9th Street Infrastructure Improvements

Capital Project SEK20068

BROOKLYN, KINGS COUNTY, NEW YORK

Phase 1A Archaeological Documentary Study

SHPO Review Number: 16PR05552
CEQR Number: 16DEP091K

Prepared for:

The New York City Department of Design + Construction

and

The New York City Department of Environmental Protection

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Management Summary

SHPO Project Review Number:	16PR05552
Involved Agencies:	New York City Department of Design + Construction New York City Department of Environmental Protection United States Army Corps of Engineers (USACE)
Phase of Survey:	Phase 1A Documentary Study
Location Information	
Location:	2nd Avenue between 7th Street and 9th Street, and 9th Street between 2nd Avenue and Smith Street, Brooklyn, New York
Minor Civil Division:	04701
County:	Kings County
USGS 7.5 Minute Quadrangle Map:	Brooklyn
Report Author:	Elizabeth D. Meade, M.A., R.P.A.
Date of Report:	January 2017

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Chapter 1: Introduction and Methodology

A. INTRODUCTION

The New York City Department of Design and Construction (DDC), on behalf of the New York City Department of Environmental Protection (DEP), is proposing the 9th Street Infrastructure Improvements project (Capital Project SEK20068) in the Gowanus neighborhood of Brooklyn (see **Figure 1**). The proposed project site includes streetbeds on the east and west sides of the Gowanus Canal and includes a portion of 9th Street between Smith Street and the Canal; 9th street between the Canal and 2nd Avenue; and 2nd Avenue between 7th Street and 9th Street (see **Figure 2**). The project is necessary to upgrade the stormwater infrastructure and alleviate flooding in the vicinity of the project site by replacing the existing stormwater collection sewers along 9th Street, including replacement of two existing outfalls on the Canal (one of the west side and the other on the east side) that would provide the needed drainage outlets to the Gowanus Canal for the collected stormwater. The project will require permits and approvals from various city, state, and federal agencies, including DEP, the New York City Department of Transportation (NYCDOT), the New York City Department of City Planning (NYCDEP), the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of State (NYSDOS), and the United States Army Corps of Engineers (USACE). The project is therefore subject to City Environmental Quality Review (CEQR), the State Environmental Quality Review Act (SEQRA), and Section 106 of the National Historic Preservation Act of 1966. DEP is serving as lead agency for the environmental review.

The principal objective of the proposed project is to improve drainage over an approximately 10-acre area by replacing a substandard and undersized drainage system with approximately 1,300 linear feet of new stormwater collection sewers; this new system would improve drainage thereby alleviating street and property flooding. The proposed storm sewers would collect the stormwater runoff and direct it to two new replacement outfalls, one on either side of the Gowanus Canal at 9th Street, which would provide a drainage outlet for the collected stormwater. The outfall on the western side of the Canal will be 18 inches in diameter and it is replacing an existing 12-inch storm sewer at that location. The outfall on the eastern side of the Canal would measure 42 inches and also replace an existing 12-inch storm sewer line. The proposed project would also improve sanitary infrastructure by installing a new, approximately 800-foot-long new sanitary sewer along 9th Street east of the Canal and replacing sections of combined sewers along 2nd Avenue. The project would also upgrade water supply by replacing old, unlined, cast iron water mains; in addition, the project would resurface all streets affected by construction.

In a comment letter dated August 17, 2016, the New York City Landmarks Preservation Commission (LPC) determined that the project site was potentially sensitive for archaeological resources associated with the precontact and historic period (notable colonial period and the 19th century) occupation of the project site and requested that a Phase 1A Archaeological Documentary Study of the site be prepared. In a comment letter dated August 23, 2016, the New York State Historic Preservation Office (SHPO) noted that the project site is located within a generalized area of archaeological sensitivity and also requested that a Phase 1A study of the project site be prepared. This document has been prepared to satisfy these comments.

B. RESEARCH GOALS AND METHODOLOGY

The following Phase 1A Archaeological Documentary Study of the Capital Project SEK20068 project site has been designed to satisfy the requirements of SHPO and LPC, and it follows the guidelines of the New York Archaeological Council (NYAC). The study documents the development history of the proposed project site and its potential to yield archaeological resources, including both precontact and historic cultural resources. In addition, this report documents the current conditions of the project site and previous cultural resource investigations that have taken place in the vicinity.

This Phase 1A Archaeological Documentary Study has four major goals: (1) to determine the likelihood that the project site was occupied during the precontact (i.e., 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 at the project site; (3) to make a determination of the project site's potential archaeological sensitivity; and (4) to make recommendations for further archaeological analysis, if necessary. The steps taken to fulfill these goals are explained in greater detail below.

The first goal of this documentary study is to determine the likelihood that the project locations were inhabited during the precontact or historic periods and identify any activities that may have taken place on the project site that would have resulted in the deposition of archaeological resources. To determine the likelihood of the project site's occupation during the precontact and historic periods, documentary research was completed to establish a chronology of the project locations' development, landscape alteration, to identify any individuals who may have owned the land or worked and/or resided there, and to determine if buildings were present on the project locations in the past. Data was gathered from various published and unpublished primary and secondary resources, such as historic maps, topographical analyses (both modern and historic), historic photographs, newspaper articles, local histories, and previously-conducted archaeological surveys. These published and unpublished resources were consulted at various repositories, including the Main Research Branch of the New York Public Library (including the Local History and Map Divisions). File searches were conducted at LPC, SHPO, and the New York State Museum (NYSM). Online textual archives, such as Google Books and the Internet Archive Open Access Texts, were also accessed.

The second goal of this Phase 1A study is to determine the likelihood that archaeological resources could have survived intact on the project site after development and landscape alteration (i.e., erosion, grading, filling, etc.). Potential disturbance associated with paving and utility installation was also considered. Historic maps documenting structures on the project location were analyzed; in addition, historic and current topographical maps were compared to determine the extent to which the project locations have been disturbed. After identifying the likelihood that archaeological resources were deposited on the project site and that they could remain intact given subsequent development and landscape alteration, a sensitivity determination was made for the project locations for both precontact and historic period resources. As described by NYAC in their Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State, published in 1994 and subsequently adopted by SHPO (see page 2):

> *An estimate of the archaeological sensitivity of a given area provides the archaeologist with a tool with which to design appropriate field procedures for the investigation of that area. These sensitivity projections are generally based upon the following factors: statements of locational preferences or tendencies for particular settlement systems, characteristics of the local environment which provide essential or desirable resources (e.g., proximity to perennial water sources, well-drained soils, floral and faunal resources, raw materials, and/or trade and transportation routes), the density of known archaeological and historical resources within the general area, and the extent of known*

disturbances which can potentially affect the integrity of sites and the recovery of material from them.

The third goal of this study was to make a determination of the project site's archaeological sensitivity. As stipulated by the NYAC standards, 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: 10). For the purposes of this study, those terms are defined as follows:

- **Low**: Areas of low sensitivity are those where the original topography would suggest that Native American sites would not be present (i.e., locations at great distances from fresh and salt water resources), locations where no historic activity occurred before the installation of municipal water and sewer networks, or those locations determined to be sufficiently disturbed so that archaeological resources are not likely to remain intact.
- **Moderate**: Areas with topographical features that would suggest Native American occupation, documented historic period activity, and with some disturbance, but not sufficient disturbance to eliminate the possibility that archaeological resources are intact on the project site.
- **High**: Areas with topographical features that would suggest Native American occupation, documented historic period activity, and minimal or no documented disturbance.

As mentioned above, the fourth goal of this study was to make recommendations for additional archaeological investigations where necessary. According to NYAC standards, Phase 1B testing is generally warranted for areas determined to have moderate sensitivity or higher. Archaeological testing is designed to determine the presence or absence of archaeological resources that could be impacted by a proposed project. Should they exist on the project locations, such archaeological resources could provide new insight into the precontact occupation of the Gowanus neighborhood of Brooklyn, the transition from Native American to European settlement, or the historic period occupation of the project site.

C. ARCHAEOLOGICAL SIGNIFICANCE OF THE GOWANUS CANAL BULKHEAD

The Gowanus Canal Bulkhead has been determined eligible for listing on the State and National Registers of Historic Places (S/NR). The eastern and western bulkhead walls of the Canal run through a portion of the project site at Smith Street and the two new outfalls would replace existing outfalls within the bulkhead walls. Based on documentary evidence, the wood retaining structures comprising the bulkhead are not expected to extend more than twenty feet inland of the current bulkhead face. The bulkhead's significance and the segments considered sensitive are described in greater detail below.

SIGNIFICANCE OF THE GOWANUS CANAL BULKHEAD

In 2004, on behalf of the United States Army Corps of Engineers (USACE), Hunter Research, Inc. ("Hunter"), Hunter Research, Raber Associates, and Northern Ecological Associates, Inc. completed a document entitled *National Register of Historic Places Eligibility Evaluation and Cultural Resources Assessment for the Gowanus Canal* in connection with their Proposed Ecosystem Restoration Study. This document presented the history of the Gowanus area and delineated a Potential Gowanus Canal Historic District, which the New York State Historic Preservation Office (SHPO) subsequently determined to be eligible for listing on the State and National Registers of Historic Places ("S/NR"). The Gowanus Canal bulkhead was identified in the 2004 Hunter, et al. report as contributing to the S/NR-eligible Gowanus Canal Historic District.

According to the 2004 Hunter, et al. report, the Gowanus Canal is approximately 5,470 feet long and 100 feet wide, and encompasses about 11,200 linear feet of bulkhead. The report stated that during the earliest period of Gowanus Canal construction in the 1850s, timber sheet piling was used to create the Canal bulkheads. However, "timber cribwork was the preferred and principal type of Gowanus Canal bulkhead beginning in the mid-1860s, and probably replaced most of the early sheet pile construction" (Hunter, et

al. 2004: 3-2). None of the original timber sheet pile construction appears to remain intact today. Timber "cribwork" is estimated to comprise over 70 percent of the total existing bulkhead along the Canal.

The archaeological value of the bulkheads was described in the report as follows:

> *Cribwork bottoms could include new information on vernacular adaptations of a well-established bulkhead form to marsh conditions. It is also possible that fill material in cribwork bulkheads might allow for relative dating of bulkhead sections, and for additional information on fill material sources* (Hunter, et al. 2004: 4-8).

ASSESSMENT OF GOWANUS CANAL BULKHEADS

The 2004 Hunter, et al. report did not identify contributing and non-contributing sections of bulkhead; however, it did acknowledge that the age, construction type, and integrity of the bulkhead varies by canal segment. The report includes a map of the Canal with bulkhead construction types identified based on low water inspection. It was estimated that "bulkheads with confirmed timber cribwork components total 69% of inspected project areas, with probable cribwork foundations covered with rip-rap comprising another 4%" (Hunter, et al. 2004:3-6). Other portions of the bulkhead consisted of concrete, steel sheet piling, and wood piles. In December 2010, John Milner Associates, Inc. (JMA) and Douglas C. MacVarish prepared *Gowanus Canal Preliminary Bulkhead Study*, commissioned by the Environmental Protection Agency (EPA). This study reviewed the bulkhead typology presented in the 2004 report, presenting Adam Brown's 2000 bulkhead types, and restated the 2004 report's conclusion that the bulkhead system as a whole constitutes a contributing feature within the Historic District. The report went beyond the conclusions of the SHPO-approved 2004 report to make a general recommendation "that all portions of the bulkhead that can be dated to before 1960 be considered" S/NR-eligible (JMA 2010: 22). In general, the Gowanus Canal bulkhead has been determined to extend approximately 20 feet below mean low water level, with four or five additional feet above the low water mark. The horizontal extent of the bulkhead, from the canal landward, is generally between 14 and 20 feet (JMA 2010). Later repairs to the Canal bulkhead consist of concrete, steel sheet piling, and wood piles.

ASSESSMENT OF PROJECT SITE BULKHEADS

The 2004 Hunter, et al. report does not include the bulkheads in the line of 9th Street in its analysis, presumably because of the alterations to the bulkhead in this area associated with the construction of the existing 9th Street Bridge. The report does identify Steel Sheet and Timber Sheet piling immediately north of the bridge on the west side, near the proposed outfall. On the east side of the Canal, the report identifies "timber cribwork with intact faces above mean low water"; however, this location is north of the proposed outfall location to the east of the Canal (Hunter, et al. 2004: 3-3). To the south of 9th Street on both the east and west sides of the Canal, Hunter identified the bulkhead walls as "timber cribwork with new/recent sections above mean low water" (ibid). It therefore does not appear that the proposed project would result in impacts on the historically significant portions of the Gowanus Canal bulkhead.

D. SUMMARY OF PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS OF THE PROJECT SITE AND VICINITY

Many archaeological investigations have been completed in the immediate vicinity of the project site and limited archaeological monitoring was completed within the project site itself. These investigations are summarized in greater detail in this chapter. Only those investigations with specific relevance to the project site are listed here; a thorough and complete list of archaeological investigations in the general Gowanus area can be found in Hunter (2011) and Dietrich and Loorya (2012). Several additional investigations that were completed in the vicinity, but that focused solely on the conditions of the Gowanus Canal bulkhead, are not included here.

