mooring in the slip.

The water frontage between piers 49 and 50 is labeled as New York, New Haven & Hartford RR and a Freight Depot structure is depicted between piers 49 and 50 on water side of South Street as shown on the 1891 Bromley atlas (Figure 11c).

East River Bulkhead

The next major development in this section of the BMCR APE was the construction of the modern bulkhead system, first initiated in 1871 by the New York City Department of Docks. The modern bulkhead would eventually come to define the current outboard boundary of this section of the BMCR APE. As noted for APE Sections 1 and 2 in the above discussions, the modern bulkhead project also involved placement of substantial landfill along the river, or outboard side of South Street and a Marginal Street was added to provide pedestrian and vehicular access to the piers and bulkhead. Initially, the proposed combined width of South/Marginal Street was 200 feet, but this was modified to 150 feet to provide an additional 50 feet for piers in the somewhat narrow East River (HPI 2007:54).

Despite the conception date of 1871 for the modern bulkhead system, few changes in this section of the APE were made during the 1870s and 1880s, as the early modern bulkhead work was conducted further downtown The 1879 Bromley atlas notes the width of South Street as 80 feet at Rutgers Slip south, 70 feet from Rutgers Slip north to Clinton Street, and more than 100 feet from the north side of Clinton Street northward (Figure 10c). These dimensions were not appreciably different than those noted in the 1849 Alvord survey (Alvord 1849; HPI 2007:55).

Few structures were built in this section of the APE between piers on the outer side of the old bulkhead during the late-19th century. One reason for the small number of structures was that Piers #44, #46, and #48 were public piers in 1879 (Figure 10c). By 1893 this had changed, as the New England Freight Line was occupying Piers #45 and #46 and had erected a covered platform on piles between the base of each pier in the APE outboard of the old crib bulkhead. These piers were later occupied by the New York, New Haven & Hartford Railroad Company (Robinson 1893).

The other structure in this section of the APE was the freight depot of the New York, New Haven & Hartford Railroad Company, erected during the 1880s in the basin along the south side of Montgomery Street, north of Pier #49. This structure extended 180 feet along the outboard side of the old crib bulkhead, and about 90 feet along the south side of Montgomery Street (HPI 2007:55) (Figure 11c).

Department of Docks reports record the completion of the modern bulkhead wall at Rutgers Slip in 1899, along with the removal of old Pier #44 and the construction of new Pier #34 (Docks 1899:82 in HPI 2007:55). Preparation for new Pier #34 included the removal of the old works and dredging to 30 feet below mhw (Docks 1899:212 in HPI 2007:55).

By 1906, the modern bulkhead wall and new piers had been completed from Rutgers Slip to Montgomery Street, except for the section between the north side of Rutgers Slip to Jefferson Street. The reason for this exception was that old Piers #45 and #46 were to be replaced by construction of new Pier #35, but as late as 1914, the plans for new Pier #35 had only been drawn up and no work had yet been initiated (Docks 1906:181; 1914:174 in HPI 2007:55). New Pier #35 and the remaining section of modern bulkhead were not completed until after 1924 (USC&GS 1924 in HPI 2007:55).

5.2.3.2 Disturbance

Bulkhead Construction

The riverbottom conditions across BMCR APE Section 3 were comparable to those discussed under bulkhead construction in Sections 1 and 2. Due to the great depth of riverbottom mud (up to 170 feet), the modern bulkhead was built on piles and supported by placement of cobbles and riprap as a base for the modern concrete and masonry bulkhead. The riverbottom was dredged for a width of 85 feet parallel to the shoreline, with the dredging extending an equal distance on each side of the proposed bulkhead location to a depth of 35 to 40 feet below mhw. Therefore, as was documented for BMCR APE Sections 1 and 2, the impact of the modern bulkhead construction for BMCR APE Section 3 during the period of 1899 to 1906 and post-1924 would have had a horizontal inland extent of 42.5 feet under present-day South/Marginal Street to a vertical depth of 35 to 40 feet below mhw.

Dredging

As discussed above under dredging of BMCR APE Sections 1 and 2, dredging was and is a normal component of harbor and slip maintenance and would have been conducted within Section 3 of the BMCR APE during the early-19th century. According to the research conducted by Schaefer for the 2007 Phase IA report (as well as research conducted by this author for prior projects along the East River), accurate records of dredging or even maps of pier slip depths prior to 1857 are not available to document routine dredging impacts to now-filled sections of the APE (HPI 2007:38).

No instances of pier removal and accompanying dredging within Section 3 of the BMCR APE can be documented until the very late-19th century and early-20th century when the dredging occurred at the same time as modern bulkhead construction (HPI 2007). The recorded depths of dredging in 1899 along the old crib bulkhead at Rutgers Slip north was 30 feet below mhw (Docks 1899 in HPI 2007:56).

Buried Utility Lines

Multiple underground historic and recent utility lines are present across BMCR APE Section 3 (Figure 4c). These include water, sewer, storm water, gas, electric, telephone, telecommunications, and oil-o-static lines. Most of the major water and sewer lines traverse the entire APE. The impact that these utility installations might have on archaeological resources depends on the width and depth of each trench required for installation.

In Rutgers Slip (Frank T. Modica Way), multiple electric lines and one 12-inch water line are noted. North of Rutgers Slip, there is NYC Water Sampling Station between two support columns of the South Street Viaduct. Near the line of Jefferson Street, there is a 141 x 65-inch (storm sewer?) main running perpendicular to South Street across the APE, leading to a sewer chamber, then to a sewer vault, and into a 48-inch circular overflow line ending at the river.

The same large diameter water and sewer lines noted for Sections 1 and 2 continue northward across Section 3, past the line of Jefferson Street and Clinton Street to Montgomery Street. Multiple electric lines and a 48-inch brick sewer are noted running beneath Jefferson Street. Multiple gas, electric, water, and telephone

lines, and a 30-inch to 36-inch circular sewer dating to 1877 are noted running beneath Clinton Street. There is a gas line running perpendicular to South Street across the APE at Clinton Street.

Multiple electric, water, and telephone lines are noted running beneath Montgomery Street just past the northern end of the project area. There is a CATV line in South Street at Montgomery Street running northward.

In addition to the main utility lines, there are numerous underground appurtenances such as sewer vaults, catch basins, electric vaults, valve boxes, manholes, fire hydrants, and service lines, all of which have created subsurface disturbance across Section 3.

5.2.3.3 Potential Archaeological Resources

Review of Soil Boring Logs

Review of soil borings conducted within BMCR APE Section 3 from Rutgers Slip to Montgomery Street in 1950 indicate a contrast between the northern and southern portions of this section. The dividing line is generally located midway between Jefferson and Clinton Streets and more specifically about 160 feet south of present-day Clinton Street (WPA 1965 Sheet 10: #117, #118, Sheet 11: #65-#96 in HPI 2007). Appendix A of this report includes the soil boring logs and boring location maps gathered for the 2007 HPI Phase IA report.

The boring logs from the southern section from Rutgers Slip to north of Jefferson Street record substantial fill strata extending from below the pavement to between 22.0 and 61.5 feet below mhw, with eight of the sixteen borings recording timbers or wood. Only three borings record a mud/silt layer underlying the fill layer, representing the shallowest fill depths of 22.0 feet and 33.6 feet below mhw, and one boring records river silt mixed with fill. In the remaining logs, the fill strata directly overlie sand or sand and gravel strata, which extend down to rock. The rock stratum is deep, generally encountered over 100 feet below mhw, and is encountered at shallower depths to the north of Jefferson Street, where it is found at 47.3 feet below mhw. The lack of river mud/silt in these borings suggest that much of that stratum was removed (probably through dredging) to prepare the riverbottom for the construction of the piers and bulkheads constructed during the 19th century (HPI 2007:57).

In the northern portion of this section and continuing northward to the south side of Montgomery Street was an area that was much closer to the natural shoreline, with shallow rock depths of 32.3 feet to 45.1 feet below mhw, only extending to 50 feet below mhw at Montgomery Street, and exhibiting higher surface elevations. In the southern section discussed above, surface elevations were rarely greater than 5.0 feet above mhw, but in this northern section, surface elevations rise moving northward, from 5.3 feet above mhw south of Clinton Street to 9.3 feet above mhw near Montgomery Street. This would explain the discovery of a portion of the old 1836 cobble stone street pavement approximately four feet below the existing pavement in 1952 during the preparation for construction of the FDR viaduct. The streetbed elevation had been raised since the 1830s through placement of fill and regrading activity (HPI 2007:57).

In each of the 18 soil borings in the northern portion of this section of the APE, the fill strata directly overlie the sand stratum without any intermediate river mud or silt stratum. In two of the borings, the fill strata directly overlie rock and timbers were noted in the fill. This would suggest that during the bulkheading/pier

construction episodes in this section, the general shallowness of the strata enabled the removal of large portions of the river mud/silt and sand strata in preparation for the sinking of cribworks (HPI 2007:57).

Categories of potential archaeological resources in BMCR APE Section 3 include submerged precontact resources; 19th century riverbottom remains, 19th century landfill retaining structures, wharves and piers; and 19th century landfill.

Submerged Precontact Resources

Precontact resources would be expected overlying the glacial till layer and underlying river deposits of mud and silt, as they would predate the inundation of the APE.

Despite the fact that specific early dredging episodes and depths are not documented in the historical record, the soil boring data indicate that much of the river mud and silt stratum in the Rutgers Slip to Montgomery Street section of the APE was removed in preparation of the riverbottom for the sinking of cribworks for piers and bulkheads during the first half of the 19th century (HPI 2007:40). The boring data indicate that the fill strata and timbers directly overlie a sand stratum, which is the stratum in which precontact resources would be expected. The dredging of the river mud and silt stratum across this section of the APE in all likelihood would have destroyed the integrity of any precontact resources that may once have been present.

Another major historic disturbance that would have affected the integrity of precontact resources was the construction of the modern bulkhead. As Schaefer noted during his 2007 Phase IA research, the dredging depth associated with the modern bulkhead was between 35 and 40 feet below mhw (HPI 2007:40). In areas of shallow rock, such as the section of the APE north of Jefferson Street, the new bulkhead could be built directly on rock, following the removal of all the intermediate strata. This action would have impacted the pre-inundation surface across the area within the APE within 42.5 feet of the modern bulkhead, destroying the integrity of any precontact resources that may once have been present (HPI 2007:58).

19th Century Riverbottom Remains

Riverbottom remains such as accidental or deliberate discards and losses from both shore facilities and ships would be expected within the river mud and silt strata that represent historic shoreline deposits, some of which have accumulated since the construction of bulkheads, piers, and wharves. Review of 34 soil boring logs conducted in this section of the APE indicate only two instances of river mud/silt underlying a fill stratum. Review of the filling history of South Street across this section may explain the absence of the river mud/silt stratum. Unlike Sections 1 and 2 of the BMCR APE, no piers were constructed on the location of the street prior to its original bulkheading during the first half of the 19th century (such as piers extending from Water Street, one block inland). Therefore, the bulkheading activity was located across an area that was free of earlier structures which would have either trapped mud and silt or caused fill to be placed around the structures. An area free of earlier structures would also have facilitated the removal of river silt/mud prior to the sinking of cribwork for the bulkhead (HPI 2007:58).

The piers that occupied the South Street shoreline from Rutgers Slip to Montgomery Street during the 19th century may have caused the accumulation of riverbottom remains in the areas now landward of the modern bulkhead. However, as discussed above, the construction of the modern bulkhead involved dredging from 35 to 40 feet below mhw and given that the recorded pier channel depths in 1857 for this section of the APE are all shallower than 28 feet below mhw, it is unlikely that 19th century riverbottom remains would

have extended beyond these depths. Therefore, this potentially sensitive stratum was removed prior to construction of the modern bulkhead eliminating the potential sensitivity for this category of remains across this section of the APE.

19th Century Landfill Retaining Structures, Wharves and Piers

The earliest portion of this section of the APE to be bulkheaded and filled was the landward 70 feet of South Street from Clinton to Montgomery Streets, completed by 1828. Further bulkheading and street construction continued south to Rutgers Slip north by 1831. South Street between Clinton and Montgomery was widened to 107/108 feet between 1831 and 1838, and Rutgers Slip was filled in between 1838 and 1843 (HPI 2007:59).

Six piers were constructed between circa 1828 and 1849, extending from the outboard side of the old crib bulkhead. Parts of these pier locations were incorporated into the APE when the modern bulkhead was completed (HPI 2007:59).

Review of the 34 soil boring logs for this section of the BMCR APE indicated timbers and wood in the fill strata of 13 soil borings. As discussed above for Sections 1 and 2, it is not possible to distinguish between landfill retaining structures and piers or wharves in soil borings because many of the same techniques were employed for both, and piers were often incorporated into retaining structures as land making efforts continued. The timbers and wood were encountered in fill and mud strata, ranging between 6.4 feet above mhw (immediately underlying 1.5 feet of surface paving) and 61.5 feet below mhw (HPI 2007:59).

The portion of the Rutgers Slip to Montgomery Street section of the APE beyond the limits of the late-19th century bulkhead would not be considered potentially sensitive because landfill did not occur here until the modern bulkhead was constructed. Preparation for the construction of the modern bulkhead involved dredging and removal of river mud and old cribworks prior to construction, as was standard practice (Docks 1914:172 in HPI 2007:59). This activity would have eliminated potential sensitivity for this category of potential remains in this area of the APE. As 19th century South Street in this portion of the APE varied in width between 68 and 108 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between 17 and 57 feet inland from the bulkhead (HPI 2007:59).

The installation of multiple underground utilities would have destroyed some of the upper sections of landfill retaining structures and piers in the remaining portions of the Section 3 APE from Rutgers Slip to Montgomery Street, depending upon the diameter of the main and the depth to which it was installed. Buried utilities would not have completely eliminated potential sensitivity for this category of remains, given their great depth (from the surface to as much as 61.5 feet below mhw) (HPI 2007:59).

As discussed above, utility maps do not provide the accuracy necessary to pinpoint these areas and even the utility companies do not rely on them to locate their own mains. Therefore, the remaining portions of this section of the BMCR APE are considered to possess moderate sensitivity for buried landfill retaining structures, wharves and piers dating from circa 1828 through the end of the 19th century.

19th Century Landfill

The earliest portion of this section of the APE to be bulkheaded and filled was the inland 70 feet of South Street from Clinton to Montgomery Streets, completed by 1828. Continued bulkheading and street

construction to the south completed South Street to Rutgers Slip north by 1831. South Street from Clinton Street to Montgomery Street was widened to 107/108 feet between 1831 and 1838, and Rutgers Slip was filled in between 1838 and 1843 (HPI 2007:59).

Six piers were constructed in this section of the APE between circa 1828 and 1849, extending from the river side of the old crib bulkhead. When the modern bulkhead was constructed, parts of these early pier locations were incorporated into the APE (HPI 2007:60).

Soil borings note "miscellaneous fill" often with timbers and wood, which indicate remains of landfill retaining structures and/or piers throughout this section of the APE. The historic fill was encountered from 6.4 feet above mhw (immediately underlying 1.5 feet of surface paving) to 61.5 feet below mhw. As mentioned in the above discussions of this resource category, it is not possible to distinguish between primary and secondary fill deposits based on the general descriptions given in the boring logs. Secondary fill was earlier defined as extending from the surface to a few feet below mean low water, which in this section of the APE is approximately 4.85 feet below mhw. The remaining strata of fill underlying the secondary fill is considered primary landfill (HPI 2007:60).

The Rutgers Slip to Montgomery section of the APE beyond the limits of the late-19th century bulkhead would not be considered sensitive for this 19th century resource because landfill did not occur here until the modern bulkhead was constructed. Construction of the modern bulkhead involved dredging and removal of river mud and old cribworks prior to construction, as was standard practice (Docks 1914:172 in HPI 2007:60). This would have eliminated potential sensitivity for this category of potential remains in this section of the APE. As 19th century South Street in this section of the APE varied in width from 68 to 108 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between approximately 17 and 57 feet inland from the modern bulkhead (HPI 2007:60).

Installation of underground utilities would have impacted some of the shallower landfill deposits in the remaining portions of this APE Section 3 from Rutgers Slip to Montgomery Street, depending on the size of the main and the depth of installation. However, buried utilities would not have completely eliminated the potential sensitivity of this category of remains given their depths from the surface to as much as 61.5 feet below mhw (HPI 2007:60).

Therefore, the remaining areas of this section of the APE are considered to possess moderate sensitivity for 19th century landfill deposits and following more in-depth review of the subsurface utility locations as the current project design plans progress, these areas may be more precisely defined or eliminated from consideration.

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6 CONCLUSIONS

6.1 Introduction

As discussed in Chapter 4, the BMCR Project Area includes modern landfill, historic landfill retaining structures, piers, wharves, and historic and modern landfill deposits. Recurring historic development, the installation of the modern bulkhead, 20th century urban renewal efforts, multiple utility installations, and transportation infrastructure improvements such as the construction of the South Street Viaduct of the FDR Drive have impacted the project area. However, the tenacity of archaeological resources has been demonstrated in recent years with the documentation of significant intact historic archaeological resources beneath paved streets, sidewalks, and 19th century buildings within a quarter mile radius of the project area, as discussed in Chapter 5. The research completed for this Phase IA documentary study suggests that there is moderate potential for submerged Precontact resources, riverbottom remains, historic landfill retaining structures, piers, wharves and slips, and historic landfill deposits in portions of the APE.

6.2 Potential Resources in APE

6.2.1 Section 1 – Roosevelt Street to Catherine Slip South

6.2.1.1 Submerged Precontact Resources

If submerged Precontact resources had survived inundation, tidal action, and river currents, which is unlikely, they would have been removed or severely impacted by subsequent historic dredging and reconstruction of bulkheads, piers and wharves. Historic Pier #29 through #34 were located within Section 1. Pier removal and the accompanying dredging across Section 1 of the BMCR APE during the early-20th century was documented in the Department of Docks reports in tandem with the construction of the modern bulkhead. The only exception that can be noted was that of the early-19th century Minturn & Champlin Wharf (discussed in Chapter 5 above), formerly located at the foot of Roosevelt Street, which was previously removed during the 1830s and its location was undoubtedly dredged for use as a slip (HPI 2007). There is no potential for encountering this category of resources in Section 1.

6.2.1.2 Riverbottom Remains

The soil boring data suggest that dredging has taken place prior to the construction of historic bulkheads and piers during the first half of the 19th century; however, the data also identify several locations in which river mud and silt accumulated after the bulkhead and piers were built. These potentially sensitive strata are noted between 23 and 39.5 feet below mhw (HPI 2007:41).

As discussed above, the area within 42.5 feet of the modern bulkhead is not sensitive for archaeological resources. However, the remainder of the BMCR APE Section 1 from Roosevelt Street to Catharine Slip has moderate sensitivity for riverbottom remains. These remains may be present in the river mud and silt stratum at depths below 23 feet below mhw (HPI 2007:41).

6.2.1.3 19th Century Landfill Retaining Structures, Wharves and Piers

As noted above, six piers were constructed within this section of the APE between ca. 1810 and 1824, some of which were built earlier than the completion of South Street. The cribworks of these piers would have been preserved when South Street was further filled and widened around them during the 19th century (HPI 2007:41). The soil boring logs encountered timbers in ten of 18 borings conducted in this section of the APE. The timbers were noted in fill and mud strata ranging between 4.4 feet above mhw (immediately underlying 1.5 feet of surface paving) and 40.1 feet below mhw (HPI 2007:41).

Pier removal and the accompanying dredging across Section 1 of the BMCR APE during the early-20th century was documented in the Department of Docks reports in tandem with the construction of the modern bulkhead. The earlier cribwork would have been removed within 42.5 feet of the bulkhead, as was standard practice.

Utility installations across Section 1 would have impacted but not eliminated this category of resources. Therefore, the remaining areas of the APE in Section 1 are considered moderately sensitive for landfill retaining structures, piers, and wharves dating from ca. 1810 to the end of the 19th century. These resources may be encountered basically from the surface to as much as 40 feet below mhw.

6.2.1.4 19th Century Landfill Deposits

Six piers were constructed within the APE between circa 1810 and 1824, and some were built before South Street was completed. The cribworks associated with these early piers would have been filled and sunk at the time of their construction, and then surrounded with later fill as they were incorporated into the street widening beyond 70 feet by 1900 (HPI 2007).

Soil borings note "miscellaneous fill" in association with timbers or wood throughout this section of the APE. The timbers and wood indicate evidence of landfill retaining structures and/or piers. The historic fill noted ranges in depth from 4.4 feet above mhw (immediately underlying 1.5 feet of pavement fill) to 40.1 feet below mhw.

Preparation for the construction of the modern bulkhead would have eliminated this category of remains within 42.5 feet of the bulkhead as dredging would have removed the fill strata and cribworks, as was standard practice. Utility installations may have impacted upper fill strata (likely the secondary landfill deposits) but not eliminated the potential for this category of remains, given their depth from the surface to as much as 40 feet below mhw. The remainder of the APE in Section 1 is considered moderately sensitive for 19th century landfill deposits dating from ca. 1810 to the end of the 19th century.

6.2.2 Section 2 – Catherine Slip South to Rutgers Slip South

6.2.2.1 Submerged Precontact Resources

In terms of the survival of submerged Precontact resources, river mud strata were noted in the boring logs from 37.5 to 65.7 feet below mhw. Historic Pier #35 through #43 were constructed by the early 19th century across Section 2. However, most of these early piers were reconstructed during the 1830s and 1840s. Preparation for the new piers would have involved dredging and removal of old crib works, as was standard

practice. Preparation for the construction of the modern bulkhead involved dredging an 85-feet-wide section of riverbottom, 35 to 40 feet below mhw. This action may have impacted this category of remains within 42.5 feet of the bulkhead, but the great depths to which the river mud strata were encountered in some of the borings suggests that some areas may have survived intact. If these resources survived inundation, tidal action, and river currents (which is unlikely, but possible), this section of the APE possesses low sensitivity for deeply buried Precontact resources.

6.2.2.2 Riverbottom Remains

The soil boring data suggest that dredging has taken place prior to the construction of historic bulkheads and piers during the first half of the 19th century; however, the data also identify several locations in which river mud and silt has accumulated apparently dating to both before construction of the piers and after the piers were completed. These potentially sensitive strata are noted between 18.5 and 55.7 feet below mhw (HPI 2007:50).

As discussed above preparation of the riverbottom for the construction of the modern bulkhead required dredging from 35 to 40 feet below mhw. Given that the recorded pier channel depths in 1857 in this section of the BMCR APE are all shallower than 30 feet below mhw, it is highly unlikely that 19th century riverbottom remains would be encountered (Harbor Commissioner 1857 in HPI 2007:51). Therefore, there is no potential sensitivity for this category of remains within 42.5 feet of the modern bulkhead across this section of the APE.

The remainder of this section of the APE from Catharine Slip to Rutgers Slip possesses moderate sensitivity for 19th century riverbottom remains, which could be encountered at depths of 40 to 55.7 feet below mhw (HPI 2007:51).

6.2.2.3 19th Century Landfill Retaining Structures, Wharves and Piers

Some the earliest piers constructed in Section 2 did not extend into South Street, or the current APE. However, piers were extended, rebuilt, removed and replaced throughout the 19th century. In 1849, there were eleven piers extending from the outboard side of South Street which were numbered 35 through 43 (Alvord 1849 in HPI 2007). South Street measured 61- to 87-feet-wide to the 19th century bulkhead.

The 1914 Department of Docks report notes that the modern bulkhead wall had been completed in this section of the current APE, creating a South/Marginal Street with a combined width of 125 feet. The additional landfill needed to widen South/Marginal Street to 125 feet was placed beyond the 19th century bulkhead in association with the modern bulkhead construction. This portion of Section 2 is not considered sensitive for landfill retaining structures, piers, and wharves because preparation for the bulkhead construction would have removed the river mud and earlier cribwork as was standard practice. Therefore, the non-sensitive area varies in width from 38 to 64 feet inland from the modern bulkhead. In addition, as was documented for BMCR APE Section 1, the impact of the 1899 to 1906 and 1914 dredging for modern bulkhead construction across BMCR APE Section 2 would have had a horizontal inland extent of 42.5 feet under present-day South/Marginal Street to a vertical depth of 35 to 40 feet below mhw.

Multiple subsurface utility installations would also have impacted, but not eliminated the potential sensitivity for this category of remains given the depths noted for timbers in the soil borings. The remaining

portion of the BMCR APE is therefore considered moderately sensitive for landfill retaining structures, piers, and wharves dating from ca. 1814 through the end of the 19th century.

6.2.2.4 19th Century Landfill Deposits

Eleven piers were constructed within this section of the APE between circa 1814 and 1859, some earlier than the completion of South Street, and therefore their cribworks would have been preserved when the street was further landfilled and widened around them (HPI 2007:52).

Soil borings note "miscellaneous fill" was encountered, often with timbers and wood in association, across this section of the APE. The timbers and wood are indicators of remains of landfill retaining structures and/or piers. The historic fill ranges in depth from 3.2 feet above mhw (immediately underlying 1.5 feet of surface paving) to 60.6 feet below mhw.

The area of this section of the APE from Catharine Slip to Rutgers Slip beyond the limits of the late-19th century bulkhead are not considered sensitive for this 19th century resource because landfilling here did not occur until the modern bulkhead was constructed. As 19th century South Street varied in width from 61 to 87 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between 38 and 64 feet inland from the modern bulkhead (HPI 2007:52). In addition, as noted above, the impact of the 1899 to 1906 and 1914 dredging for modern bulkhead construction across BMCR APE Section 2 would have had a horizontal inland extent of 42.5 feet under present-day South/Marginal Street to a vertical depth of 35 to 40 feet below mhw.

Installation of underground utilities would have impacted some of the shallower landfill deposits in the remaining sections of this APE Section 2 from Catharine Slip to Rutgers Slip, depending on the size of the main and the depth of installation. However, buried utilities would not have completely eliminated the potential sensitivity of this category of remains given their depths from the surface to as much as 60 feet below mhw (HPI 2007:52) Therefore, the remaining areas of this section of the APE are considered moderately sensitive for 19th century landfill deposits.

6.2.3 Section 3 – Rutgers Slip South to Montgomery Street

6.2.3.1 Submerged Precontact Resources

In terms of submerged Precontact resources, the soil boring logs suggest that much of the river mud stratum was removed in preparation for pier and wharf cribworks during the first half of the 19th century, as fill strata and/or timbers directly overlie a sand stratum. Pier #44 through #50 were constructed during the 1830s (Pier #44, #45, #46, and #48) and 1840s (Pier # 47, # 49, and #50) across Section 3. Most of these piers were reconstructed or lengthened by 1849, and it is possible that if submerged Precontact resources had survived inundation, tidal action, and river currents, which is unlikely, they would have been removed or severely impacted by historic dredging and pier reconstruction during the mid-19th century. More recent dredging would have severely impacted the stratum in which this category of remains would be encountered. The dredging prior to modern bulkhead construction would have removed 35 to 40 feet of strata, or less if shallow rock was encountered, eliminating the sensitivity of this category of remains within 42.5 feet of the bulkhead. There is no potential for encountering this category of remains in Section 3.

6.2.3.2 Riverbottom Remains

Only two soil borings of 34 conducted in this section encountered river mud/silt beneath fill strata. In contrast to Sections 1 and 2, no piers were constructed from South Street prior to the original bulkheading during the first half of the 19th century. The piers that occupied the South Street shoreline from Rutgers Slip to Montgomery Street during the 19th century may have caused the accumulation of riverbottom remains in the areas now landward of the modern bulkhead. However, as preparation for the modern bulkhead construction involved dredging of 35 to 40 feet below mhw, and the 1857 recorded pier channel or slip depths were all shallower than 28 feet below mhw, it is very unlikely that riverbottom remains would have extended beyond these depths. Therefore, this potentially sensitive stratum was removed prior to construction of the modern bulkhead eliminating the potential sensitivity for this category of remains across this section of the APE.

6.2.3.3 19th Century Landfill Retaining Structures, Wharves and Piers

The boring logs from the southern section of Section 3 from Rutgers Slip to north of Jefferson Street record substantial fill strata extending from below the pavement to between 22.0 and 61.5 feet below mhw, with eight of the sixteen borings recording timbers or wood. In the northern section of this section and continuing northward to the south side of Montgomery Street was an area that was much closer to the natural shoreline, with shallow rock depths of 32.3 feet to 45.1 feet below mhw.

The earliest portion of this section of the APE to be bulkheaded and filled was the landward 70 feet of South Street from Clinton to Montgomery Streets, completed by 1828. Further bulkheading and street construction continued south to Rutgers Slip north by 1831. Six piers were constructed between ca. 1828 and 1849, extending from the outboard side of the old crib bulkhead. Parts of these pier locations were incorporated into the APE when the modern bulkhead was completed (HPI 2007:59).

The portion of APE Section 3 beyond the limits of the late-19th century bulkhead would not be considered potentially sensitive because landfill did not occur here until the modern bulkhead was constructed during the period of 1899 to 1906 and post-1924. Preparation for the construction of the modern bulkhead involved dredging and removal of river mud and old cribworks prior to construction, as was standard practice (Docks 1914:172 in HPI 2007:59). This activity would have eliminated potential sensitivity for this category of potential remains in this area of the APE. As 19th century South Street in this portion of the APE varied in width between 68 and 108 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between 17 and 57 feet inland from the bulkhead (HPI 2007:59).

In addition, as was documented for BMCR APE Sections 1 and 2, the impact of the dredging for the modern bulkhead construction for BMCR APE Section 3 would have had a horizontal inland extent of 42.5 feet under present-day South/Marginal Street to a vertical depth of 35 to 40 feet below mhw.

Installation of underground utilities may have impacted upper sections of Landfill Retaining Structures, Wharves, and Piers in the remaining parts of the APE, but would not have eliminated potential sensitivity for this category of remains. Therefore, the remaining areas of Section 3 in the APE are considered to possess moderate sensitivity for buried Landfill Retaining Structures, Wharves, and Piers dating from ca. 1828 to the end of the 19th century.

6.2.3.4 19th Century Landfill Deposits

The earliest portion of this section of the APE to be bulkheaded and filled was the inland 70 feet of South Street from Clinton to Montgomery Streets, completed by 1828. Continued bulkheading and street construction to the south completed South Street to Rutgers Slip north by 1831. South Street from Clinton Street to Montgomery Street was widened to 107/108 feet between 1831 and 1838, and Rutgers Slip was filled in between 1838 and 1843 (HPI 2007:59).

Six piers were constructed in this section of the APE between circa 1828 and 1849, extending from the river side of the old crib bulkhead. When the modern bulkhead was constructed, parts of these early pier locations were incorporated into the APE (HPI 2007:60).