ARCHAEOLOGICAL SENSITIVITY STUDY OF THE GOWANUS CANAL

In 2011, Hunter conducted an extensive archaeological sensitivity study of the area surrounding the Gowanus Canal (Hunter 2011). This report followed a similar study completed by Hunter in 2004. Though the study did not focus explicitly on streetbeds, it did include the location of the project site in its entirety and also included extensive background information regarding the surrounding area, including the Battle of Long Island and the alleged burial of soldiers in the vicinity of the project site. The study identified numerous areas of archaeological sensitivity throughout the study area, though none were in the location of the project site. The study identified two potential locations that may have been used as a burial ground following the Battle of Long Island in 1776. The first is in the area between 7th and 8th Streets and 3rd Avenue and 4th Avenue; this location represents the commonly reported location of the burial ground based on Field's 1869 map of the Battle of Brooklyn. The second is in the vicinity of the block bounded by 1st Street and 2nd Street, between the Gowanus Canal and 3rd Avenue, in the vicinity of the burial location as depicted by Fraser (1909). The Hunter study identifies other areas of sensitivity associated with historic mills and mill dams, the bulkhead walls lining the Gowanus Canal, and sunken ships. The 2011 Hunter study did note the presence of the Cole's Mill Dam tide mill complex in the location of the western portion of the project site. However, the report concluded that this location was not sensitive as a result of extensive disturbance caused by the construction and maintenance of the 9th Street elevated viaduct and piers as well as the footings for the 9th Street Bridge over the Gowanus Canal.

GOWANUS CANAL AREA HISTORIC RESOURCES INVENTORY AND LIMITED PHASE 1A DOCUMENTARY AND ARCHAEOLOGICAL SENSITIVITY REPORT

In 2012, architectural historian Gregory G. Dietrich and archaeologist Alyssa Loorya authored an extensive architectural and archaeological resources assessment of the area surrounding the Gowanus Canal on behalf of a local community group known as Friends & Residents of Greater Gowanus. Like the 2011 Hunter Research study, the project site was included within the study area assessed by Dietrich and Loorya; however, that investigation did not specifically investigate the archaeological sensitivity of the streetbed itself. The report also included extensive background information on the Battle of Long Island and the alleged burial location of the Maryland soldiers who perished in 1776. Dietrich and Loorya identified an alternate location for the reported burial ground, and suspected that it was one block to the west of the traditionally reported site, in the area by 6th Street, 8th Street, 2nd Avenue, and 3rd Avenue. This report makes reference to Cole's Mill, but does not summarize its history nor does it identify it as an area of archaeological sensitivity. Finally, the report assessed the archaeological sensitivity of three sites along the northern side of 9th Street between 3rd Avenue and the Gowanus Canal (adjacent to the project site), which were determined to have no to low archaeological sensitivity.

PROPOSED KINDERGARTEN CENTER AT 168 8TH STREET PHASE 1A STUDY

In May 2016, AKRF prepared a Phase 1A study for the site of a proposed new school located on 8th Street between 3rd and 4th Avenues in Brooklyn. The report summarizes the history of that site, which has been identified by representatives of local community groups as a Revolutionary War burial ground. Extensive documentary research was conducted; however, no primary source documentation could be located to confirm that the site had ever been used as a burial ground. The report incorporated research independently conducted by William J. Parry, Ph.D., a professor of archaeology at Hunter College of the City University of New York and a board member of the Old Stone House in Brooklyn (Parry 2016). Dr. Parry's research revealed no indication that the burial of soldiers killed in action actually occurred in the vicinity of the project site. Furthermore, Dr. Parry presented evidence that far fewer men were killed on the battlefield than has been reported, with many only having been wounded during the fighting. Dr. Parry hypothesized that the dead soldiers may have been interred in a family cemetery, such as the one located on the grounds of the Cortelyou House to the northeast of the project site. Dr. Parry concluded that there is not sufficient "evidence to focus on any single site, to the exclusion of others" when

attempting to identify the burials, which he suggests would be "isolated military burials anywhere in the neighborhood" and were likely disturbed by subsequent development (Parry 2016: 10). The Phase 1A determined that the site was not sensitive for precontact archaeological resources, but that it had moderate potential to contain 19th century shaft features (e.g., cisterns, wells, and privies). The report recommended Phase 1B testing on the site to confirm the presence or absence of archaeological resources or evidence.

Chapter 2: Environmental and Physical Settings

A. CURRENT CONDITIONS

The project site is currently occupied by active streetbeds, each of which contains various utility lines (see **Appendix A** and **Photographs 1** through **6**). The proposed outfalls will be placed in the location of existing outfalls within the bulkheads on either side of the Canal (see **Photographs 7** and **8**).

B. GEOLOGY AND TOPOGRAPHY

The borough of Brooklyn is found within a geographic bedrock region known as the Atlantic Coastal Plain Province. This has been described as "that portion of the former submerged continental shelf which has been raised above the sea without apparent deformation" (Reeds 1925: 3). Soils on Long Island, on which Kings County is located, are composed of glacial till or undifferentiated sediments such as sand and clay. The Atlantic Coastal Plain is typified by "flat, low-lying" ground "that slopes very gently toward the sea" (Isachsen, et al. 2000: 149). The glacial till was deposited by the massive glaciers that retreated from the area toward the end of the Pleistocene epoch (1.6 million years before present [BP] to approximately 10,000 years BP). There were four major glaciations that affected New York City, culminating approximately 12,000 years ago with the end of the Wisconsin period. During the ice age, a glacial moraine bisected Brooklyn, running in a northeast-southwest direction and marking the location of the southernmost point of the most recent glacial event (Schuberth 1968). The deposition of glacial till in the wake of the retreating glaciers resulted in the creation of sand hills, known as kames, across New York City, some of which rose to heights of one hundred feet.

The landscape surrounding the project site has been significantly modified over the last three centuries as a result of the filling in and channeling of the Gowanus Creek—a large body of water that formerly ran in the vicinity of the modern Canal—the grading associated with the construction of streets in the neighborhood, and residential and industrial development. Before the late-19th century, when the Gowanus Canal was constructed, the project site was inundated by the Gowanus Creek and its associated marshland. As seen on the 1776 Ratzer map (depicting conditions circa 1766), the project site is to the west of a small hill once stood at the edge of the marsh, representing the closest fast (dry) land on the eastern side of the creek (see **Figure 3**). A small area at the western end of the project site, in the vicinity of the intersection of Smith Street and 9th Street, was occupied by a narrow neck of land that extended through the marsh.

The street widths of the project site corridors have remained consistent since at least the 1880s. Current USGS maps indicate that the general elevation of the project site is approximately 10 to 15 feet above mean sea level, with the highest elevation near 2nd Avenue and sloping down to the west (see **Figure 1**). The topography is more level within the portion of the project site on the west side of the Gowanus Canal, where the elevation is at less than 10 feet above mean sea level. The general topography of the site is consistent with that depicted on USGS maps dating back to at least 1897, suggesting that little change has occurred in the last century. As part of this Phase 1A study, a review of historic maps containing historic elevation information was conducted to assess the historic landscape of the project site and its surrounding area. The results of this examination of historic maps and the changes that have been observed in street corner elevations surrounding the project site are presented in **Table 2-1**.

Table 2-1
Street Corner Elevations as Identified on Historic Maps

Map/Year	Map Datum	Elevation (in feet) at the Intersection of:			
		2nd Avenue at 7th Street	2nd Avenue at 8th Street	2nd Avenue at 9th Street	9th Street at Smith Street
1886 Robinson	Above High Tide	11	11.5	11.8	12.1
1898 Ullitz Atlas	*Not included in key*	n/a	8.56	7.46	n/a
1903 Ullitz Atlas	Above High Tide	n/a	10.5	9	9.5
1915 Sanborn Map	*Not included in key*	8	8.5	7.45	9.5
1935 Rock Data Map	Brooklyn Borough Datum	8	8.5	7.3	11.3
1950 Sanborn Map	Above Mean High Tide	8	8	7.5	9.5
2012 Sanborn Map	Above Mean High Tide	8	8	7.5	9.5

Notes: Certain historic maps appear to be depicting the city's legal/proposed grade at these intersections, which may not have been the same as the actual elevation. Only the 1935 Rock Data Map identifies both the legal and actual grades at certain locations.

These street corner elevations indicate that relatively minor fluctuations in street elevation have occurred over the last 130 years, though some discrepancies do exist. Small differences in elevation between historic maps may therefore vary according to the datum[1] that was used to calculate the elevation; the exact point where the elevation was measured, which likely also varied as some cartographers measured the center of intersections and others measured specific street corners; and whether the map was showing the legal (planned) grade established by the city or the actual grade as currently developed at the time. Elevations of the same ground surface taken relative to different datum points will therefore differ despite the fact that they refer to the same location. Therefore, understanding the datum from which an elevation was measured is critically important to an analysis of historic elevation and landscape change.

Datum points have historically been linked to tidal action, with mean sea level representing the average of high and low tide. A committee to plan and construct Brooklyn's streets was established by an act of legislature in 1835 (Koop 1914). Surveyor J.S. Stoddard was hired by the commission to survey the locations of the streets and place monuments with known elevations at planned street corners (ibid). Stoddard's elevations were relative to the Brooklyn Highway Datum, which was "taken from 827 of these monuments [relative] to the highest tidewater mark and mark in feet…[to] aid in the future pitching and grading of the streets" (ibid: 74). However, Stoddard recorded neither his original benchmarks nor information regarding tidal observations (ibid). Stoddard's measurements were then used to establish datum points elsewhere in Brooklyn and as a result, "on account of discrepancies having crept in, the datum points failed to preserve the uniformity" that their creators intended (ibid: 75). The modern Brooklyn Borough Datum is 2.547 feet higher than the National Geodetic Vertical Datum of 1929 (NGVD29), an approximation of mean sea level at Sandy Hook, New Jersey. The NGVD29 datum has largely been replaced by the North American Vertical Datum of 1988 (NAVD88), the 0-point of which is approximately 1.1 feet higher than the 0-point of NGVD29.

The National Oceanic and Atmospheric Administration (NOAA) has calculated that since 1850, the mean sea level near the Battery at the southern end of Manhattan has risen at a rate of approximately 2.84 millimeters per year, or approximately 0.93 feet over the course of a century (NOAA 2013). Therefore, while the location of sea level should not contribute greatly to differences in elevation as depicted on historic maps, some variation may be the result in the change of sea level itself or in inaccurate ways of measuring sea level and high tide during the historic period.

[1] A datum is the point from which surface elevations are measured (where the elevation is considered to be 0).

C. SOILS

The United States Department of Agriculture (USDA) Web Soil Survey[1] indicates that the majority of the project site is characterized by a soil complex known as "Urban Land, Reclaimed Substratum (UrA)." The extreme western portion of the project site is in the vicinity of two additional soil complexes: the "Urban Land-Greenbelt Complex (UGB)" and the "Urban Land, Till Substratum Complex (UtB)." These soil types are composed of minor components associated with other soil types, including the Ebbets, LaGuardia, and Greenbelt soil complexes with small portions of other soil types. These soil types are described in greater detail in **Table 2-2** and are depicted in **Figure 4**.

Table 2-2
Project Area Soils

Series Name	Soil Horizon Depth (in inches)	Texture, Inclusions	Slope (%)	Drainage	Landform
Urban Land, Reclaimed Substratum	**M**: 0 to 15	Cemented Material	0 to 3	Unknown	Summit
	2^C: 15 to 79	Gravelly Sandy Loam			
Urban Land, Till Substratum	**M**: 0 to 15	Cemented Material	3 to 8	Unknown	Summit
	2^C: 15 to 79	Gravelly Sandy Loam			
Ebbets	**A**: 0 to 4	Loamy fill with construction debris	0 to 8	Well-drained	Anthropogenic urban fill plains
	Bw: 4 to 8				
	C1: 8 to 60				
Greenbelt	**^A**: 0 to 5	Loam	3 to 8	Well-drained	Summit, backslope, footslope
	^Bw1: 5 to 16	Loam			
	^Bw2: 16 to 30	Loam			
	^C: 30 to 79	Sandy Loam			
LaGuardia	**A**: 0 to 8	Fill materials; gravelly sandy loam	0 to 8	Well-drained	Modified landscapes near urban centers
	Bw: 8 to 26				
	C: 26 to 79				

Sources: USDA web soil survey, accessed January 2017.

A series of soil borings along the proposed project corridor was completed by DDC in 2015 (see **Appendix B**). The borings indicate that the entire project corridor is covered with a layer of fill material measuring between approximately 8 and 20 feet below the ground surface. Many of the borings to the east of the Gowanus Canal showed evidence of peat layers which likely denote the bottom of the marshes that formerly occupied the majority of the site. Peat was identified within the streetbed of 9th Street at depths of 10 to 15 feet below the ground surface and within 2nd Avenue at depths between 12 and 17 feet. West of the Canal, two borings—one within Smith Street south of 9th Street and one in the location of the new outfall north of 9th Street near the Canal—included evidence of peat. As there was some dry land west of the Canal, less peat is expected in this location. The boring within Smith Street included only "little peat" mixed with silt and roots at a depth of 11 feet below the ground surface. The boring in the vicinity of the outfall identified a gray brown silty clay layer with peat at a depth of 20 feet and a layer of brown peat at a depth of 30 feet. Another series of older soil borings is included in the 1935 Rock Data Map; however, those boring logs do not differentiate between mud and peat and are therefore less useful.

[1] Accessed through: https://websoilsurvey.sc.egov.usda.gov/.

Chapter 3: Precontact Period

A. PREVIOUSLY IDENTIFIED NATIVE AMERICAN ARCHAEOLOGICAL SITES NEAR THE PROJECT SITE

In general, Native American habitation sites in the northeastern United States are most often located in coastal areas with access to marine resources, and near fresh water sources and areas of high elevation and level slopes not exceeding 10 to 12 percent (NYAC 1994). The potential presence of Native American activity near a project site is further indicated by the number of precontact archaeological sites that have been previously identified in the vicinity of a project site. Information regarding such previously identified archaeological sites was obtained from various locations including the site files of OPRHP and NYSM—accessed through the Cultural Resource Information System (CRIS) database,[1] and other published accounts.

The project site is not included within a generalized area of archaeological sensitivity as mapped by OPRHP in the CRIS database. Two precontact archaeological sites exist within 1.0 mile of the project site, as summarized in **Table 3-1**. In addition, other sources (e.g., Bolton 1922 and 1934; Parker 1920) document Native American sites in the general vicinity of the project site. Additional Native American sites were identified between 1 and 2 miles south of the project site, near the shores of the Gowanus Bay in the vicinity of what is now the Sunset Park neighborhood of Brooklyn (Bolton 1922).

Table 3-1
Previously Identified Precontact Archaeological Sites

Site Name and Number	Approximate Distance from Project Site	Time Period	Site Type and Information	Other Reference(s)
NYSM Site 3606 Parker (1920) Site 2	1 mile (5,280 feet)	Woodland	Camp or village	
Native American Burial OPRHP Site A04701.017322	0.85 miles (4,200 feet)	Precontact	Human burial encountered by a private landowner. Burial included clam and oyster shell and possibly red ochre.	
Werpoes Bolton (1922) Site 67	0.85 miles (4,200 feet)	Precontact	Village and maize field	Bolton 1922
Sassian's Maize Land Bolton (1922)	0.6 miles (3,250 feet)	Precontact	Planting field	Bolton 1922 Grumet 1981

Source: New York State Cultural Resource Information System (https://cris.parks.ny.gov); Bolton 1922 and 1934; and Grumet 1981.

As seen on Bolton's 1922 map of Native American sites and trails, the largest village site near the project site was *Werpos*, situated near the intersection of Hoyt and Baltic Streets, approximately 0.85 miles northeast of the project site near what was originally the northern terminus of the stream that was subsequently converted into the Gowanus Canal (Bolton 1922, Bolton 1934). The village was on the western side of the creek that originally ran through the area and was therefore on the opposite shore from the project site. Bolton indicated that the village was abandoned shortly after European settlement and that the village was originally inhabited by the Manhattan Indians (Bolton 1922). The same group maintained a second village also called *Werpos* within what is now Greenwich Village in Manhattan

[1] https://cris.parks.ny.gov.

(ibid). In 2004, the New York City Office of the Chief Medical Examiner (OCME) reported to OPRHP that the skeleton of a male Native American had been discovered on private property in the immediate vicinity of the village of Werpos (OPRHP Site A04701.017322). The burial was found in a context with clam and oyster shells and red ochre (Adams 2004).

A large maize planting field was situated immediately to the northwest of the village (ibid). A trail extended southwest from this site and Bolton's map indicates that another Native American settlement was situated along this branch (Bolton 1922). It is possible that the southern site was a planting field known as "Sassian's Maize Land" (Grumet 1981: 50). Another Native American trail, later known as Gowanus Road, extended along the southeastern side of the Gowanus Creek from a point near modern Atlantic Avenue to settlements along the Gowanus Bay to the south of the project site. At its closest point, the trail was several blocks to the east of the project site in the vicinity of what is now 5th Avenue.

B. PRECONTACT ARCHAEOLOGICAL SENSITIVITY

As described above, Native American activity has been documented to the northeast of the project site. While no sites have been documented on the southern or eastern sides of the Gowanus Creek, it is highly likely that Native Americans used the marshes in the vicinity of the project site as an important source of plant and animal food resources and it is likely that habitation sites were present on the eastern side of the creek. Marine life and wild game would have been abundant in this area during the precontact period, making western Brooklyn attractive to Native Americans. However, the project site was almost entirely inundated by the Gowanus Creek and its associated marshland. While it is possible that intact precontact ground surface may exist at very great depths that pre-date the formation of the marshes, the proposed project is not expected to penetrate those potential ground surfaces.

Chapter 4: The Historic Period

A. THE EARLY HISTORY OF THE PROJECT SITE

New York was "discovered" by Giovanni de Verrazano in 1524 and explored by Henry Hudson in 1609, thus marking the beginning of European occupation in the area. Hudson described the Brooklyn Heights neighborhood to the north of the project site as having "magnificent forests gorgeous with autumnal hues" (Stiles 1867: 9). By 1621, the area had become part of a Dutch colony and the States-General in the Netherlands chartered the Dutch West India Company ("WIC") to consolidate Dutch activities in the New World. It was at this time that the WIC began to purchase large tracts of land from the Native Americans. The WIC began to purchase land in northwest Brooklyn in the late 1630s (Bolton 1975). It has been speculated that the sale of Brooklyn land "saved New Netherland from being abandoned by the West India Company" (Armbruster 1918: 3). After the WIC purchased the land from the local Native Americans, they in turn granted it to European settlers.

The western end of Long Island was settled in the first half of the 17th century by predominantly Dutch and Walloon (French Protestants from Belgium who fled to escape persecution) families. In 1638, land was granted to any individual who promised to establish a farm in the area (Armbruster 1918). Six independent towns were established in the second and third quarters of the century. One of these was Brooklyn, where the project site was located. Brooklyn was first settled in the 1640s, although not formally organized until 1746. While at first the WIC granted patroonships—a patroon was the "feudal chief" of a small colony of fifty or more individuals (Stiles 1867: 20)—they found that farms were more successful if the land was granted directly to individual farmers. Therefore, the land was given the name Brooklyn, which is derived from the Dutch Bruijkleen, meaning "a free loan, given to a tenant or user for a certain consideration" (Armbruster 1914: 20). The name went through several changes throughout the Dutch and English colonial periods—from Bruijkleen to Breukelen to Brookland and, finally, to Brooklyn. English settlements were established throughout Brooklyn during the mid-1600s. In 1664, the English took control of the colony and it was renamed "New York." As described in **Chapter 2, "Environmental and Physical Settings**," the 1776 Ratzer map, depicting conditions in 1766, indicates that the project site was inundated by the Gowanus Creek and its associated marshes. The dry land to the east and west of the marshes was occupied by farms and small homesteads in the time leading up to the Revolutionary War.

B. THE BATTLE OF BROOKLYN

Like all of what is now New York City, Brooklyn was occupied by the British during the Revolutionary War in the late 18th century. The most prominent battle in the New York region was the Battle of Long Island, also known as the Battle of Brooklyn, which occurred on August 27, 1776. The history of the battle has been extensively documented in both historic sources (e.g., Furman 1824, Ward 1839, Bailey 1840, Onderdonk 1849, Lossing 1850, Stiles 1867, Field 1869, Johnston 1878, and Fraser 1909) and contemporary works (Gallagher 1998, Schecter 2002, and Reno 2008) as well as through archaeological investigations (Hunter Research 2011; Dietrich and Loorya 2012). As such, the history of the complete battle, which was waged across much of Brooklyn as troops moved from east to west, will only be briefly summarized here with a particular focus on the military activity that occurred in the immediate vicinity of the project site.

The Cortelyou House, located to the northeast of the project site near the intersection of what is now 5th Avenue and 3rd Street, has since been reconstructed as the Old Stone House. This house was the scene of some of the battle's most intense fighting (Reno 2008). Around noon on that day, British troops—led by Lord Cornwallis—approached from the north to meet the American troops—led by Lord Stirling—along the Gowanus Road to the east of what is now 5th Avenue. The American soldiers suffered greatly during the fight, and soldiers from Maryland are said to have stayed behind to continue the fight, sacrificing themselves to allow the remaining regiments to retreat (ibid).

Numerous maps were created in the 19th century to depict the sequence of the battle, including the fighting at the Cortelyou House. Stiles' 1867 map depicts the Cortelyou House, but otherwise does not depict battle activity near the project site. Field's 1869 map and Johnston's 1878 map of troop positions and movements both indicate that Stirling's troops retreated west across the swamps in the vicinity of the project site. A map included in Bailey's 1840 history of the battle depicts the location of the Maryland soldiers' defeat further to the northwest, in the location of what was known as Freeke's Mill Pond. As described previously, there has been speculation that these soldiers were buried in a mass grave in the vicinity of the project site. No primary source materials have been located that confirm the presence or location of a mass grave in the vicinity of the project site. Multiple locations have been proposed for the possible cemetery, all of which are east of the project site. The most frequently cited location of the cemetery is on a hill located east of 2nd Avenue. As seen on **Figure 3**, at the time of the Revolutionary War, the project site was inundated marshland and the hill that has been identified as a potential burial location is to the east of the project site (AKRF 2016). While it is known that soldiers retreated across the marshes and that many may have perished in the swamps, it is impossible to say with certainty if the marshes within the project site were the final resting place of any of the soldiers who fought in the battle.

C. THE MILLING INDUSTRY IN THE 18TH CENTURY

Sproule's 1781 map of Brooklyn continues to depict the majority of the project site as inundated with marshland and the waters of the Gowanus Creek. The marshes were heavily utilized by salt hay farmers, but the area soon became a center of milling activity (Hunter 2011). However, the map reflects the construction of a mill and mill dam along the western side of the creek in the vicinity of the project site. This mill is also depicted on the 1782 British Headquarters Map (and the copy made in 1900 by B.F. Stevens). The history of the mill was documented in Hunter's 2011 cultural resource assessment of the Gowanus Canal. As described by Hunter, the mill was founded in the late-18th century by John Rapelje and was later owned and operated by John Coles (Stiles 1867). As described by Stiles (1867):

> *...the mill pond was an artificial work, being excavated out of the marsh, on the side of the Gowanus Kil* [sic]*, by negro labor. Jordan Cole's house was situated on Ninth Street, between Gowanus Canal and Smith street* (Stiles 1867: 67).

A map produced in 1836 prior to the sale of the mill complex (reproduced in Appendix D of the Hunter report) depicts a "mansion" in the center of what is now 9th Street east of Smith Street and the mill itself further to the east, within the line of 9th Street at the Gowanus Canal. The 1821 Randel Map continues to depict the mill, labeled "Cole Mill," at the western end of the project site. The 1836 Colton Map, which identifies "Cole's Mill Pond" and the 1844 Hassler Coastal survey continue to depict Cole's Mill at the western end of the project site (see **Figure 5**).

D. THE CONSTRUCTION OF THE GOWANUS CANAL

In the first half of the early 19th century, Brooklyn's landscape was transformed as farms and large estates were broken up and divided into smaller blocks and lots for residential development. As part of this urban development, the marshes adjoining the Gowanus Creek were filled in to create developable land. Richard Butt's 1846 map of Brooklyn reflects the proposed filling in of the Gowanus Creek marshes and the construction of streets through the newly created land. Similar projections are depicted on

Sidney's 1849 map. In 1849, a 30-foot railroad drawbridge was constructed across the Creek in the vicinity of modern 9th Street (Hunter 2004). The early-to mid-19th century urbanization and industrialization of Brooklyn, then an agricultural suburb, resulted in the construction of the Gowanus Canal, which was planned and built in stages between the 1840s and 1870s (Hunter 2011). The construction and later completion of the Canal resulted in the rapid industrialization of the surrounding neighborhood (ibid).[1]

Connor's 1852 map of Brooklyn reflects the construction of the Canal. While the map does not depict individual building footprints, it does use shading to identify developed areas. The map shows that the project site was developed with buildings to the west of the Gowanus Canal—where 9th Street was then known as "Church Street"—but not to the east of the Canal. Colton's 1855 map similarly uses shading to the depict development on the western side of the creek, but shows that the eastern side was still largely inundated marshland. That map also depicts the drawbridge that crossed the Canal in this location and the rail line that extended down 9th Street in either direction.

A coastal survey produced in 1856 by F.H. Gerdes reflects significant development in the vicinity of the project site. That map depicts 9th Street as a rail corridor throughout the entire length of the project site. The rail line is depicted as running north along 3rd Avenue before turning west down 9th Street and continuing across the Gowanus Creek via bridge. The construction of the Canal's bulkhead walls is visible to the north of the project site, though the Gowanus Creek in the immediate vicinity of the project site appears to have been largely unmodified at the time with the exception of the area immediately surrounding 9th Street. To the west of the creek, the project site is depicted as having been filled in and developed with a number of structures on the north and south sides of the 9th Street rail corridor. On the eastern side of the creek, a large pier or bulkhead is depicted extending north and south of 9th Street. Several larger buildings were constructed south of the rail line as were smaller buildings to the north. To the east, some landfilling is depicted within the former marshes, but the majority of the development was in the vicinity of the original fast land east of 2nd Avenue. When it was constructed circa 1840, 3rd Avenue was among the first roads to be opened through the area and the Gerdes survey depicts it as a major corridor (Stiles 1869).

Dripps' 1869 atlas of Brooklyn reflects the completion of the Gowanus Canal's construction. At that time, 9th Street was still an active rail corridor. The properties adjacent to the street were developed with numerous buildings used for industrial purposes, including coal yards. Along the waterfront to the east of the Canal were additional industrial enterprises, including a saw mill. The land south of 9th Street between 1st and 2nd Avenues was undeveloped at that time, and only a handful of historic lots were developed along the north site. At this time, 2nd Avenue was largely undeveloped between 7th and 9th Streets, likely due to the presence of basins extending east of the Canal near 7th and 6th Streets. Bromley's 1880 atlas and Hopkins 1880 atlas both depict the project site in a nearly identical manner as the 1869 Dripps map. Those maps depict little development along 2nd Avenue and a small number of developed lots on the north side of 9th Street. The streetcar line continued to run along 9th Street, but only as far west as the Canal. To the south of 9th Street, a cloth or hat factory and several houses had been constructed. On the western side of the Canal, the area continued to be used for industrial purposes, largely associated with the coal and sulphur industries. The Hopkins atlas also depicts a 6-inch water line within a portion of 9th Street west of 2nd Avenue.