Soil borings note "miscellaneous fill" often with timbers and wood, which indicate remains of landfill retaining structures and/or piers throughout this section of the APE. The historic fill was encountered from 6.4 feet above mhw (immediately underlying 1.5 feet of surface paving) to 61.5 feet below mhw.

The Rutgers Slip to Montgomery section of the APE beyond the limits of the late-19th century bulkhead would not be considered sensitive for this 19th century resource because landfill did not occur here until the modern bulkhead was constructed. Construction of the modern bulkhead involved dredging and removal of river mud and old cribworks prior to construction, as was standard practice (Docks 1914:172 in HPI 2007:60). This would have eliminated potential sensitivity for this category of potential remains in this section of the APE. As 19th century South Street in this section of the APE varied in width from 68 to 108 feet, and the modern bulkhead is at 125 feet, this non-sensitive area varies between approximately 17 and 57 feet inland from the modern bulkhead (HPI 2007:60).

Underground utilities may have impacted some of the shallowest landfill deposits but could not have eliminated potential sensitivity for this category of remains, given their depth. Therefore, the remaining areas of the APE are considered moderately sensitive for 19th century landfill deposits dating from ca. 1828 through the end of the 19th century.

Table 6-1

Archaeological Potential Resource Categories by APE Section

Archaeological Resource Category	SECTION 1 Roosevelt Street – Catharine Slip South	SECTION 2 Catharine Slip – Rutgers Slip South	SECTION 3 Rutgers Slip – Montgomery Street
Submerged Precontact	No Potential	Area within 42.5 feet of modern bulkhead, below 40 feet of mean height of water (mhw) has low potential	No Potential
Riverbottom Remains	Area between 19th century bulkhead and 42.5 feet landward of modern bulkhead, 23 to 39.5 feet below mhw has moderate potential	Area between 19th century bulkhead and 42.5 feet landward of modern bulkhead, 40 to 55.7 feet below mhw has moderate potential	No Potential
Landfill Retaining Structures, Wharves and Piers	Area below South Street from landward sidewalk line to 42.5 feet inland of modern bulkhead, to 40.1 feet below mhw has moderate potential	Area below South Street landward of 19th century bulkhead, to 56 feet below mhw has moderate potential; no potential from 38 to 64 feet inland of modern bulkhead	Area under the landward 70 feet of South Street from Clinton Street to Montgomery Street has moderate potential; no potential from 17 to 57 feet inland of modern bulkhead
Landfill Deposits	Area under the landward 70 feet of South Street, landward of the 19th century bulkhead has moderate potential	Area under South Street landward from the 19th century bulkhead; and older bulkhead 110-112 feet across Catharine Slip and 71-74 feet across Market Slip have moderate potential	Area under South Street landward from the 19th century bulkhead has moderate potential; no potential from 19th century bulkhead outboard

6.3 SUMMARY

The BMCR Project would entail subsurface disturbance to depths of 40 to 60 feet below grade along the entire alignment to install the supporting micropiles. This means that the entire alignment has the potential to impact archaeological resources.

The construction activities vary across the project area with respect to anticipated horizontal and vertical extents of disturbance, particularly in association with project actions concerning existing utility removal and installation of new utilities in new alignments. As noted in the preceding chapters of this report and noted in the project plans, the mapped locations of utility lines are tentative, and subject to verification by the utility owners prior to BMCR Project construction activities. It is also noted that the installations of

certain utility lines have already impacted subsurface conditions across the project area, although likely not to depths that would completely eliminate archaeological potential. However, verification of utility corridor locations may serve to refine the areas of potential sensitivity.

Non-sensitive areas that are not recommended for further archaeological study have been identified across the three sections of the APE. These include areas filled post-1900 in association with the installation of the modern bulkhead, the footprints of disturbance created by the construction of the FDR Drive South Street Viaduct column foundations, and areas dredged to depths of 40 feet in association with the preparation for construction of the modern bulkhead. These areas vary across the three APE sections and are discussed in detail in Chapter 5.

7 RECOMMENDATIONS

The current Phase IA documentary study technical report has concluded that there are discrete areas of potential archaeological sensitivity across the APE that may be impacted by the completion of the BMCR Project. The Phase IA technical report will be submitted to EDC, OMB, OOM, SHPO, and LPC for their review and comment. It is anticipated that the SHPO and LPC, as the regulatory review agencies, will concur with the conclusions and recommendations of the report and request additional archaeological work for the project.

Preparation of an Archaeological Monitoring and Testing Plan (Plan) is recommended as the next step in the compliance process for the consideration/protection of archaeological resources. It is anticipated that the Plan would be developed through consultation with SHPO, LPC, EDC, and AECOM. The Plan would outline in which portions of the APE it would be most efficient to monitor during construction and in which portions of the APE it would be feasible to conduct Phase IB subsurface testing prior to construction. For example, the great depths at which some of the sensitive areas lie is a consideration when proposing Phase IB testing. In such instances, archaeological monitoring during construction might prove to be the more efficient strategy. All archaeological monitoring and testing strategies would be designed and conducted in consultation with SHPO and LPC.

The project actions vary across the APE with respect to anticipated horizontal and vertical extents of disturbance in association with the installation of the flood control system elements and its proposed micropile support system. Many details of the proposed flood control system are not yet finalized, as design plans are still under development. Project actions also include removal of existing utilities and installation of new utilities on different alignments to avoid conflict with the flood control system, which also vary in anticipated horizontal and vertical extents of disturbance across the APE. Questions remain as to confirmation on the mapped locations of existing utility corridors, which will be answered by the owners of such utilities or through field testing as the project and its design progresses. At such time, the Plan would be developed in consultation with EDC, SHPO, and LPC.

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Figures

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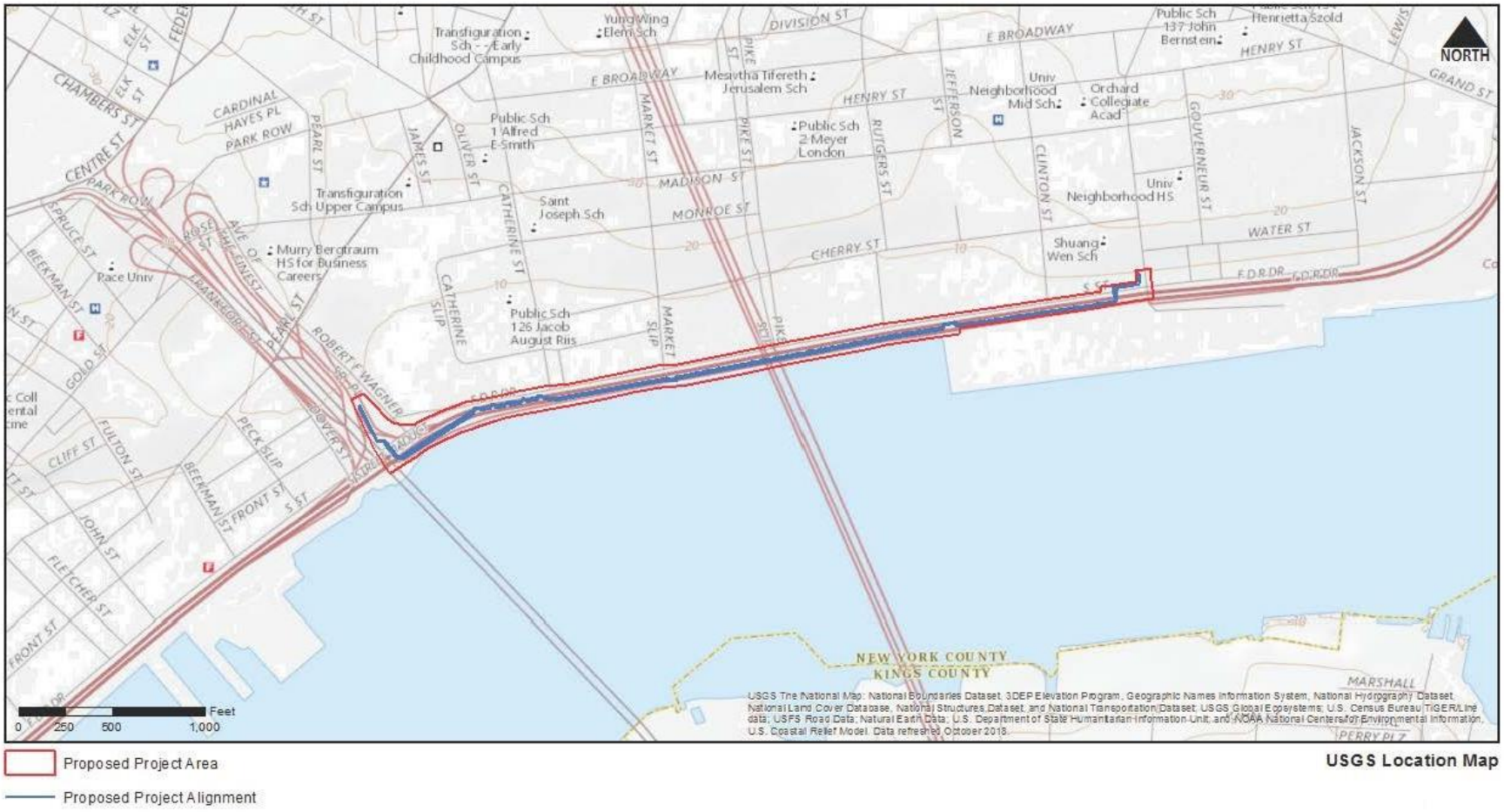


Figure 1 - USGS Project Location Map

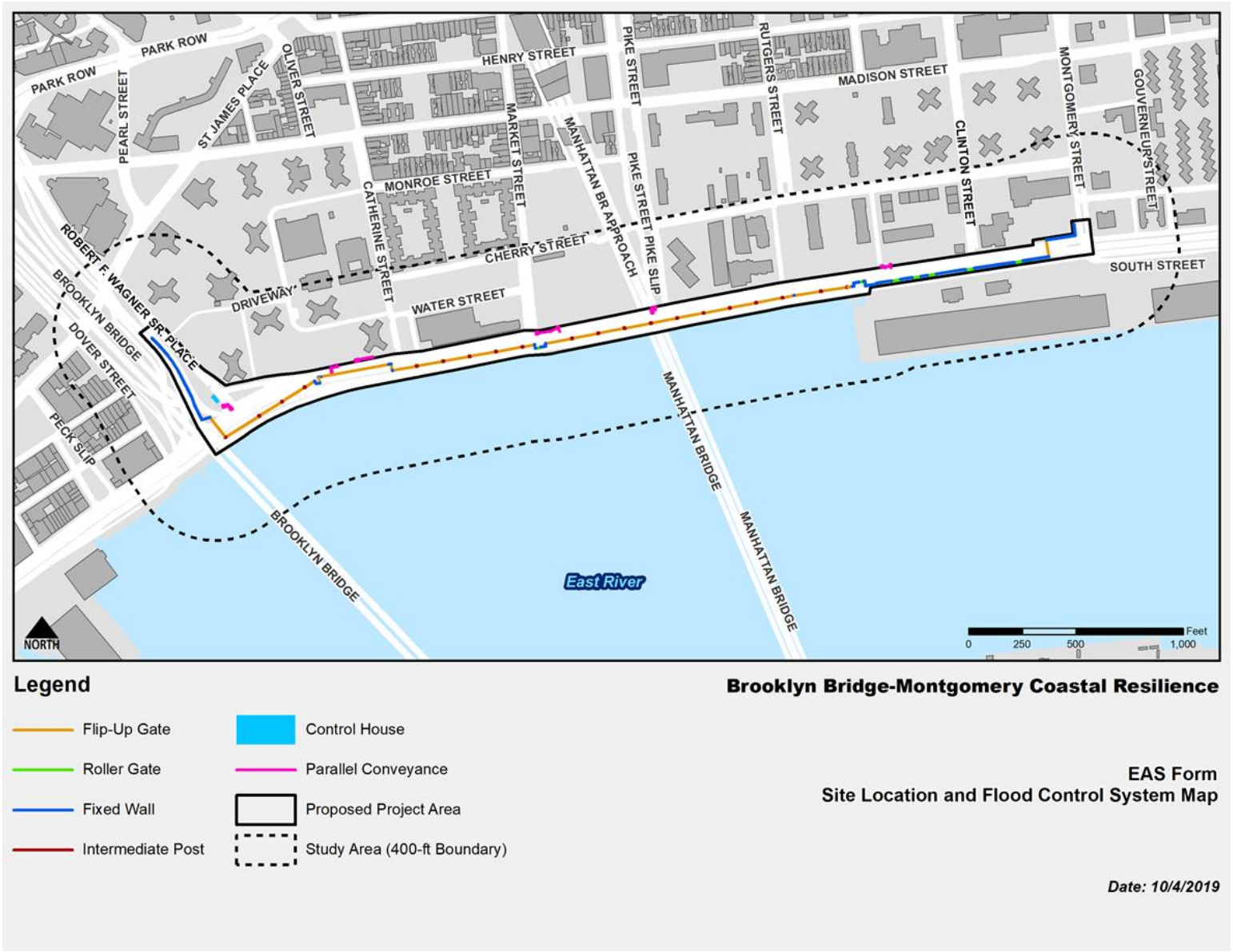
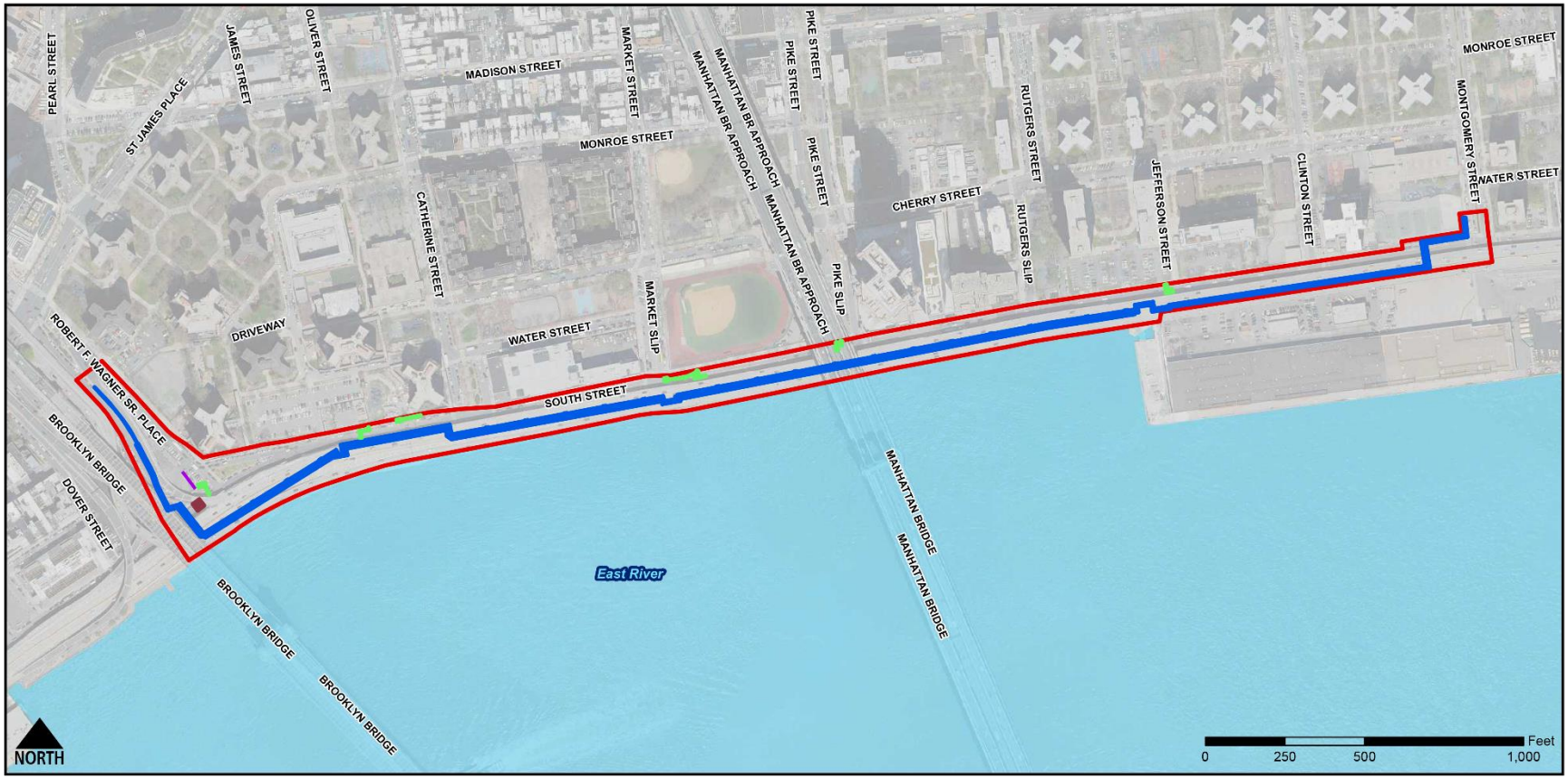


Figure 2 – Project Area Location and Flood Control System Map, taken from BMCR EAS Form



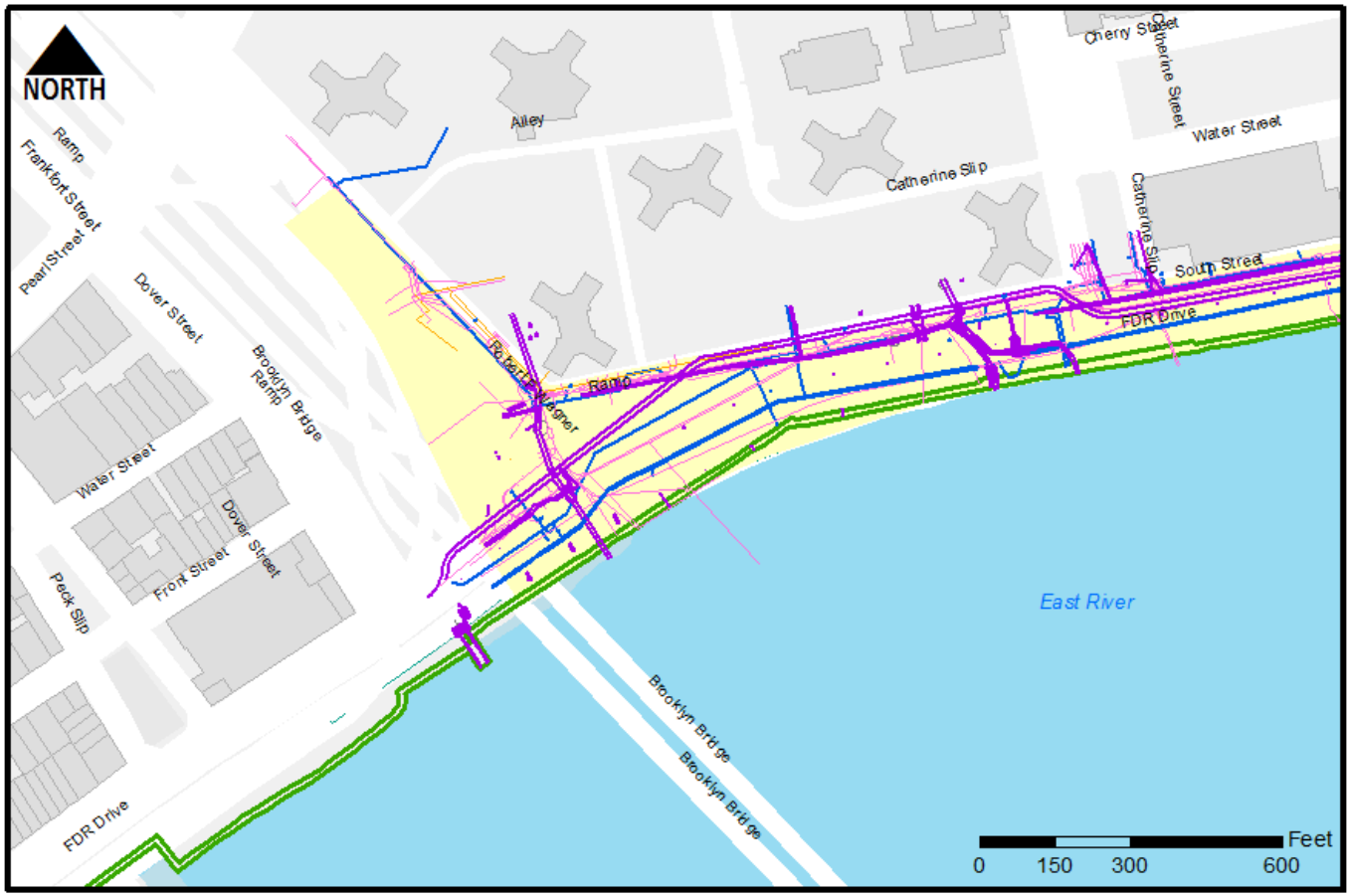
Legend

- Proposed Project Alignment
- Project Area and Archaeological Area of Potential Effect
- Control House
- Parallel Conveyance
- Isolation Gate

Brooklyn Bridge-Montgomery Coastal Resilience

Archaeological Area of Potential Effect

Figure 3 - Archaeological Area of Potential Effect



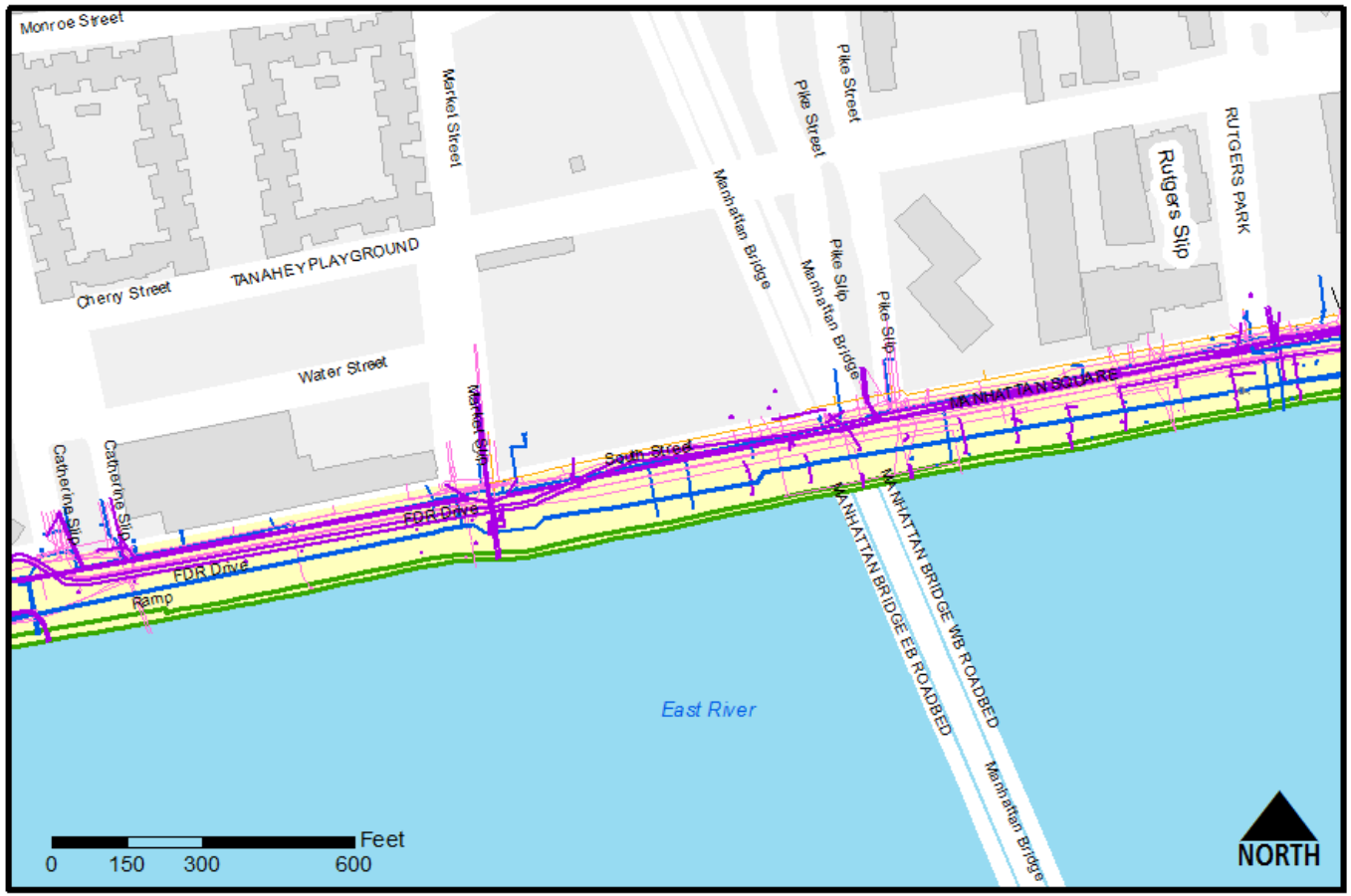
Legend

- Storm Drain / Sewer Line
- Water Main Line
- Gas Line
- Electric / Cable / Telephone Line
- Bulkhead
- All Other Lines
- Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

Buried Utilities within Archaeological Area of Potential Effect, NYC DDC 2019
(Detail: Former Roosevelt Street to Catherine Slip)

Figure 4a - Buried Utilities within BMCR APE Section 1



Legend

- Storm Drain / Sewer Line
- Water Main Line
- Gas Line
- Electric / Cable / Telephone Line
- Bulkhead
- All Other Lines
- Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

Buried Utilities within Archaeological Area of Potential Effect, NYC DDC 2019
(Detail: Catherine Slip to Rutgers Slip)