Robinson's 1886 atlas of Brooklyn (see **Figure 6**) reflects additional development surrounding the project site, but few changes are shown to the streetbeds of 9th Street or 2nd Avenue. The map depicts the construction of a water line in 9th Street west of the Canal. Additional industrial and residential structures

[1] The history and influence of the Gowanus Canal are summarized in greater detail in Hunter (2011) and Dietrich and Loorya (2012).

were constructed along 9th Street between the Canal and 2nd Avenue and along 2nd Avenue between 7th and 9th Streets. This stretch of 2nd Avenue does not appear to have been developed with water or sewer lines at this time. A Sanborn map published the same year depicts a 6-inch water line and a series of hydrants within 9th Street, but does not depict utilities within 2nd Avenue. By the publication of the 1898 and 1903 Hyde atlases of Brooklyn, however, many more utility lines had been installed within the streetbeds of both 2nd Avenue and 9th Street.

E. THE PROJECT SITE IN THE 20TH CENTURY

A Sanborn map published in 1904 depicts a small wood frame "bridgemaster's house" within the streetbed of 9th Street on the west side of the Canal. The 9th Street Bridge was replaced with a bascule bridge in 1905 (Hunter 2004). The 1908 Bromley and 1916 Hyde atlases of Brooklyn depict few changes to the street corridors included within the project site. Both maps continue to show the streets as active streetcar corridors with numerous subsurface utilities. The 1915 Sanborn map does not depict any additional changes to the streetbeds within the project site. While the map continues to depict a structure associated with a "bridge tender" slightly to the south of that seen on the 1904 Sanborn, the map does not depict the 9th Street Bridge itself.

By 1929, streetcars began to be replaced by a network of subways, and the surface lines in the vicinity of the project site were slated to be replaced. The 1929 Bromley atlas of Brooklyn continues to depict streetcar lines within the streetbed of 9th Street, but notes that an elevated subway line was to be constructed through the area. The first elevated subway bridge in this area was constructed in 1933 (Hunter 2004). The elevated structure is depicted on the 1939 Sanborn map of Brooklyn. That map also depicts a "lift bridge" across the Gowanus Canal along the line of 9th Street. Sanborn maps published in 1950 do not depict any additional changes to the project corridor. The elevated subway bridge along 9th Street was replaced in the late-20th century (ibid). The project corridor has remained an active roadway since that time.

Chapter 5: Conclusions and Recommendations

A. SENSITIVITY ASSESSMENT

As part of the background research for this Phase 1A Archaeological Documentary Study, various primary and secondary resources were analyzed, including historic maps and atlases, historic photographs and lithographs, newspaper articles, and local histories. The information provided by these sources was analyzed to reach the following conclusions.

DISTURBANCE ASSESSMENT

The locations of the project site streetbeds have all been disturbed to some extent as a result of the construction of the streets and grading and paving associated with street maintenance. The project site has also experienced disturbance as a result of the construction and demolition of bridges, street car lines, and roads. It is assumed that all of the streetbeds are disturbed to depths of approximately 1 to 1.5 feet below the existing streetbeds. In addition, all of the project site streetbeds have been disturbed to greater depths during the installation of utilities. It is assumed that the locations of any existing utilities are considered to be disturbed from the ground surface to a depth of one to two feet below the bottom of the utility line and to a distance of one to two feet on either side, beyond the outer edges of each utility line, representing the trench that was likely dug as part of the line's installation. Any location where no utilities are present or where there is a space of five feet or more between the outer edges of existing utilities should be considered undisturbed. Those locations beneath the disturbed portions of existing utility trenches are also considered undisturbed. The proposed outfalls are replacing existing outfalls and therefore, those portions of the project site are considered to be extensively disturbed.

PRECONTACT SENSITIVITY ASSESSMENT

The precontact sensitivity of project sites in New York City is generally evaluated by a site's proximity to level slopes, water courses, well-drained soils, and previously identified precontact archaeological sites. The project site is situated on a peninsula near tidal marshland and high ground, and would therefore have been an ideal site for camping or hunting and gathering, or permanent occupation. The majority of the project site was formerly inundated marshland. The project site has experienced substantial disturbance as a result of the construction, grading, and paving of streets, the installation of utilities, and the construction of bulkheads and bridges. Prior to the rise of sea levels, it is likely that the locations of the former marshland were exposed to the air and were used as Native American living surface before being inundated. However, these deposits are very deeply buried and would be expected to be located beneath the peat layers that were identified in soil borings at depths of 10 to 17 feet beneath the ground surface across the project site. The proposed project is not expected to result in impacts on potentially deeply buried soil layers. Therefore, the project site is determined to have low sensitivity for precontact archaeological resources.

HISTORIC SENSITIVITY ASSESSMENT

The portion of the project site situated to the east of the Canal was inundated marshland until the mid-19th century, when the construction of the Gowanus Canal resulted in the rapid industrial development of the area. No map-documented structures have been identified within this portion of the project site, which remained an active rail and road corridor throughout the historic period after it was filled. Finally, the area contains existing utilities in close proximity to the locations of proposed utilities. On the western side of

the Canal, the streetbed of 9th Street was formerly the site of the Cole's Mill complex, which included a mansion and a mill within the streetbed. Hunter's 2011 archaeological assessment determined that the location of Cole's Mill was not sensitive as a result of extensive disturbance associated with the construction of the existing 9th Street Bridge and the construction of several previous bridges in the same location. The construction of the existing elevated subway trestle would also have resulted in disturbance to the area. Finally, the proposed utilities are in close proximity to existing utilities (see **Appendix A**). Therefore, the project site is determined to have low sensitivity for archaeological resources dating to the historic period.

B. RECOMMENDATIONS

The project site is determined to have low sensitivity for archaeological resources dating to both the precontact and historic periods. Therefore, no additional archaeological analysis is recommended.

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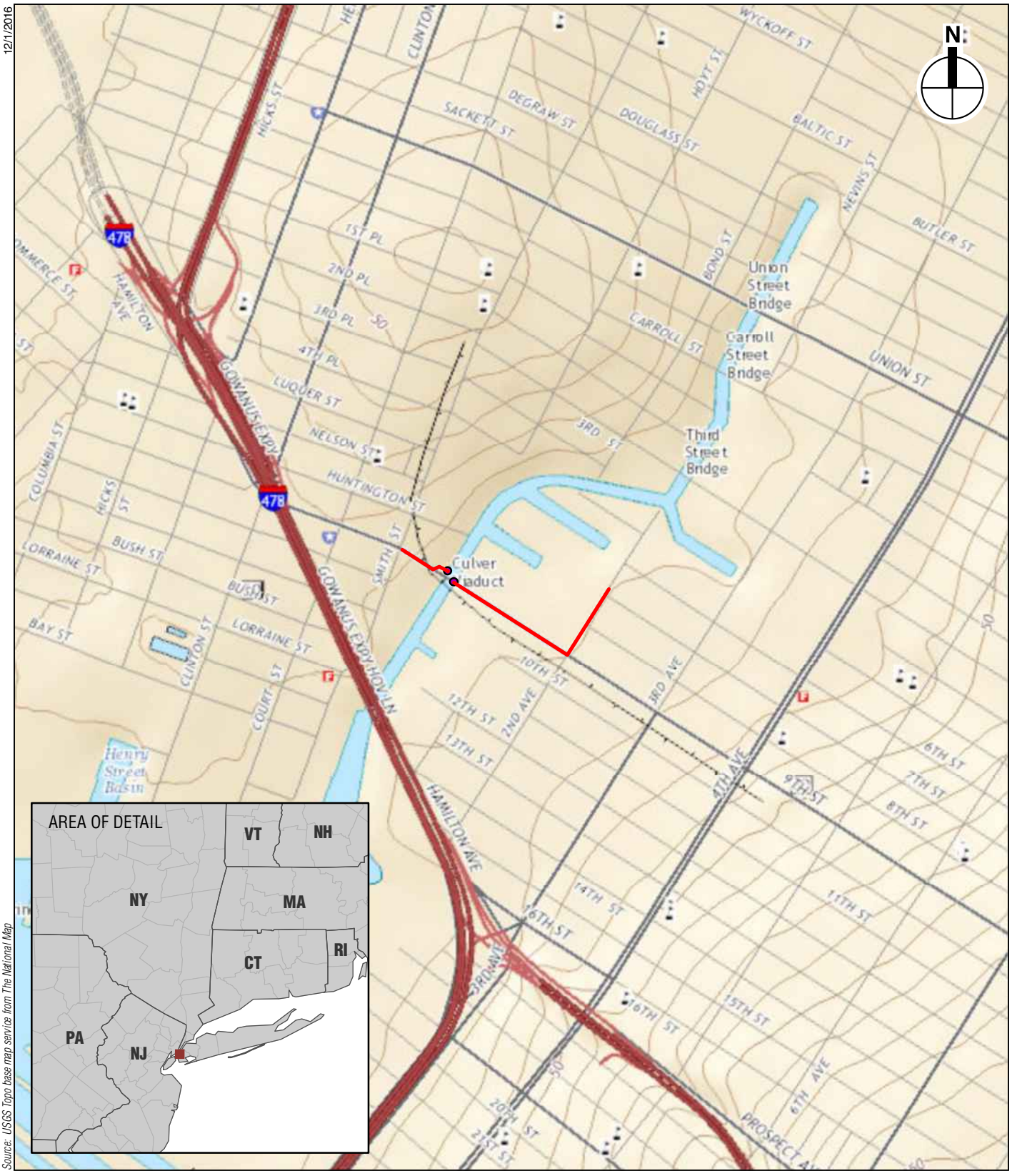