Figure 4b - Buried Utilities within BMCR APE Section 2

Figure 4c - Buried Utilities within BMCR APE Section 3

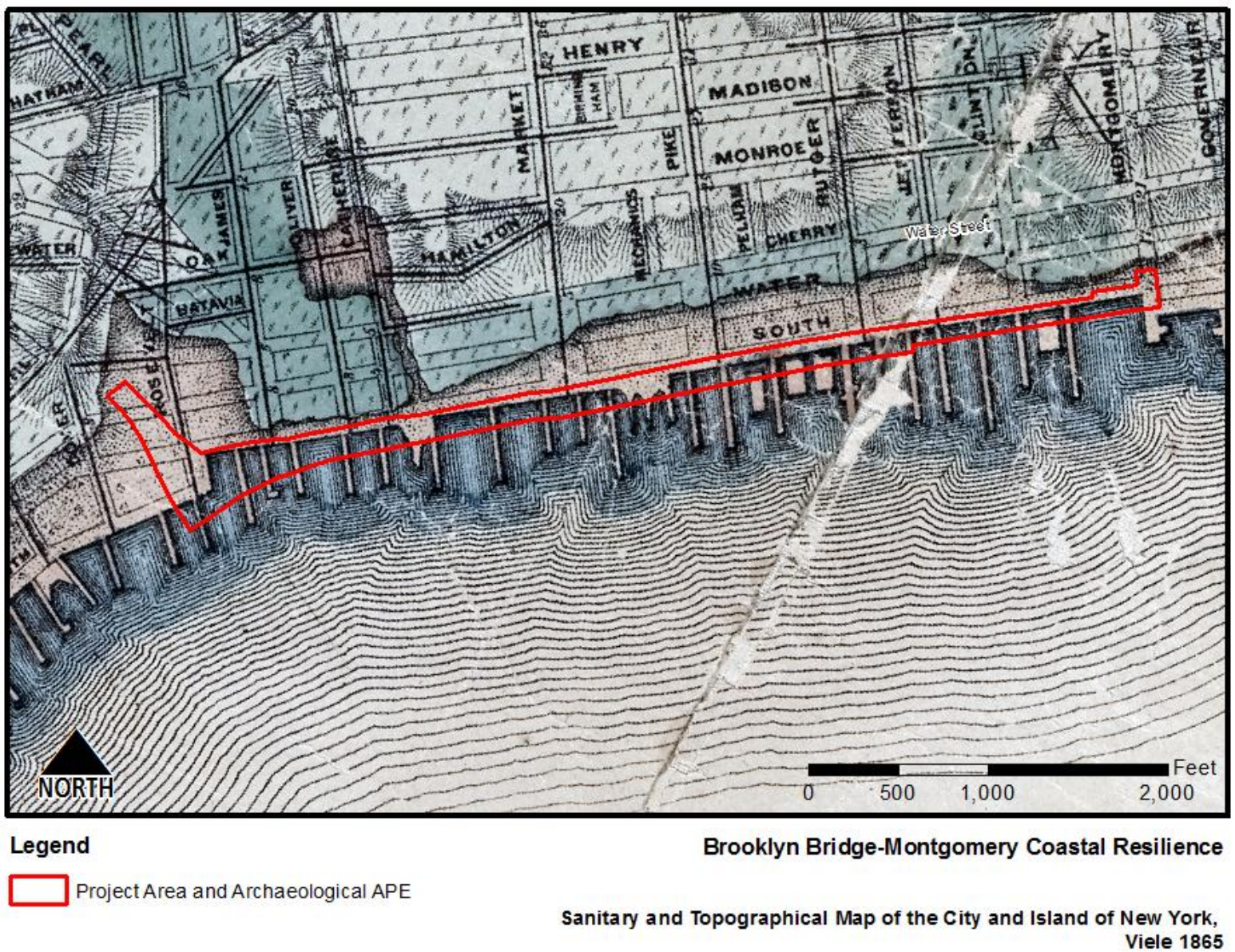


Figure 5 - BMCR APE Superimposed on Viele 1865 Map

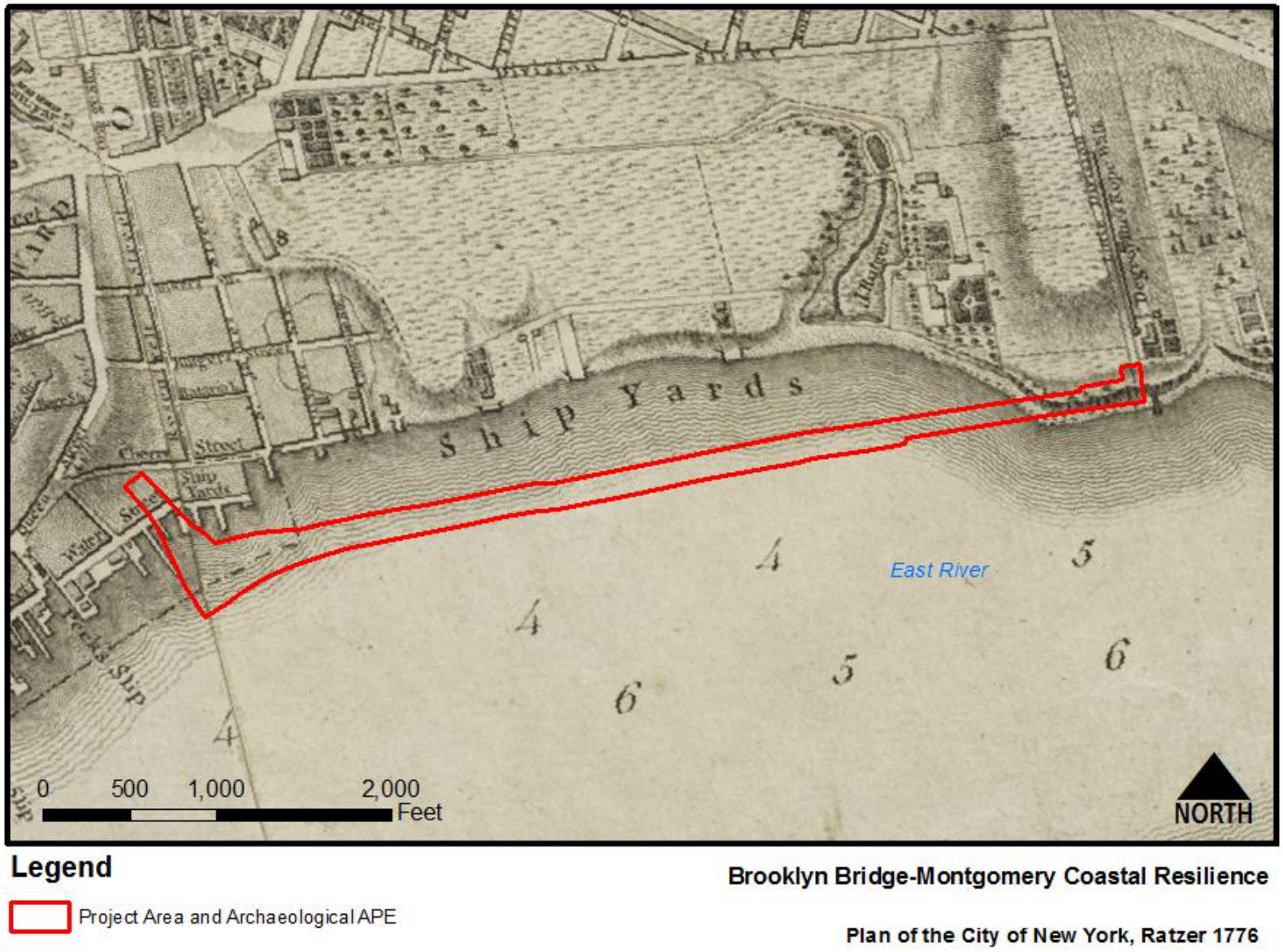
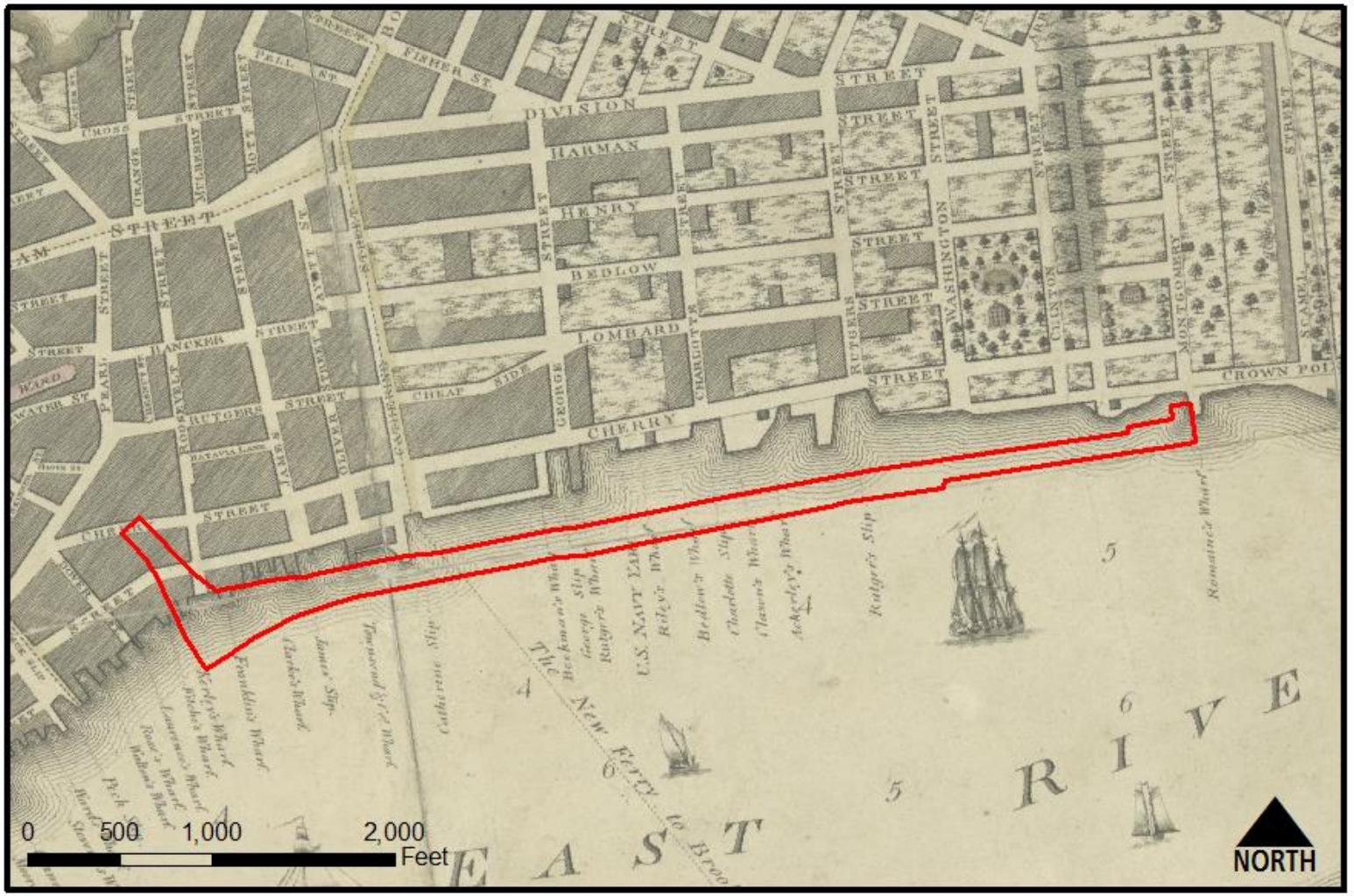


Figure 6 - BMCR APE Superimposed on Ratzer 1776 Map



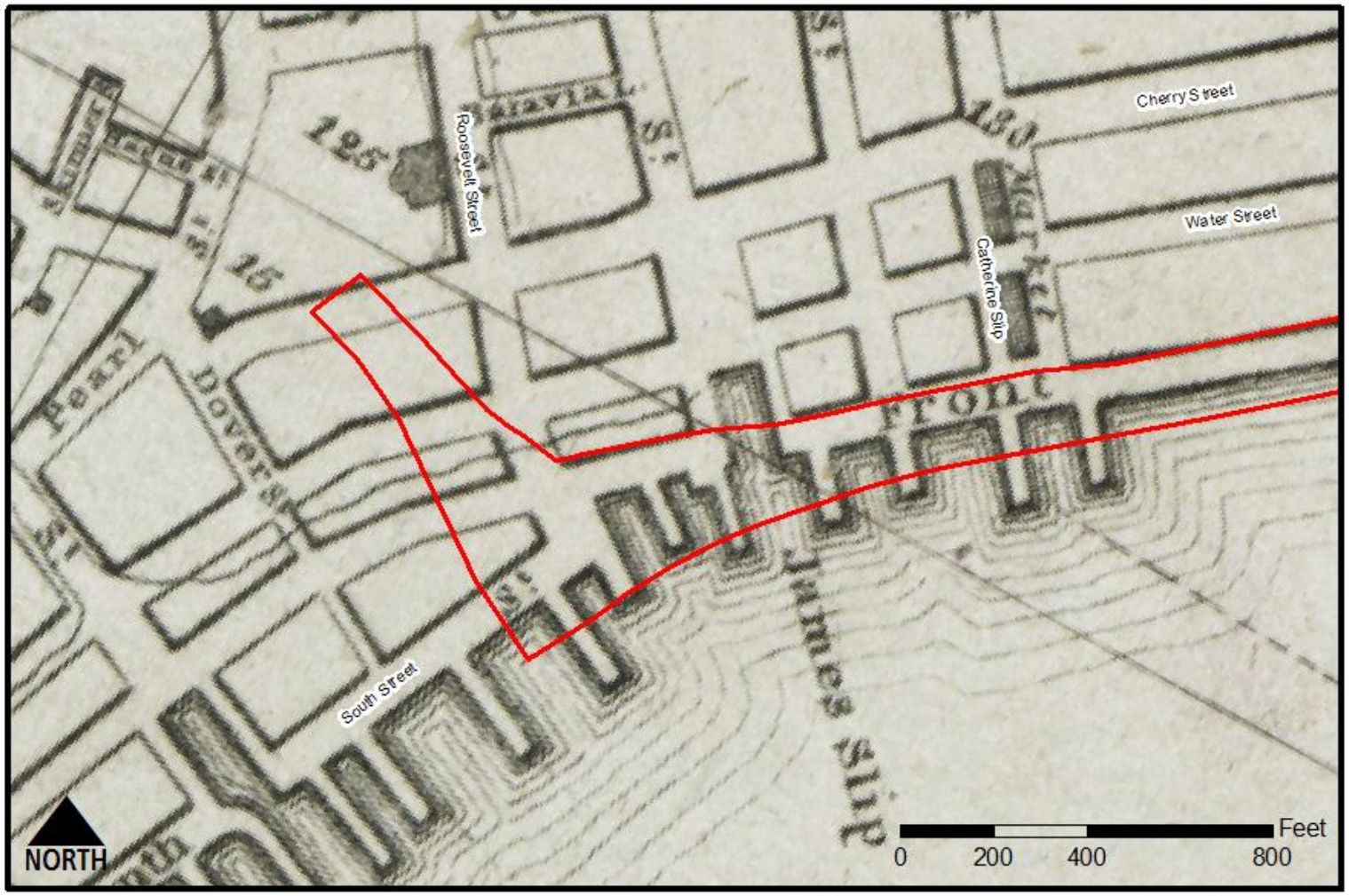
Legend

Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

A New & Accurate Plan of the City of New York, Taylor and Roberts 1797

Figure 7 - BMCR APE Superimposed on Taylor Roberts 1797 Map



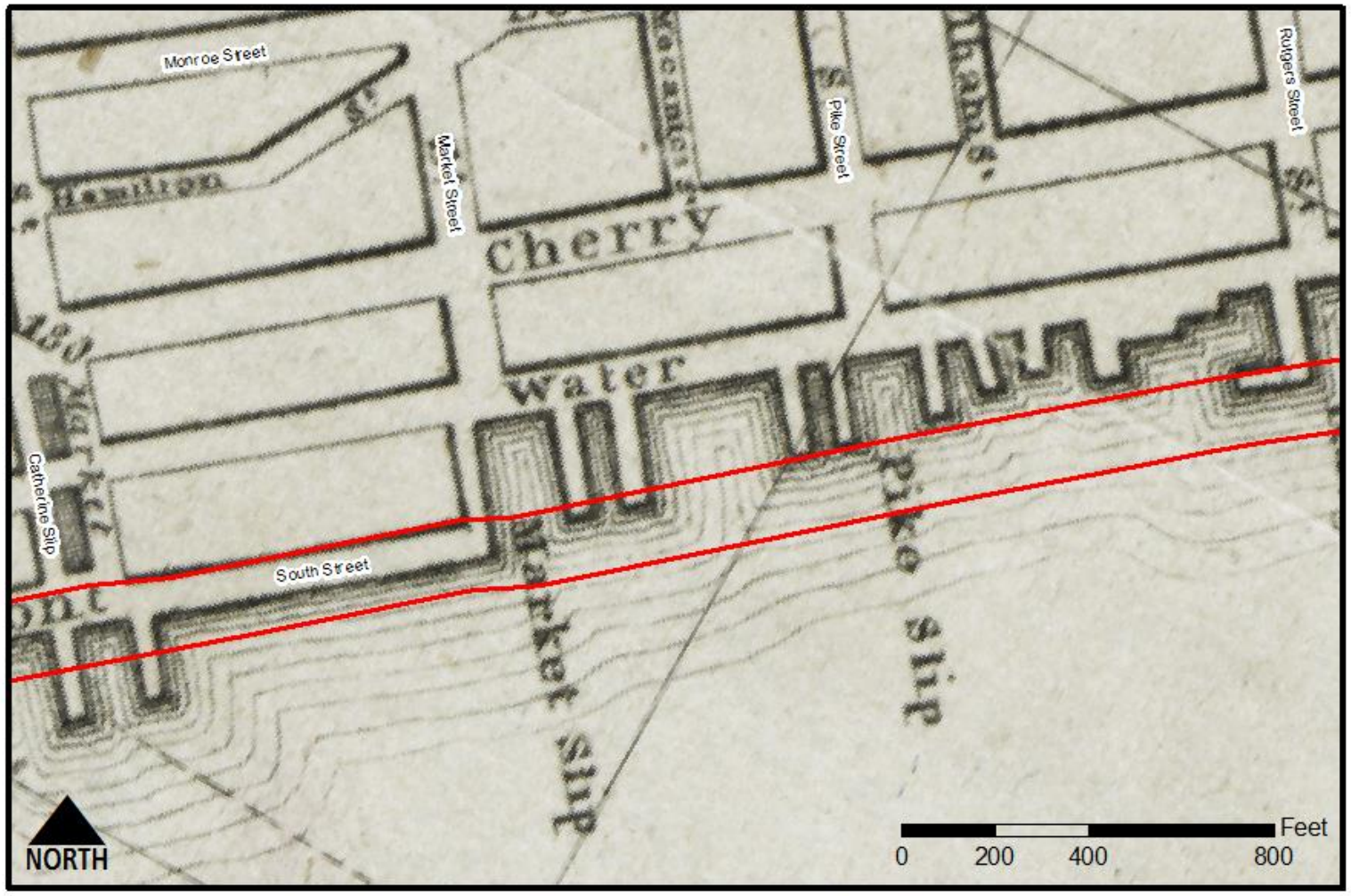
Legend

Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

Plan of the city of New York and of the island, Goodrich 1828
(Detail: Former Roosevelt Street to Catherine Slip)

Figure 8a - BMCR APE Section 1 Superimposed on Goodrich 1828 Map



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Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

Plan of the city of New York and of the island, Goodrich 1828
(Detail: Catherine Slip to Rutgers Slip)

Figure 8b - BMCR APE Section 2 Superimposed on Goodrich 1828 Map

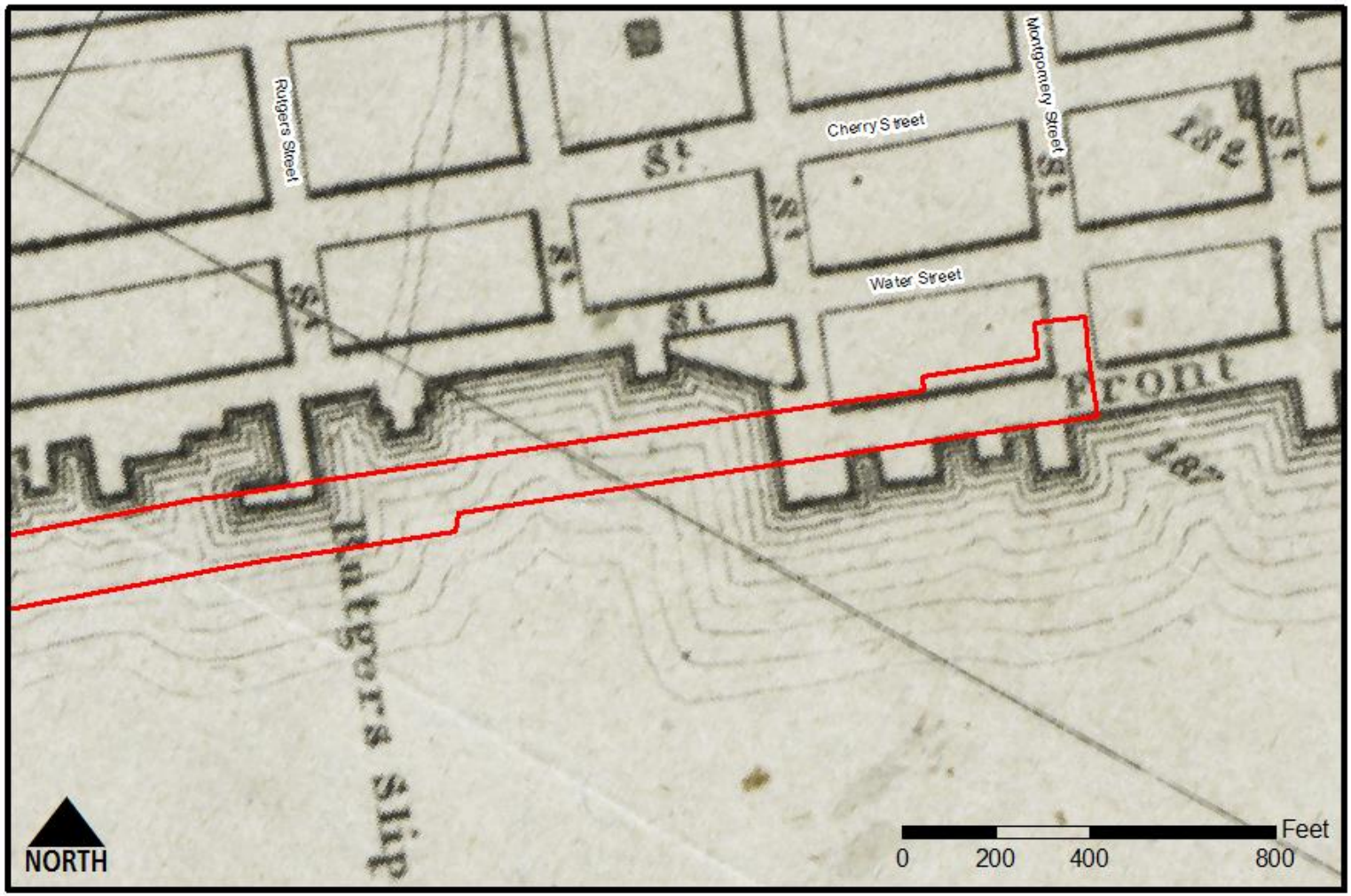
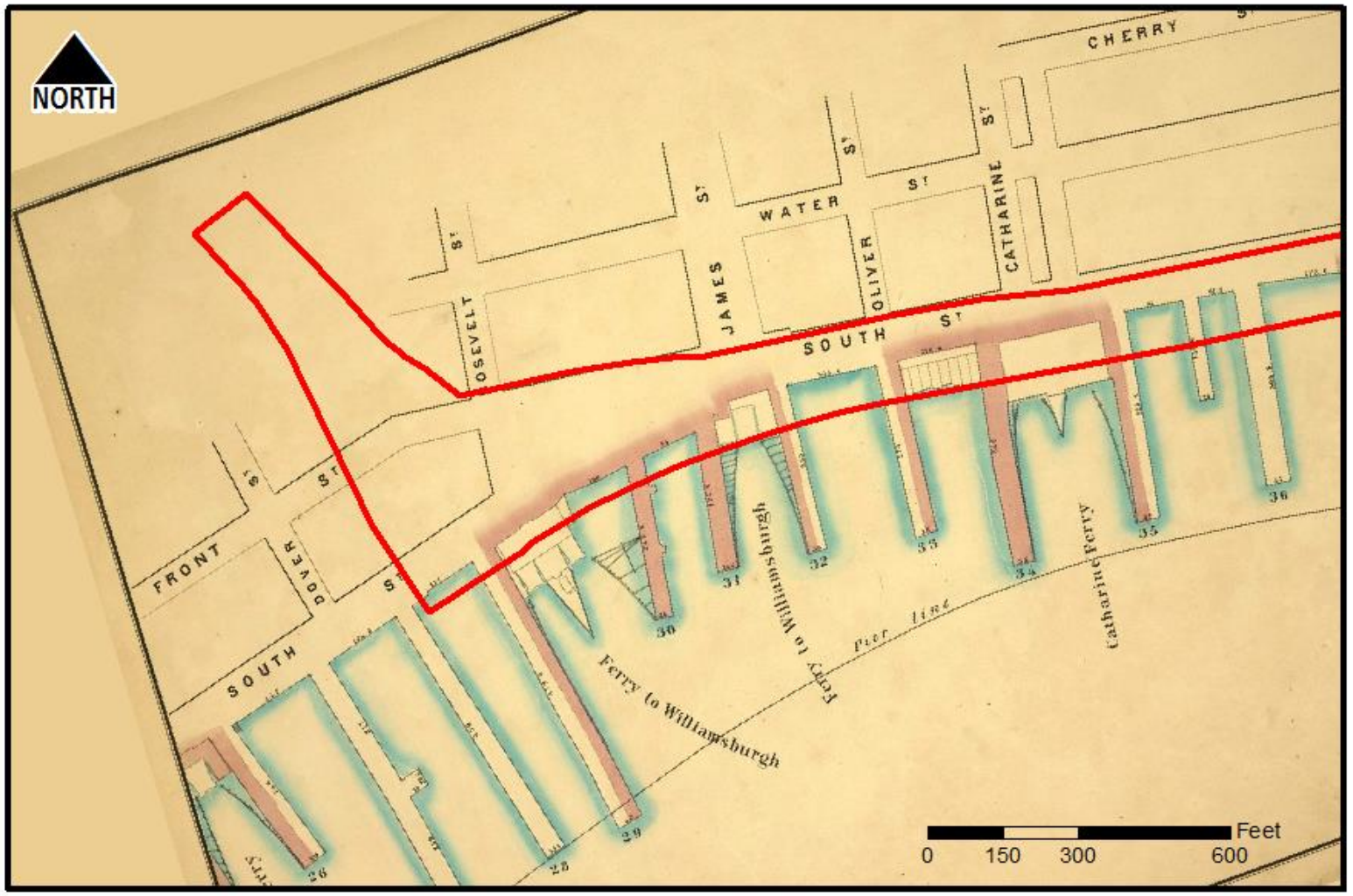


Figure 8c - BMCR APE Section 3 Superimposed on Goodrich 1828 Map



Legend

Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

Maps of the Wharves and Piers, Buckhout 1860
(Detail: Former Roosevelt Street to Catherine Slip)