Project Sites

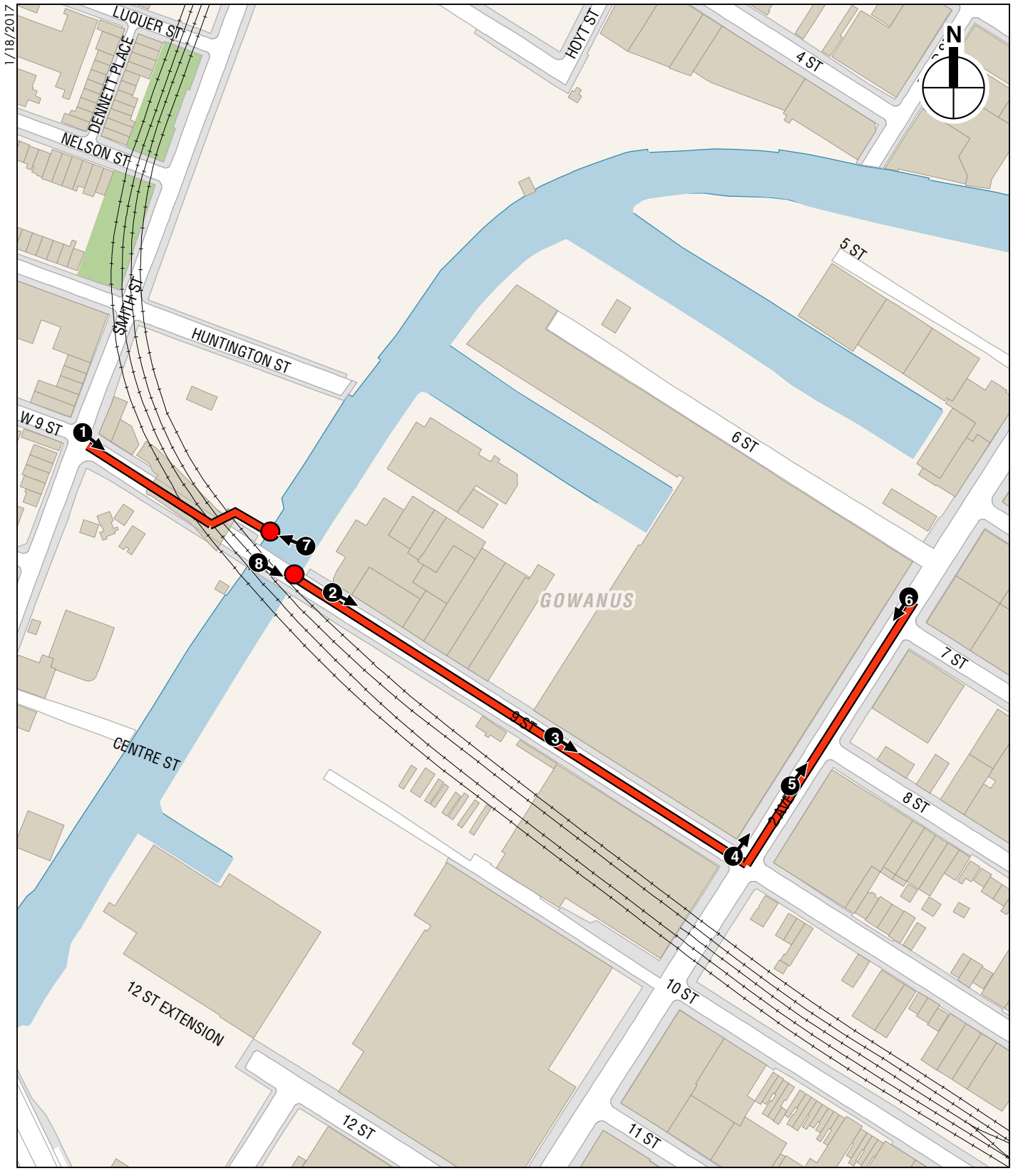
Proposed Outfall Replacement

0 2,000 FEET

Approximate coordinates of Project Site:
73°59'41"W 40°40'26"N

9th Street Infrastructure Improvements
NYC DDC Capital Project No. SEK-20068

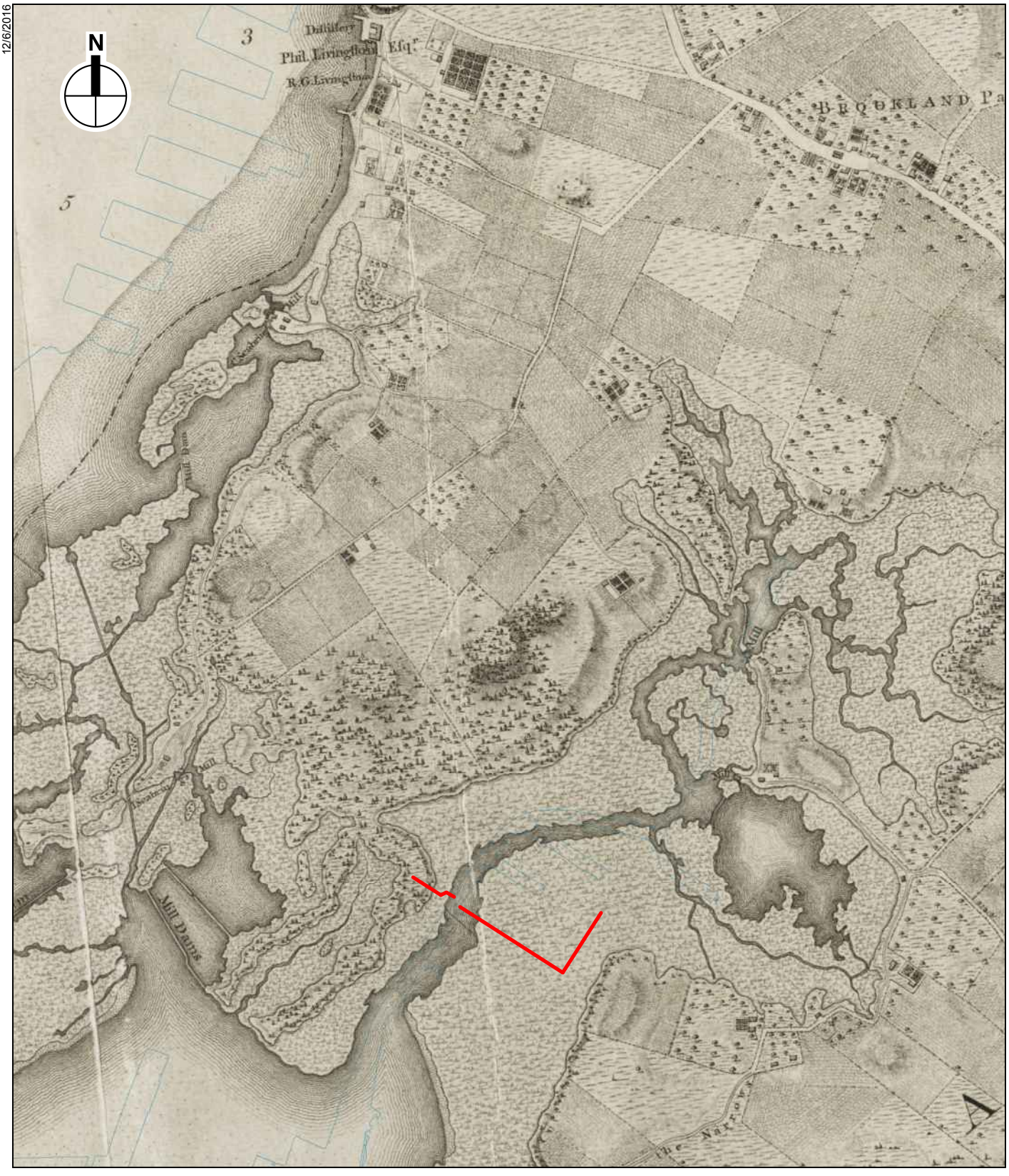
USGS 7.5 Minute Topographic Map
Brooklyn Quad
Figure 1



9th Street Infrastructure Improvements
NYC DDC Capital Project No. SEK-20068

Proposed Project Corridor
Figure 2

12/6/2016



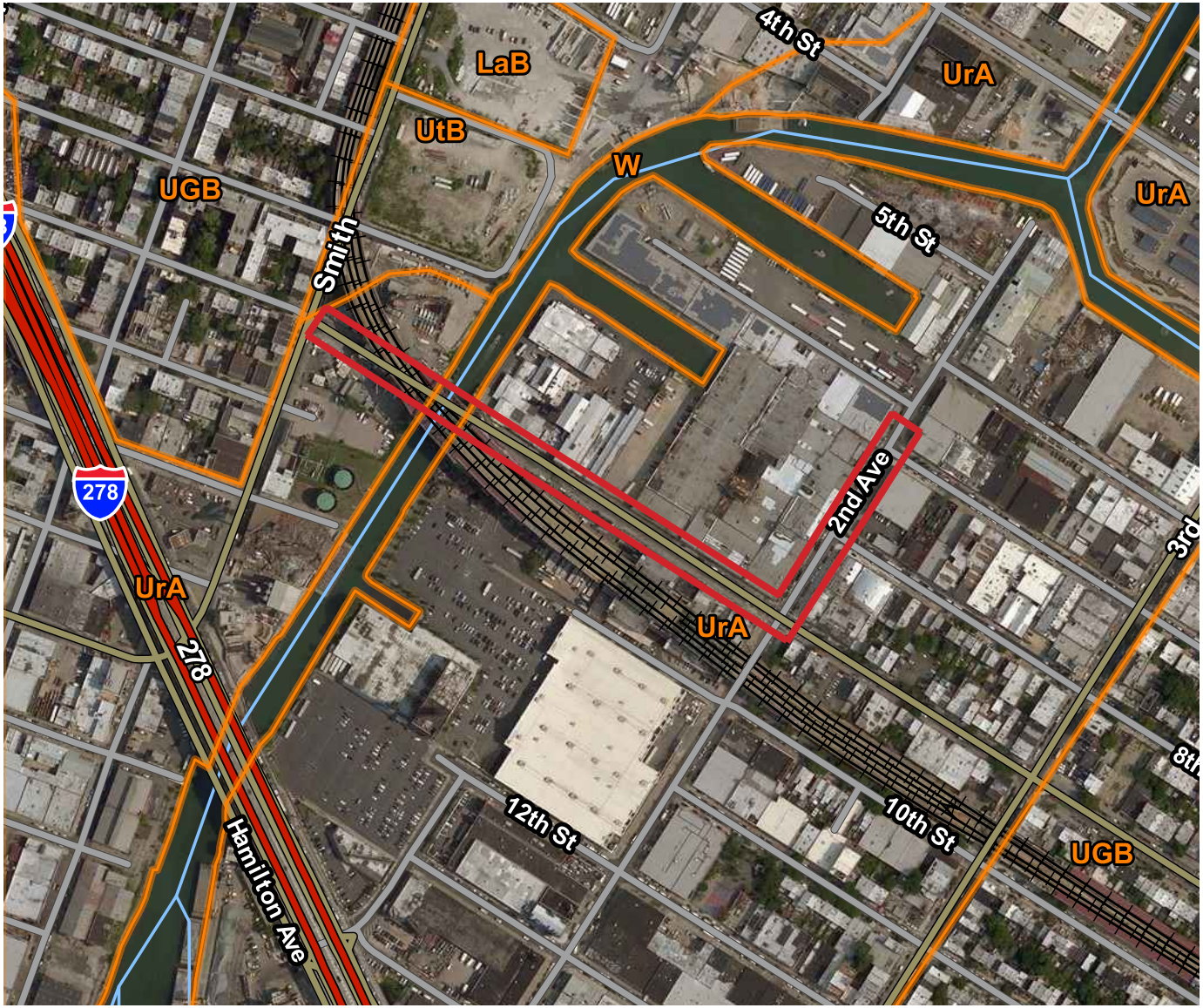
Project Sites

0 1,000 FEET

9th Street Infrastructure Improvements
NYC DDC Capital Project No. SEK-20068

1776 Ratzer Map
Figure 3

1.18.17



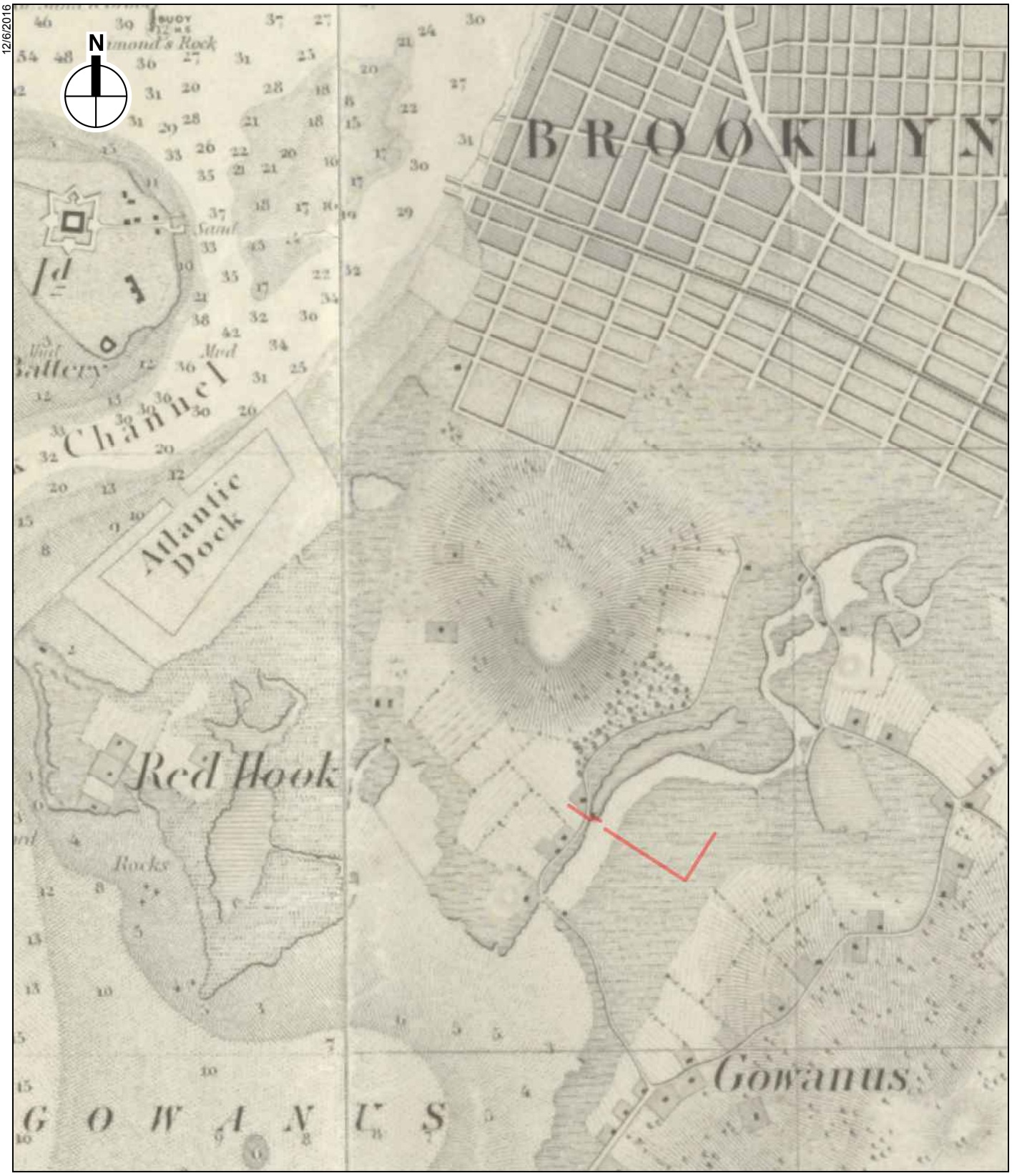
Source: *USDA Web Soil Survey*

Approximate Location of Project Corridor

9th Street Infrastructure Improvements
NYC DDC Capital Project No. SEK-20068

USDA Soils Map
Figure 4

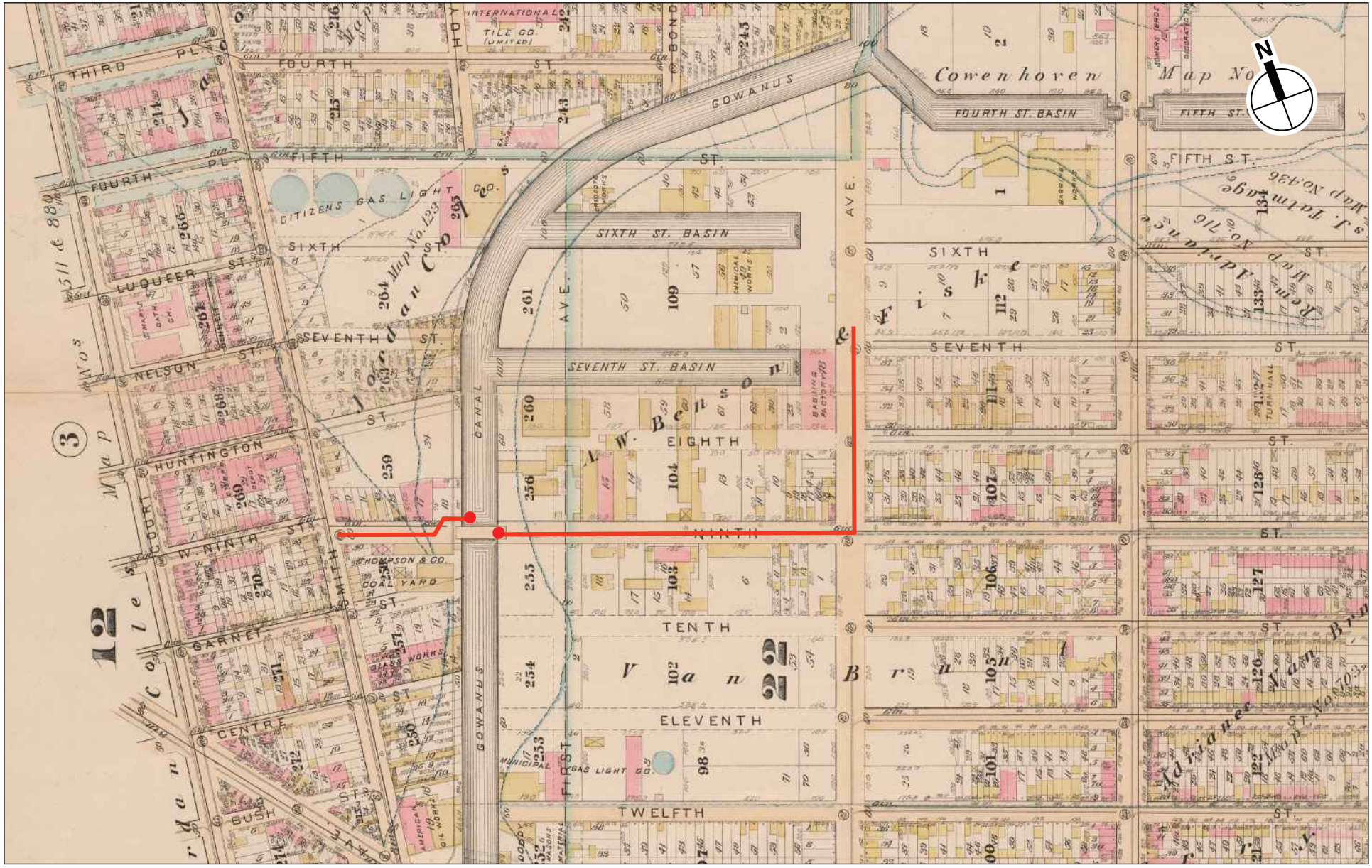
12/6/2016



9th Street Infrastructure Improvements
NYC DDC Capital Project No. SEK-20068

1844-1845 Hassler Coastal Survey
Figure 5

12.2.16



9th Street Infrastructure Improvements
NYC DDC Capital Project No. SEK-20068

1886 Robinson Atlas

Figure 6

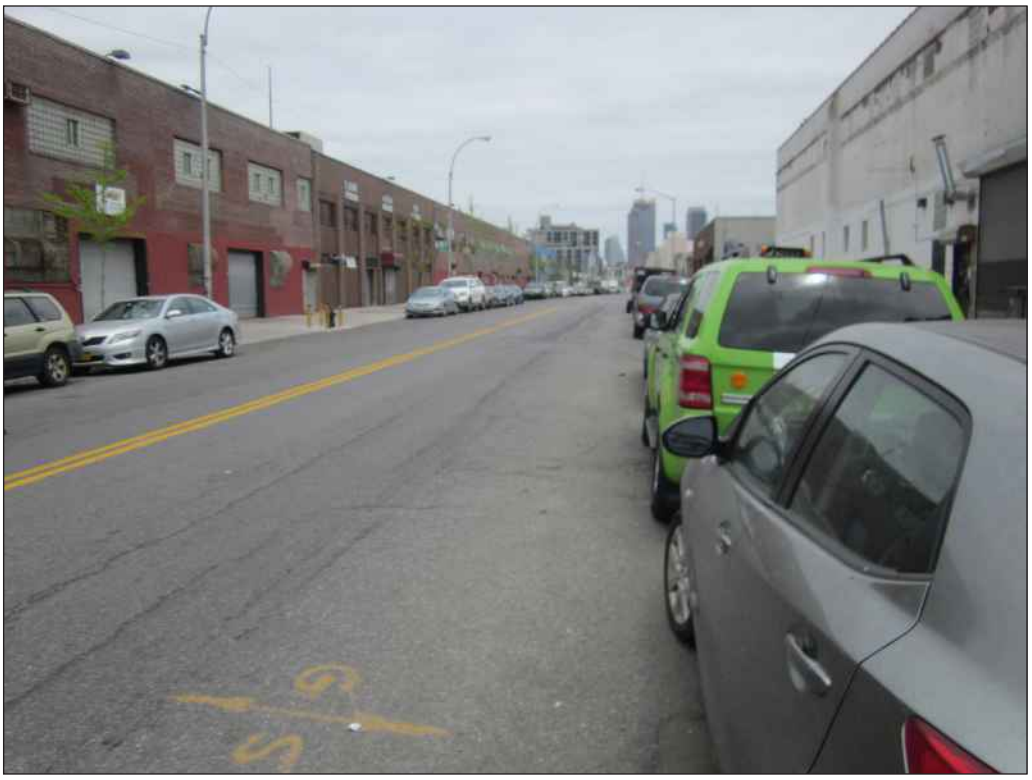
Photographs

View of 9th Street looking east towards the Gowanus Canal from a point east of Smith Street, beneath the 9th Street Bridge. **1**

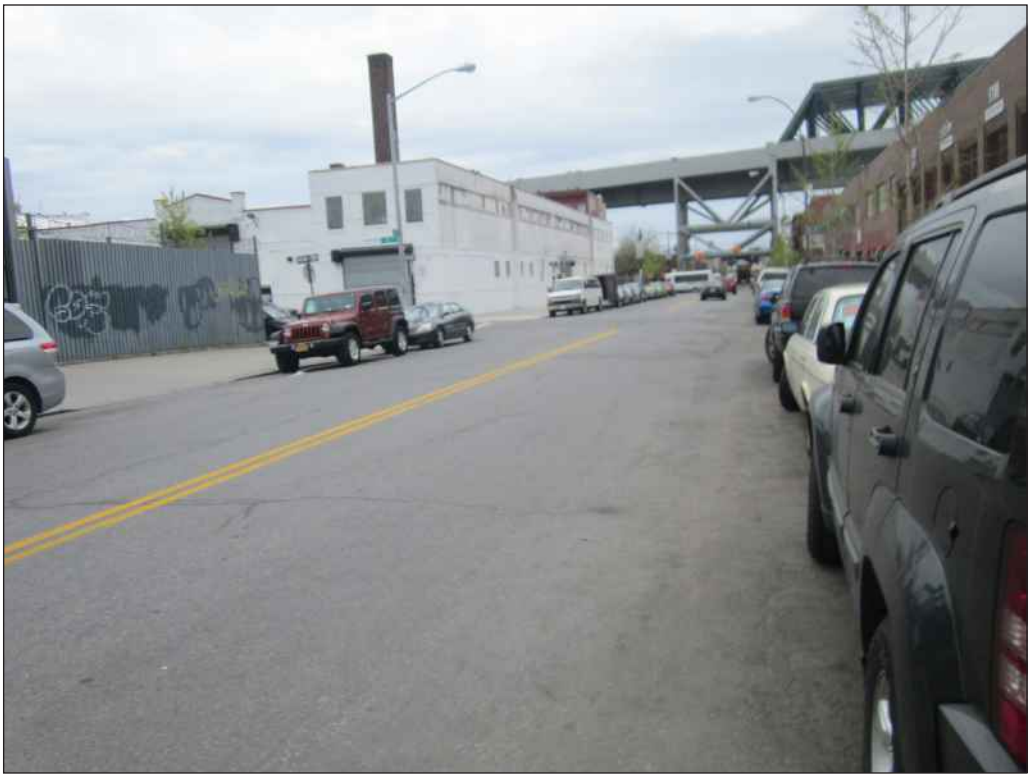
Looking east along 9th Street from a point near the eastern side of the Canal. **2**

View east along 9th Street towards 2nd Avenue. **3**

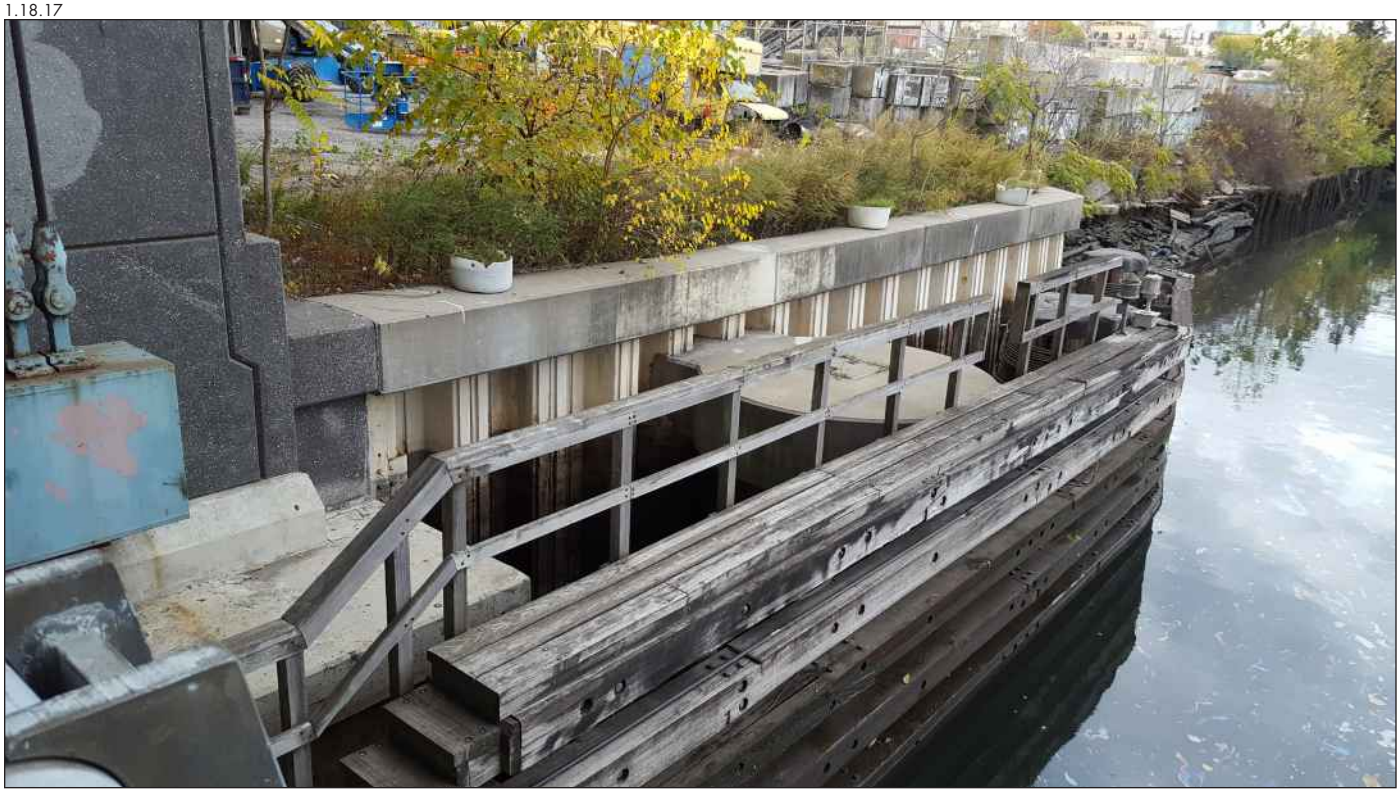
View of 2nd Avenue looking north from 9th Street. **4**



View north along 2nd Avenue looking towards 8th Street. **5**



Looking south along 2nd Avenue from a point near 7th Street. **6**



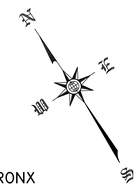
Location of the outfall on the west side of the canal **7**

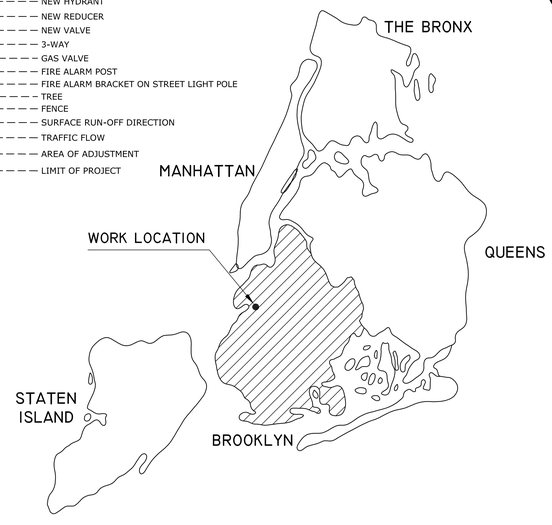
Location of the outfall on the east side of the canal **8**