Figure 9a - BMCR APE Section 1 Superimposed on Buckhout 1860 Map

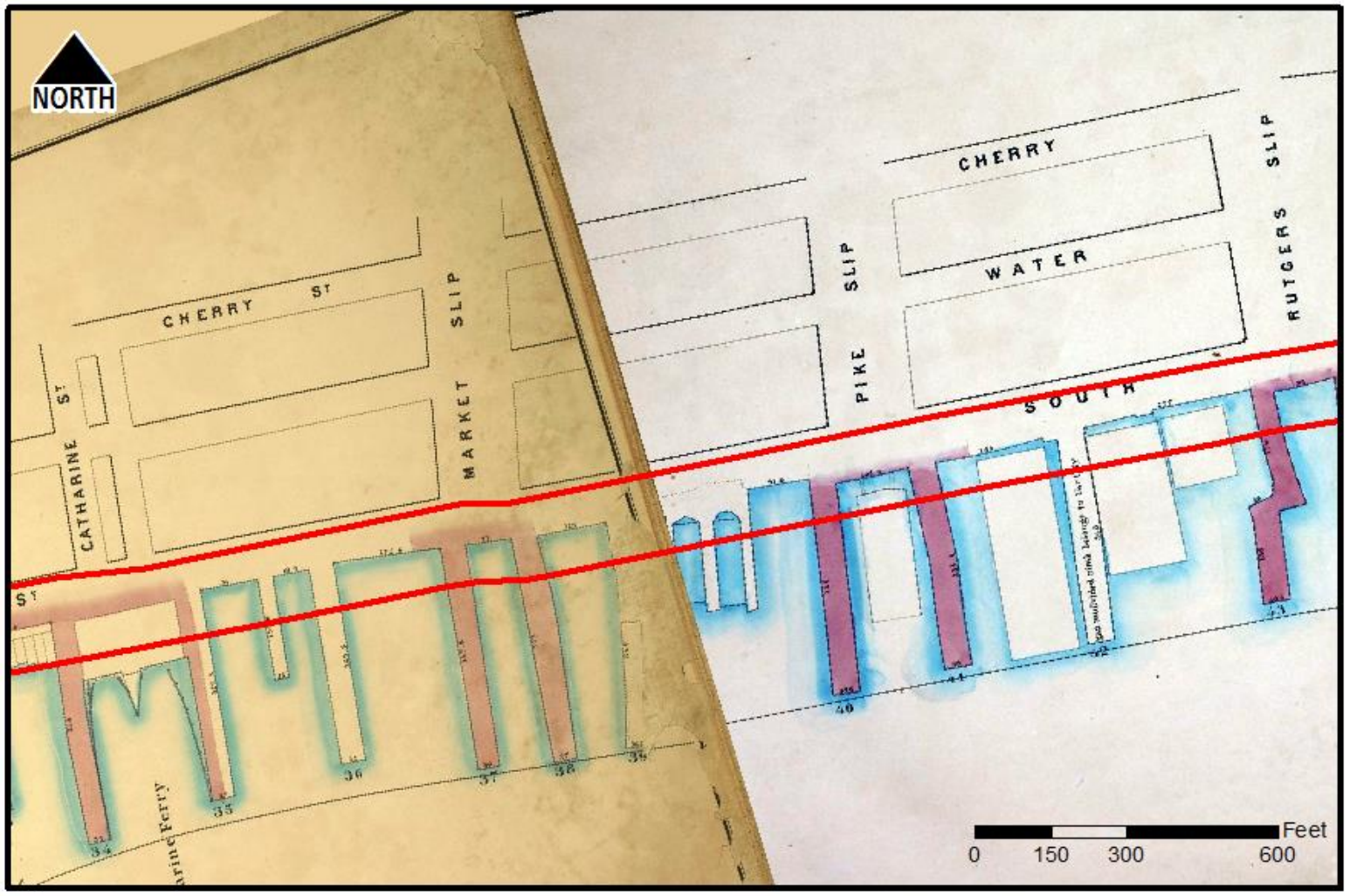


Figure 9b - BMCR APE Section 2 Superimposed on Buckhout 1860 Map

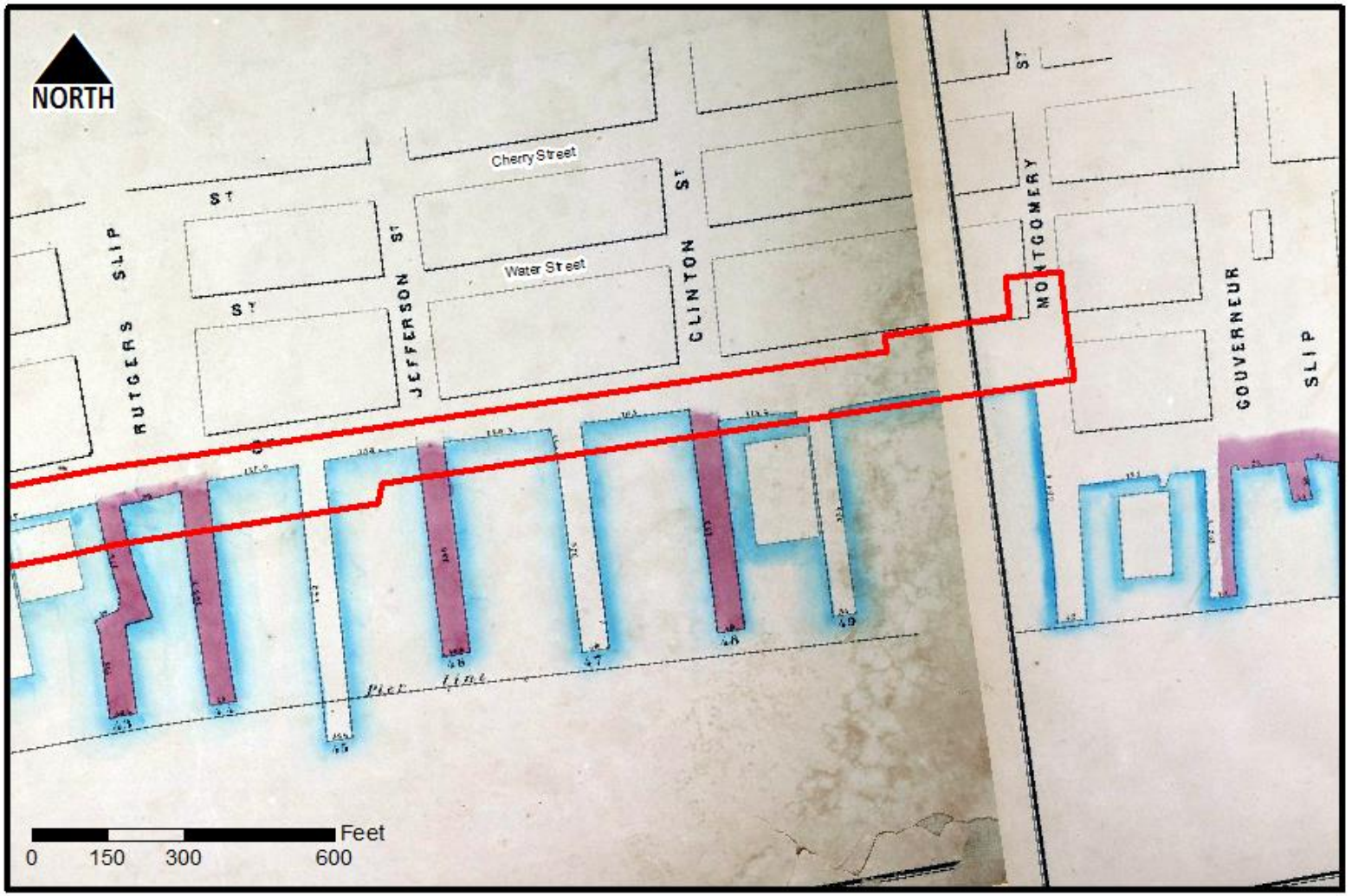


Figure 9c - BMCR APE Section 3 Superimposed on Buckhout 1860 Map

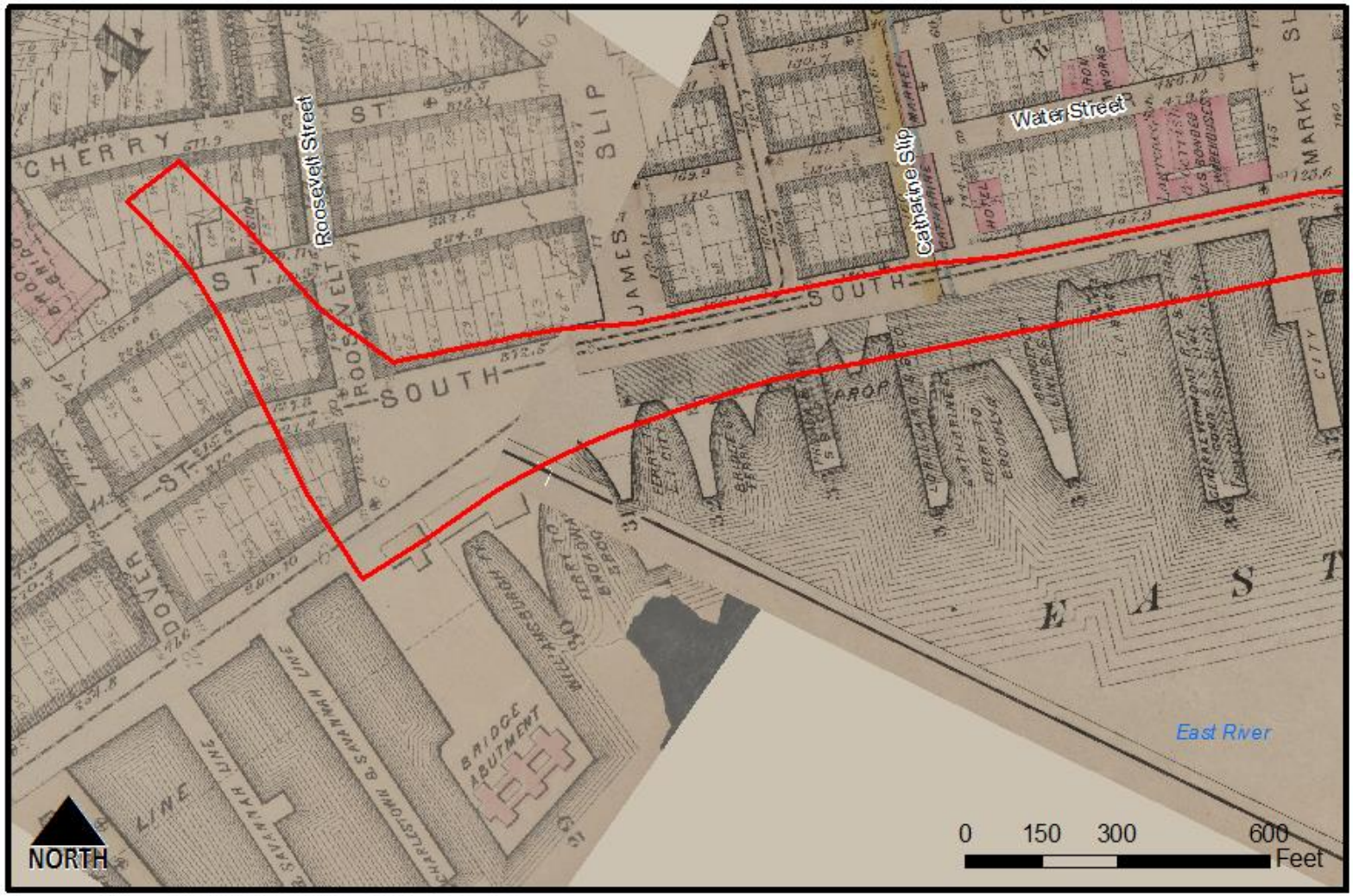
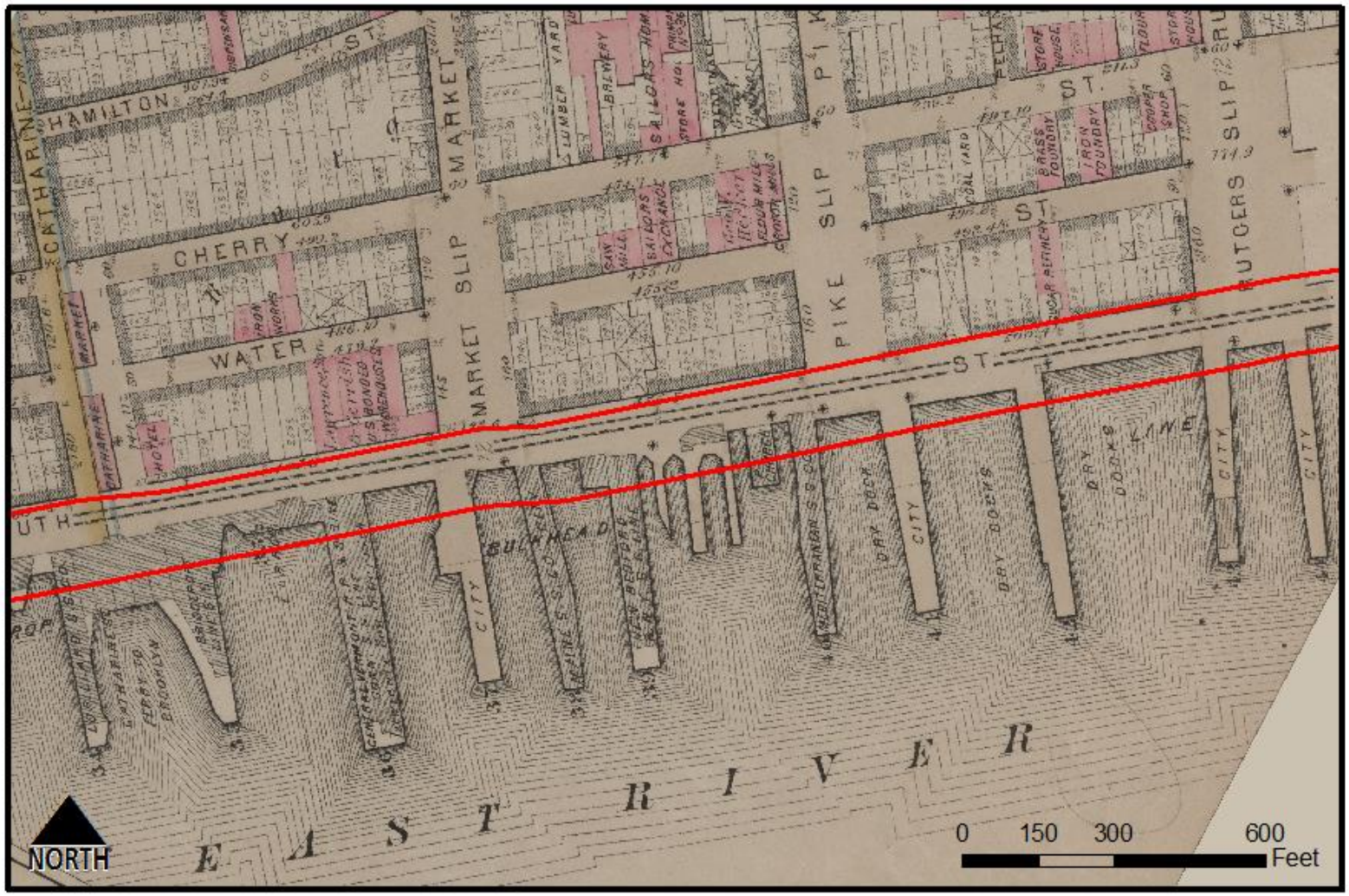


Figure 10a - BMCR APE Section 1 Superimposed on Bromley 1879 Atlas



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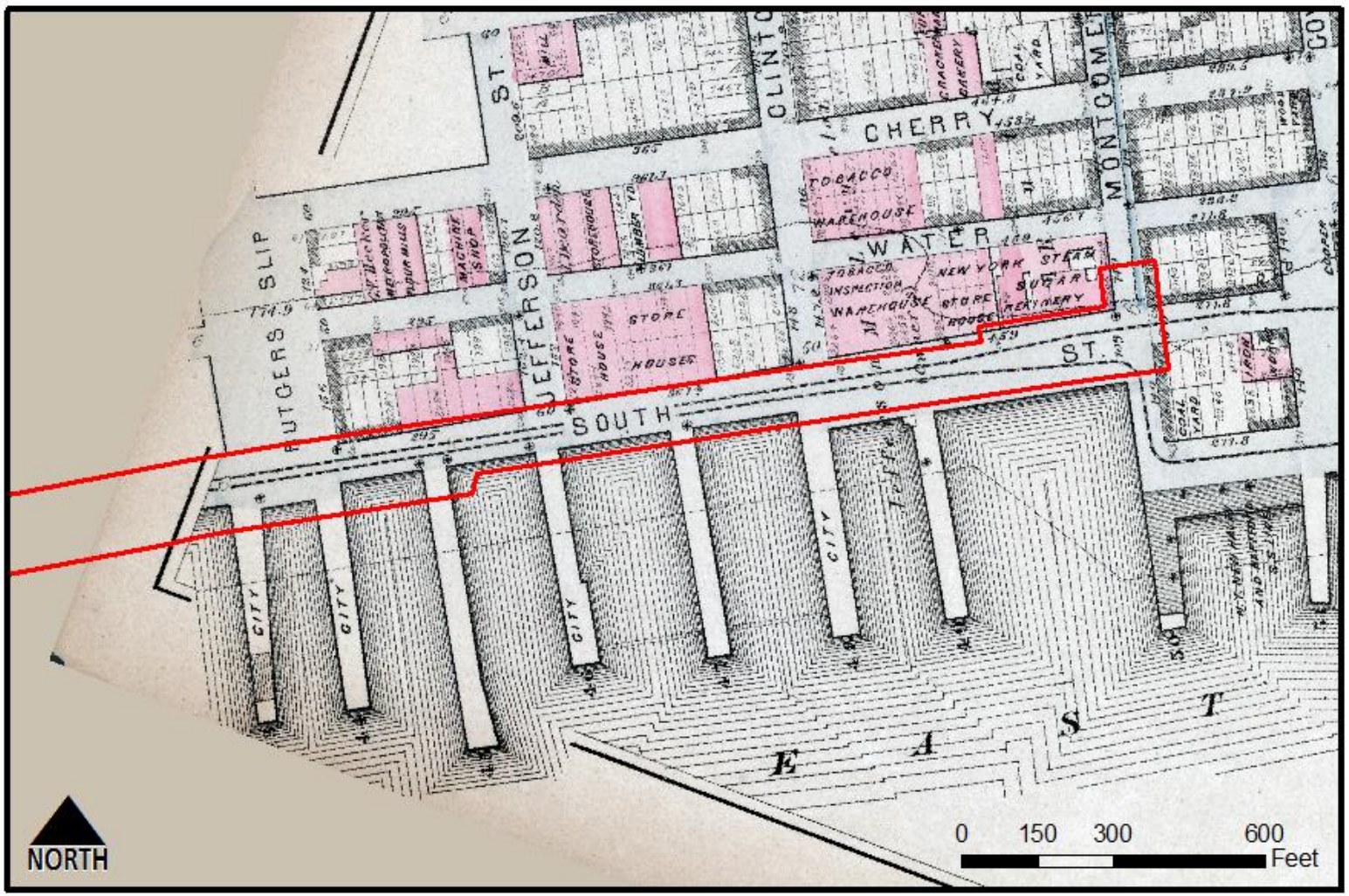

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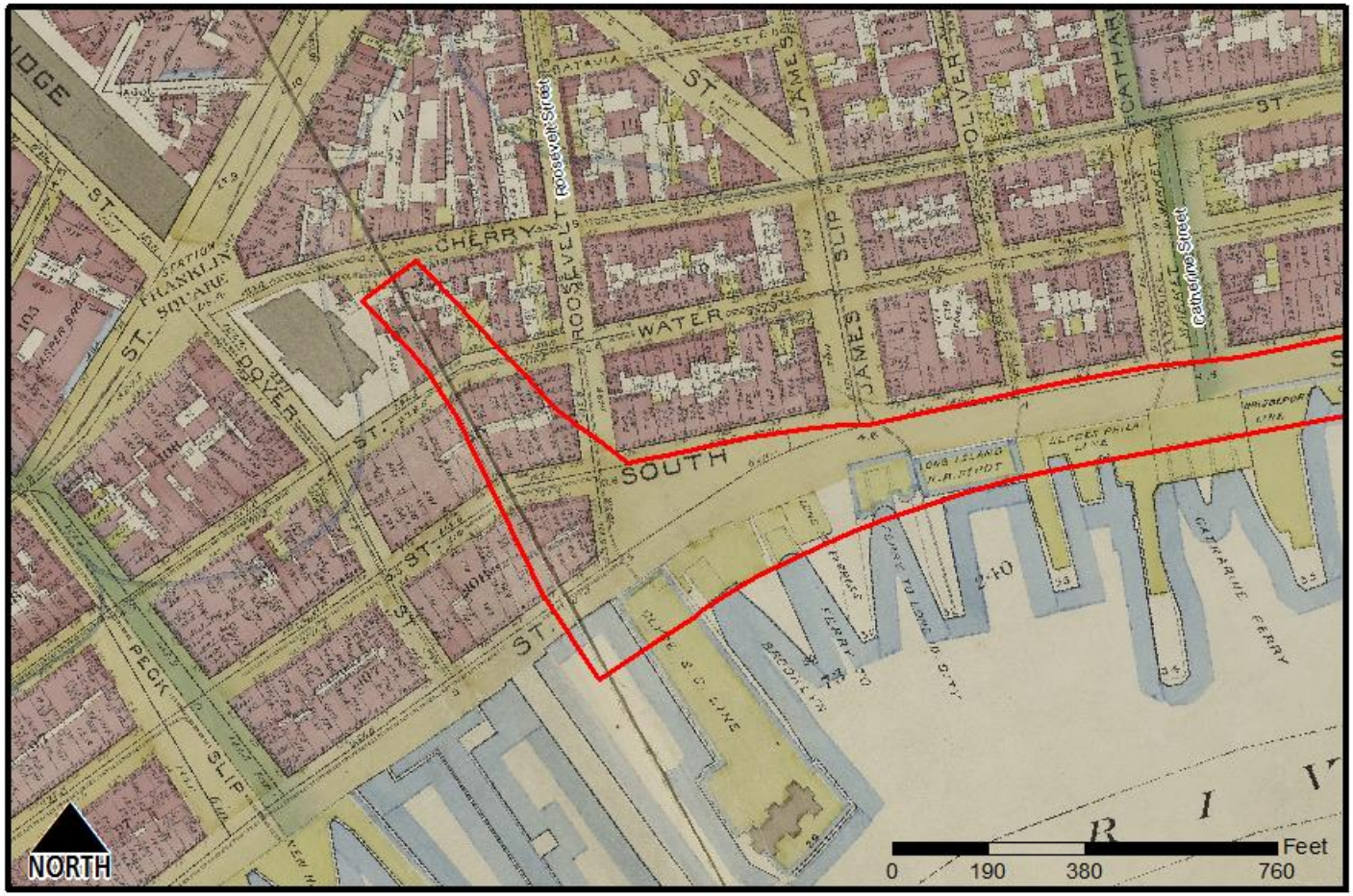
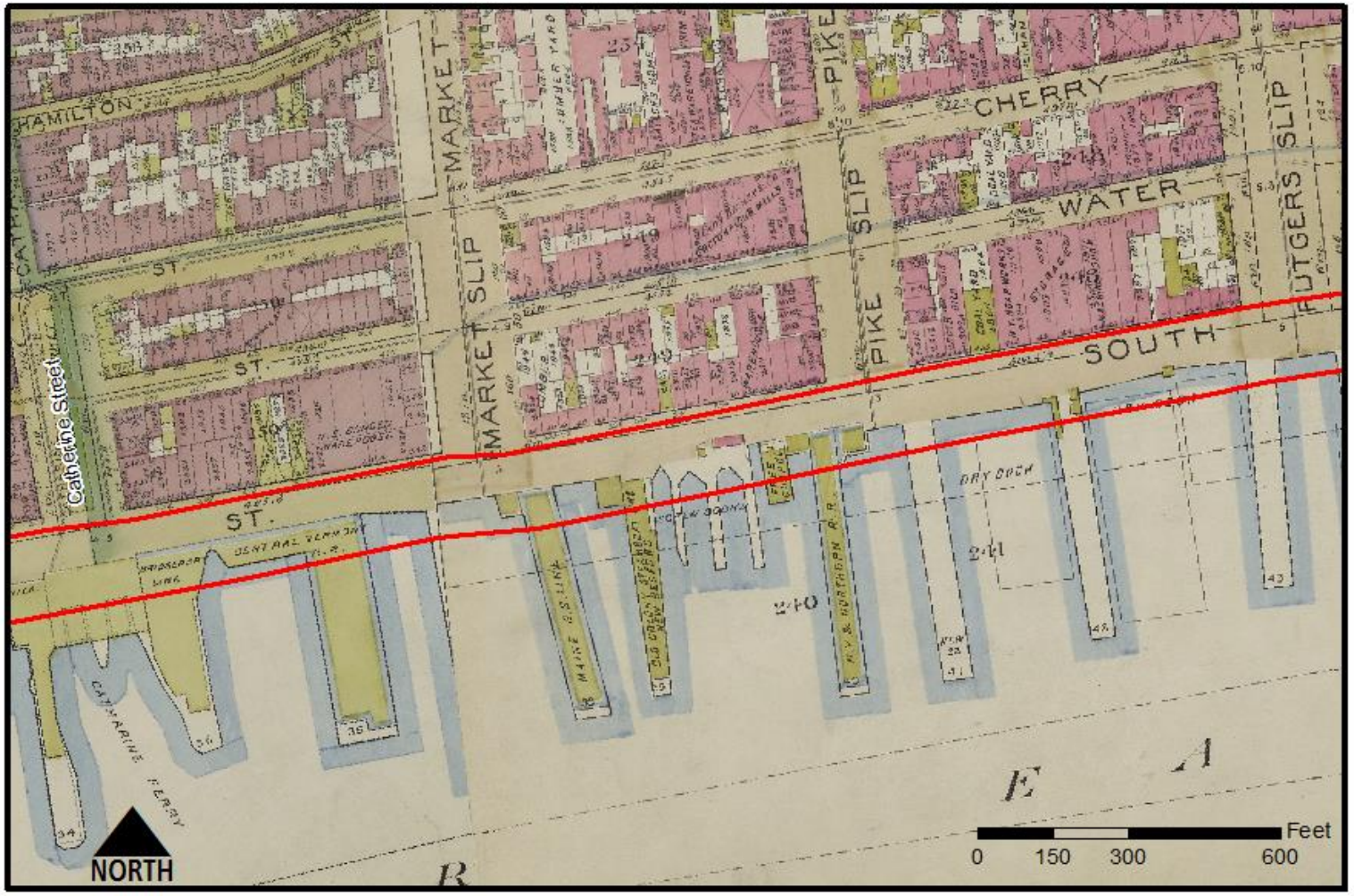