Appendix A: Project Drawings

LEGEND

P.C. — POINT OF CURVATURE
P.I. — POINT OF INTERSECTION
P.T. — POINT OF TANGENCY
R. — RADIUS
△ — ANGLE OF DEFLECTION
DIA. — DIAMETER
C.L. — CENTER LINE
INV. EL. — INVERT ELEVATION
BLDG. LINE — BUILDING LINE
INT. SWR. — INTERCEPTING SEWER
COMB. SWR. — COMBINED SEWER
STM. SWR. — STORM SEWER
CL. — CLASS
D.I.P. — DUCTILE IRON PIPE
STD. C.I. — STANDARD CAST IRON
E.S.V.P. — EXTRA STRENGTH VITRIFIED PIPE
R.C.P. — REINFORCED CONCRETE PIPE
F.A. — FIRE ALARM
W.P. — WORKING POINT
B.S. — BLUE STONE
B.S.C., B.S.W. — BLUE STONE CURB, BLUE STONE WALK
D.C. — DROPPED CURB
GRAN. BLOCK — GRANITE BLOCK
GRAN. C. — GRANITE CURB
F.T.R.C. — FLAT TOP REINFORCED CONCRETE
P.R.C. — PRECAST REINFORCED CONCRETE
BRK. — BRICK
EXIST. — EXISTING
N.T.S. — NOT TO SCALE
C.C., C.W. — CONCRETE CURB, CONCRETE WALK
CONC. — CONCRETE
BLT. — BUILT
F.D. — FIRE DEPARTMENT
T.S. — TRAFFIC SIGN
CH. — CHAMBER
D.B. — DOUBLE BARREL
MH — MANHOLE
EXISTING SEWER LINE
WATER LINE OR STEAM MAIN
GAS LINE
ELECTRIC
TELEPHONE
FIRE ALARM DUCT
NEW SEWER (UNDER 24"DIA.)
NEW SEWER (24" DIA. & LARGER)
NEW 8" WM
NEW 12" WM
NEW 16" WM
NEW 20" WM
BUILT MANHOLE
NEW MANHOLE
BUILT MANHOLE REPLACED BY NEW MANHOLE
MANHOLE-WATER, ELECTRIC, TELEPHONE, FIRE
EXISTING CATCH BASIN
EXISTING DOUBLE CATCH BASIN
EXISTING CATCH BASIN TO BE REMOVED
NEW CATCH BASIN - TYPE 1 (UNLESS OTHERWISE NOTED)
NEW CATCH BASIN REPLACING EXISTING BASIN
STREET LIGHT (METAL POLE)
UTILITY POLE
UTILITY POLE WITH STREET LIGHT
FIRE HYDRANT-HIGH PRESSURE, LOW PRESSURE
HYDRANT TO BE REMOVED
NEW HYDRANT
NEW REDUCER
NEW VALVE
3-WAY
GAS VALVE
FIRE ALARM POST
FIRE ALARM BRACKET ON STREET LIGHT POLE
TREE
FENCE
SURFACE RUN-OFF DIRECTION
TRAFFIC FLOW
AREA OF ADJUSTMENT
LIMIT OF PROJECT





NOTE:

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0 1 2 3 4
ORIGINAL SIZE IN INCHES

Department of Design and Construction

DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

PROJECT ID: SEK20068

FOR THE CONSTRUCTION OF STORM AND COMBINED SEWERS AND APPURTENANCES IN:

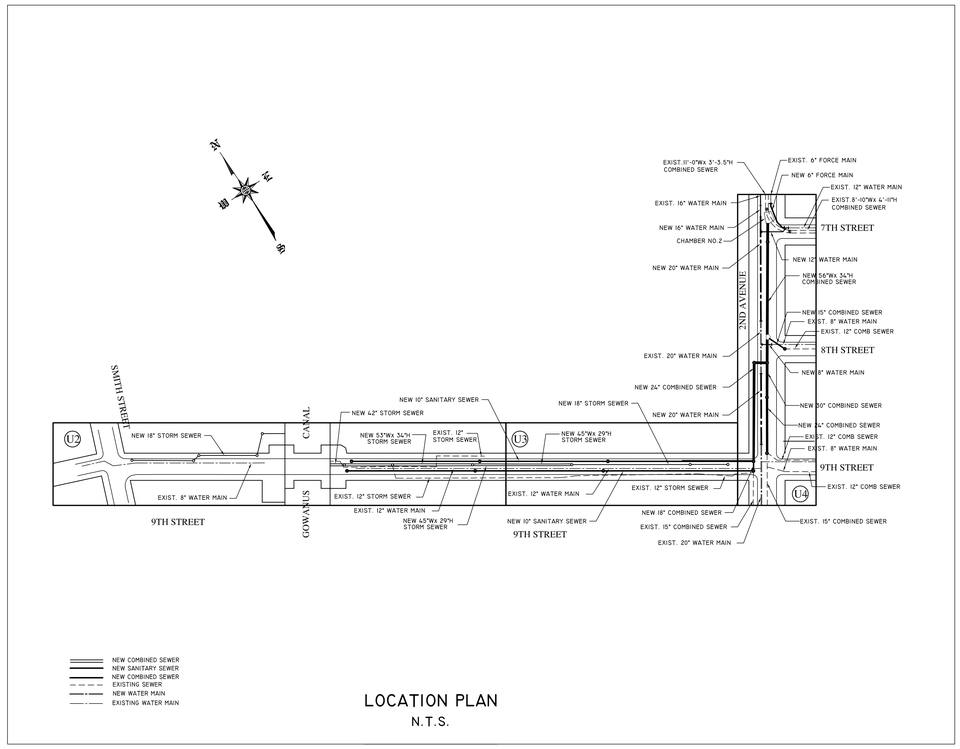
9TH STREET BETWEEN SMITH STREET AND 2ND AVENUE
2ND AVENUE BETWEEN 9TH STREET AND 7TH STREET

CAPITAL PROJECT WM-I

FOR THE REPLACEMENT OF WATER MAINS AND APPURTENANCES IN:

2ND AVENUE BETWEEN 9TH STREET AND 7TH STREET

BOROUGH OF BROOKLYN



LOCATION PLAN
N.T.S.

COMMUNITY BOARD NO. 6

LIST OF DRAWINGS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	9TH STREET FROM SMITH STREET TO 2ND AVENUE PLAN AND PROFILE
3	9TH STREET FROM SMITH STREET TO 2ND AVENUE PLAN AND PROFILE
4	2ND AVENUE FROM 9TH STREET TO 7TH STREET PLAN AND PROFILE. MODIFIED PRECAST MANHOLE DETAIL
5	9TH STREET FROM SMITH STREET TO 2ND AVENUE SANITARY SEWER PROFILES
6	ADDITIONAL PROFILES ALONG 2ND AVENUE. SECTIONA–A. MINI PILE DETAIL
7	CHAMBER NO. 1
8	CHAMBER NO. 2
9	OUTFALL NO. 1 WEST 9TH STREET AND GOWANUS CANAL
10	OUTFALL NO. 2 WEST 9TH STREET AND GOWANUS CANAL
12-14	MAINTENANCE AND PROTECTION OF TRAFFIC
15	FIRE DEPARTMENT BASE MAP
1 - 8	CON EDISON UTILITY DRAWINGS (FOR REFERENCE ONLY)
B1 - B5	BORING RECORDS

ERIC MACFARLANE, P.E.
DEPUTY COMMISSIONER — DATE

GURDIP SAINI, P.E.
ASSOCIATE COMMISSIONER — DATE

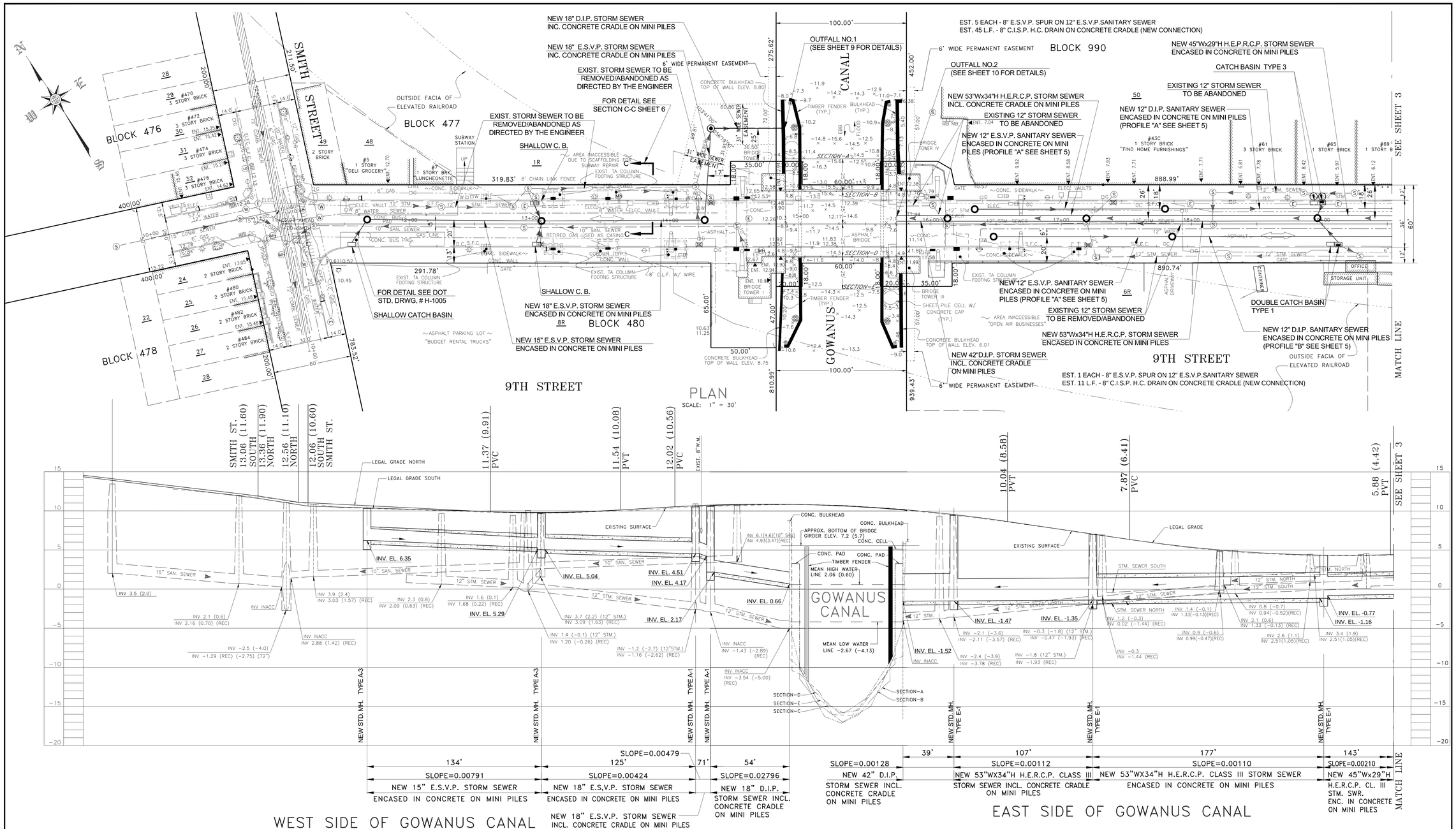
PURNIMA DHARIA, P.E.
ASSISTANT COMMISSIONER — DATE

FRANK LIN, P.E.
DIRECTOR — DATE

NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

PROJECT ID: SEK20068 | DATE: 08-22-16 | SHEET 1 OF

CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



"ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S BLUE INKED OR EMBOSSED SEAL SHALL BE CONSIDERED TO BE A TRUE VALID COPY"

"UNAUTHORIZED ALTERATIONS OR ADDITION TO A LAND SURVEYING DRAWING BEARING A LICENSED PROFESSIONAL LAND SURVEYOR'S SEAL IS A VIOLATION OF ARTICLE 145, SECTION 7209, PARAGRAPH 2 OF THE NEW YORK STATE EDUCATION LAW"

FIELD SURVEY WAS COMPLETED IN: MONTH 00, 2011

LOCATIONS, EXTENT AND SIZES OF UNDERGROUND UTILITIES AND SUBSTRUCTURES HAVE BEEN DETERMINED FROM RECORD INFORMATION, SUPPLEMENTED BY DATA OBTAINED IN THE FIELD. ACCURACY OF THIS UTILITY DATA IS NOT GUARANTEED, NOR IS THERE ANY GUARANTEE THAT ALL EXISTING UTILITIES AND SUBSTRUCTURES, WHETHER FUNCTIONAL OR ABANDONED, ARE SHOWN ON THIS MAP.

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2. ALL ELEVATIONS REFER TO THE BOROUGH OF BROOKLYN HIGHWAY DATUM, WHICH IS 2.560 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK, NEW JERSEY AS ESTABLISHED BY THE U.S. COAST AND GEODETIC SURVEY.
3. MEAN HIGH WATER ELEVATION= 0.60 FEET (BOROUGH PRESIDENTS OF BROOKLYN HIGHWAY DATUM), MEAN LOW WATER ELEVATION= −4.13 FEET (BOROUGH PRESIDENTS OF BROOKLYN HIGHWAY DATUM), BASED ON NOAA PROGRAM VDATUM FOR NAD83(2011)(EPOCH2010.0) NAVD88 (GEOID12A). CONVERSION FROM NAVD88 TO BOROUGH PRESIDENTS DATUM BASED ON AVERAGE STATIC GPS OBSERVATIONS TO CONTROL POINTS AND LEVEL RUN TIED TO BOROUGH BENCHMARKS 4712 & 4362 NAVD88 ELEV. −1.495 FEET=BOROUGH ELEVATION.

NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
KS ENGINEERS, P.C.
494 BROAD STREET, 4TH FL.
NEWARK, NJ 07102
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED S.P.