Figure 11a - BMCR APE Section 1 Superimposed on Bromley1891 Atlas



Legend

Project Area and Archaeological APE

Brooklyn Bridge-Montgomery Coastal Resilience

Atlas of New York, Bromley 1891
(Detail: Catherine Slip to Rutgers Slip)

Figure 11b - BMCR APE Section 2 Superimposed on Bromley 1891 Atlas

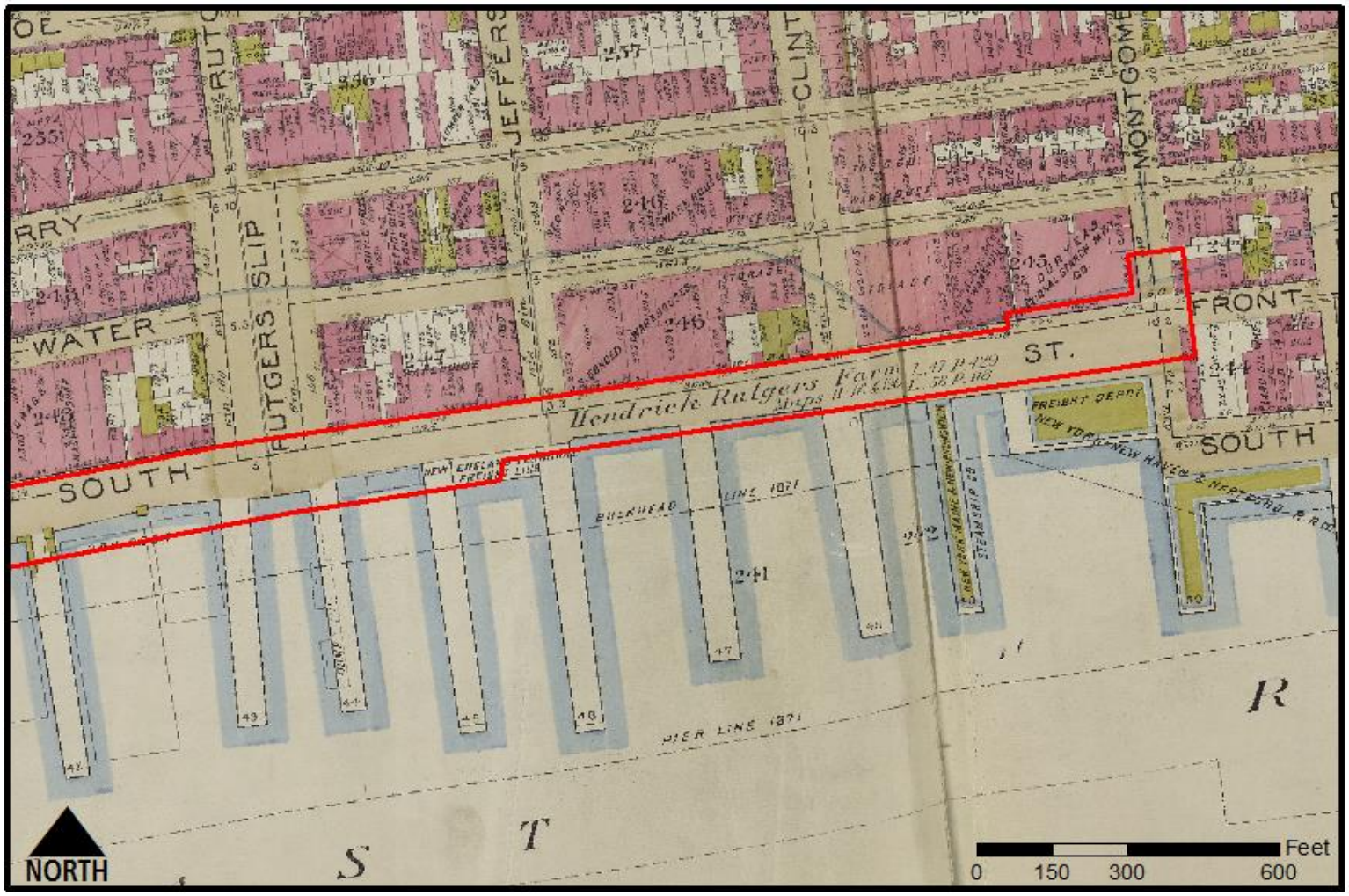


Figure 11c - BMCR APE Section 3 Superimposed on Bromley 1891 Atlas

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Photographs of Project Corridor

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Photo 1: Looking east toward the East River on Robert F. Wagner, Sr. Place at the southern end of the Project Area.

Photo 2: Looking north, on the East River Waterfront Esplanade that includes a bike path, seating areas and general open space, at the south end of the Project Area.

Photo 3: Looking west toward the New York City Housing Authority's Alfred E. Smith Houses on South Street between Robert F. Wagner, Sr. Place and Catherine Slip.

Photo 4: Under the FDR Drive and on the East River Waterfront Esplanade at Catherine Slip, looking north. The bike lane runs along the esplanade and was temporarily shifted due to construction.

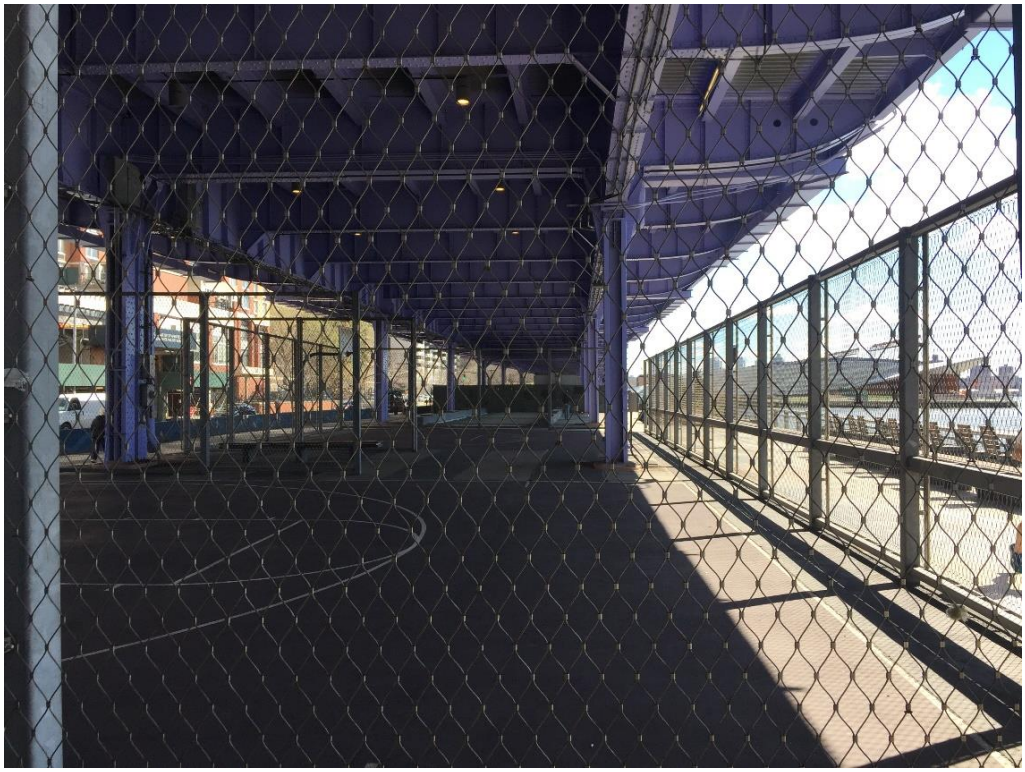

Photo 5: Under the FDR Drive looking north at the NYC Parks Department basketball court on the East River Waterfront Esplanade just north of Pike Slip.

Photo 6: Some of the community recreational amenities of the East River Waterfront Esplanade under the FDR Drive just south of Pier 35.

Photo 7: Looking south on South Street at the residential towers north of the Manhattan Bridge including One Manhattan Square and 265 South Street.

Photo 8: Looking east towards Brooklyn at the Pier 35 park, an outdoor public space.

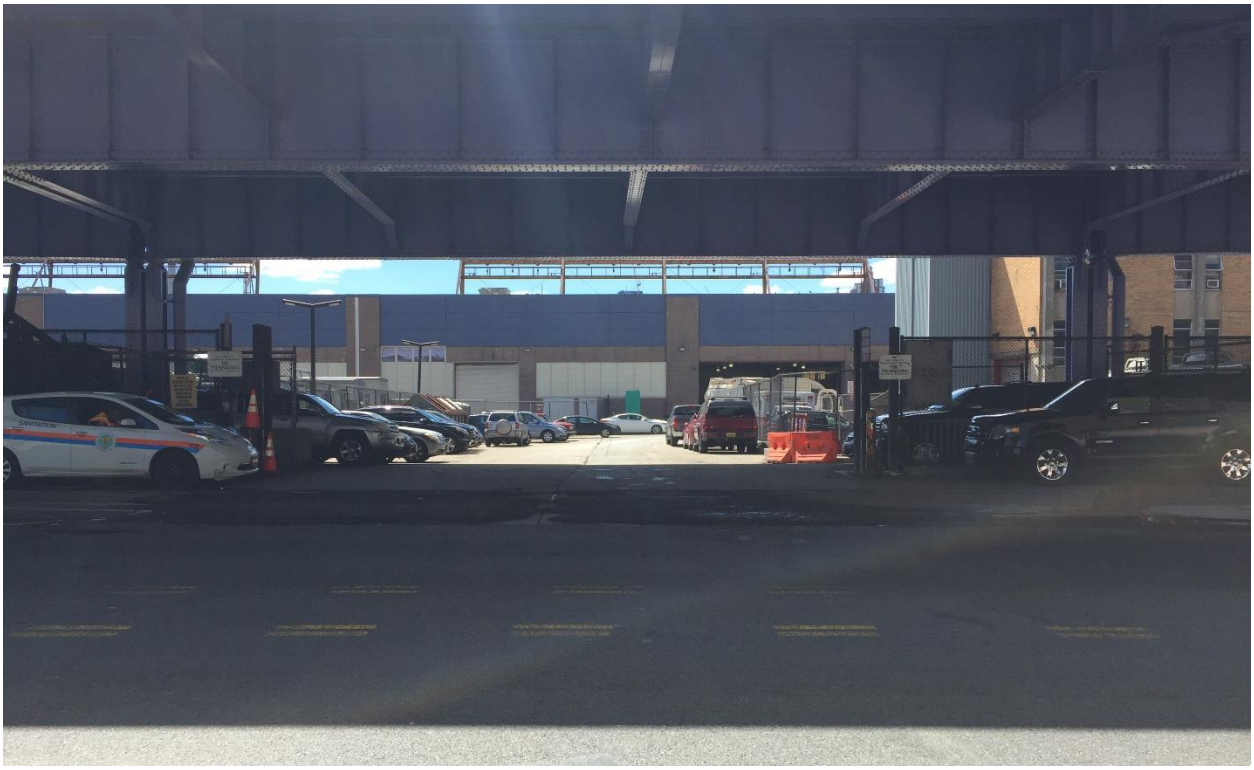

Photo 9: Looking east from South Street at NYC Department of Sanitation Garage 03 on Pier 36 (Montgomery and Jefferson Streets) at the northern end of the Project Area.

Photo 10: Looking south on South Street at P.S. 184 and its playground at the corner of South Street and Montgomery Street.

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Appendix A

Appendix A-1 Soil Boring Logs and Location Maps

HPI, Inc.
2007 *East River Waterfront Esplanade and Piers – Inboard Resources, North of Brooklyn Bridge, Phase IA Archaeological Assessment.* Prepared for AKRF, Inc. and LMDC.

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Appendix A

Appendix A-2 Soil Boring Logs

HPI, Inc.
2008 *East River Esplanade and Piers, Borough of Manhattan, New York, New York, Archaeological Field Monitoring and Soil Boring Analysis.* Prepared for the New York City Economic Development Corporation.

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Appendix B

Administrative Correspondence

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Appendix C

Engineering Plans

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Appendix D

Project Personnel

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