SCALE AS SHOWN

CADD FILE

SHEFALEE PATEL, P.E.
ENGINEER-IN-CHARGE

FRANK LIN, P.E.
DIRECTOR

CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

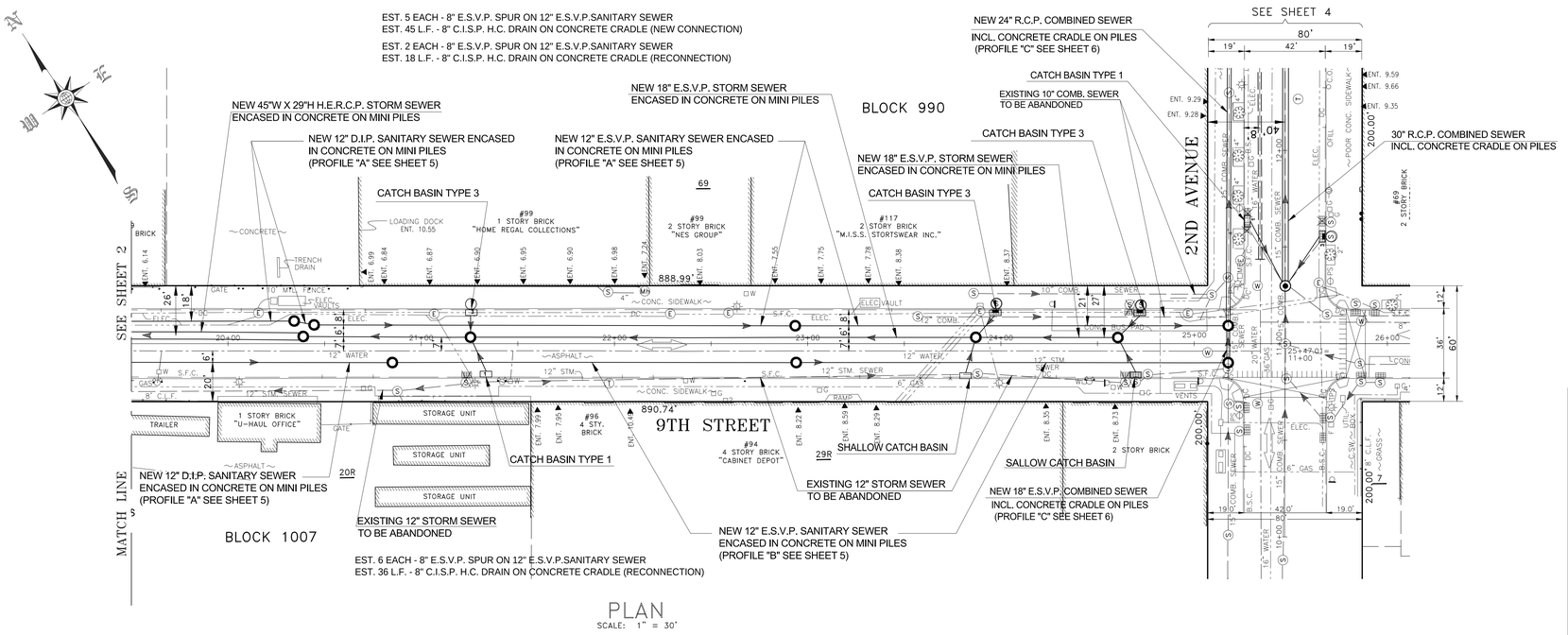
9TH STREET FROM SMITH STREET TO 2ND AVENUE
PLAN AND PROFILE

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

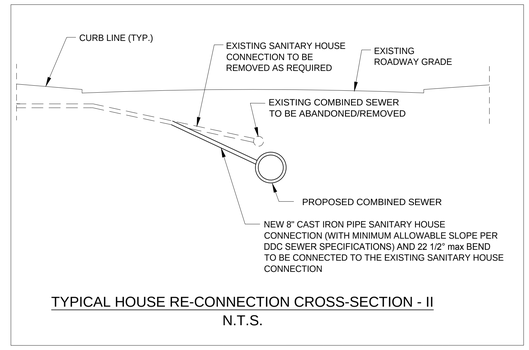
PROJECT ID: SEK 20068 | DATE: 10-22-16 | SHEET 2 OF 14 | U2

IN-HOUSE DESIGN

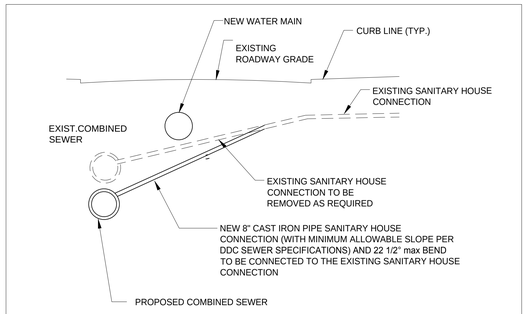
CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



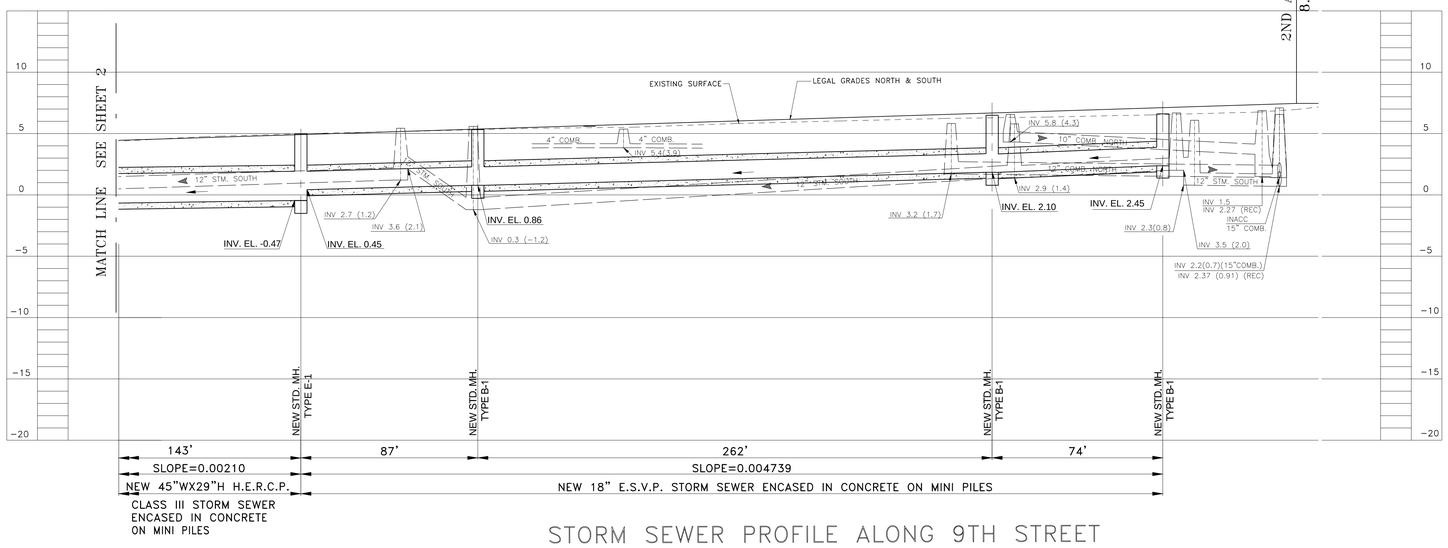
PLAN
SCALE: 1" = 30'



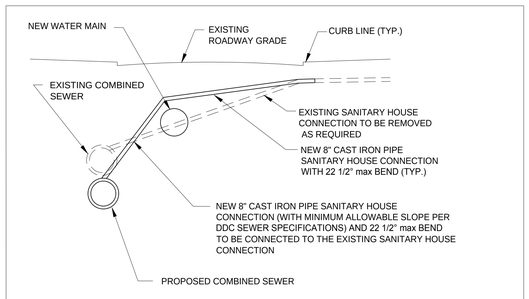
TYPICAL HOUSE RE-CONNECTION CROSS-SECTION - II
N.T.S.



TYPICAL HOUSE CONNECTION CROSS-SECTION - I
N.T.S.



STORM SEWER PROFILE ALONG 9TH STREET
EAST SIDE OF GOWANUS CANAL
SCALE: VERT: 1" = 5'
HORIZ: 1" = 30'



TYPICAL HOUSE CONNECTION CROSS-SECTION
N.T.S.

NOTE:

THE CONTRACTOR IS ADVISED THAT THE COST OF RECONNECTING EXISTING HOUSE CONNECTION DRAINS FROM THE EXISTING COMBINED SEWERS TO NEW COMBINED SEWERS AT DIFFERENT LOCATIONS IN THE STREET, INCLUDING ALL EXCAVATION INSIDE AND OUTSIDE OF THE TRENCH, SHALL BE DEEMED INCLUDED IN THE PRICE BID FOR CONTRACT ITEMS 52.41CO8R "C.I.S.P. H.C. DRAIN ON CONCRETE CRADLE (RECONNECTION)" . NO ADDITIONAL PAYMENT SHALL BE MADE.

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NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
KS ENGINEERS, P.C.
494 BROAD STREET, 4TH FL.
NEWARK, NJ 07102
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED S.P.

SCALE
AS SHOWN
CADD FILE

SHEFALEE PATEL, P.E.
ENGINEER-IN-CHARGE
FRANK LIN, P.E.
DIRECTOR

CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

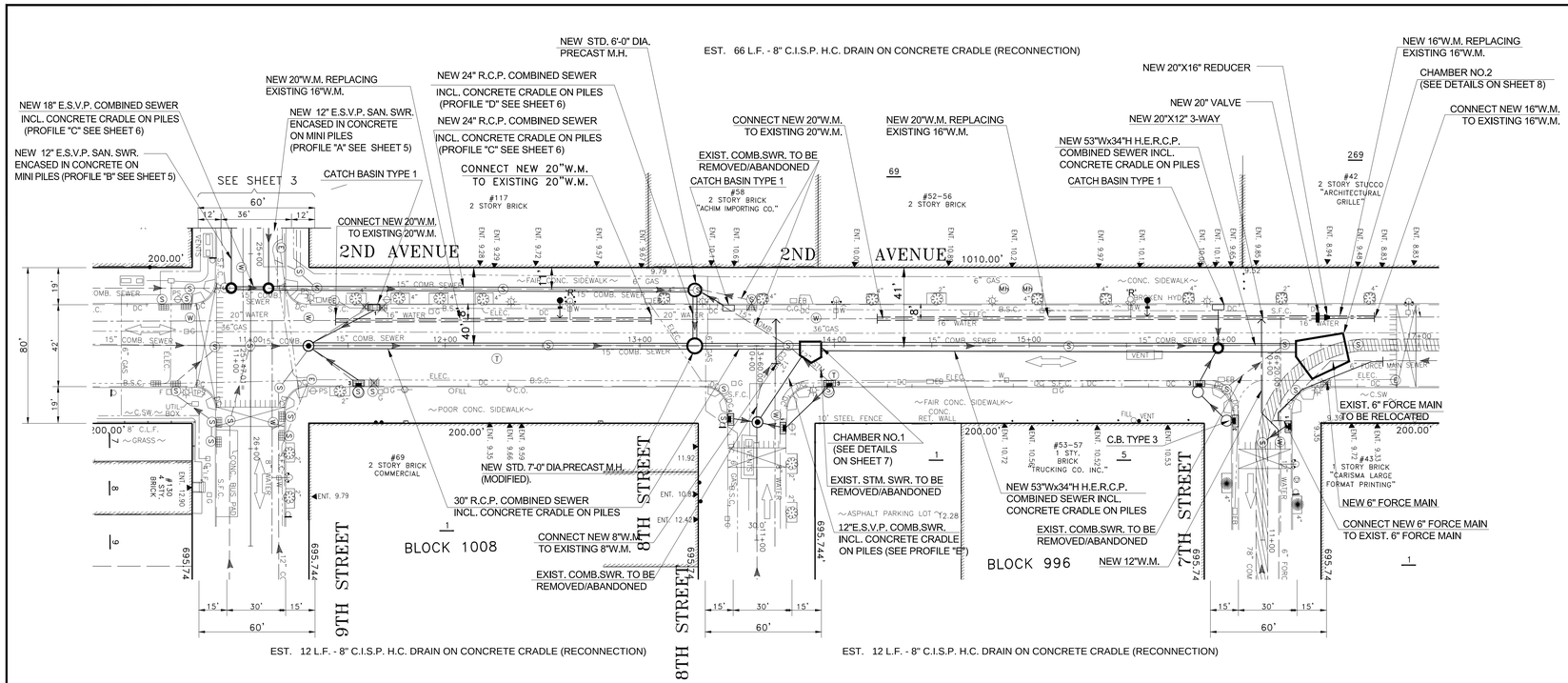
9TH STREET FROM SMITH STREET TO 2ND AVENUE
PLAN AND PROFILE

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

PROJECT ID: SEK 20068 | DATE: 10-22-16 | SHEET 3 OF 14 | U3

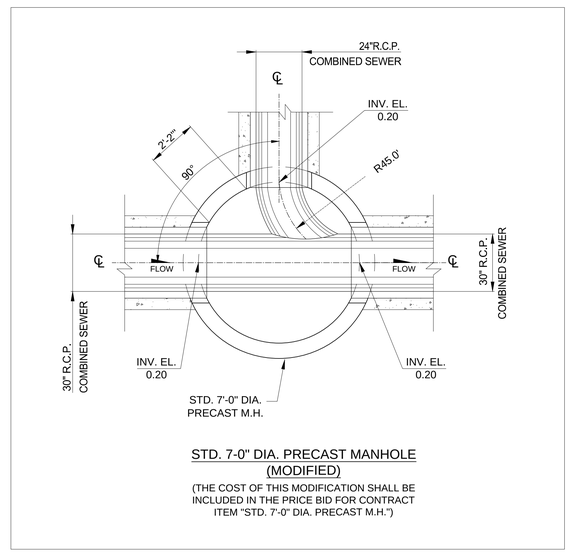
IN-HOUSE DESIGN

CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



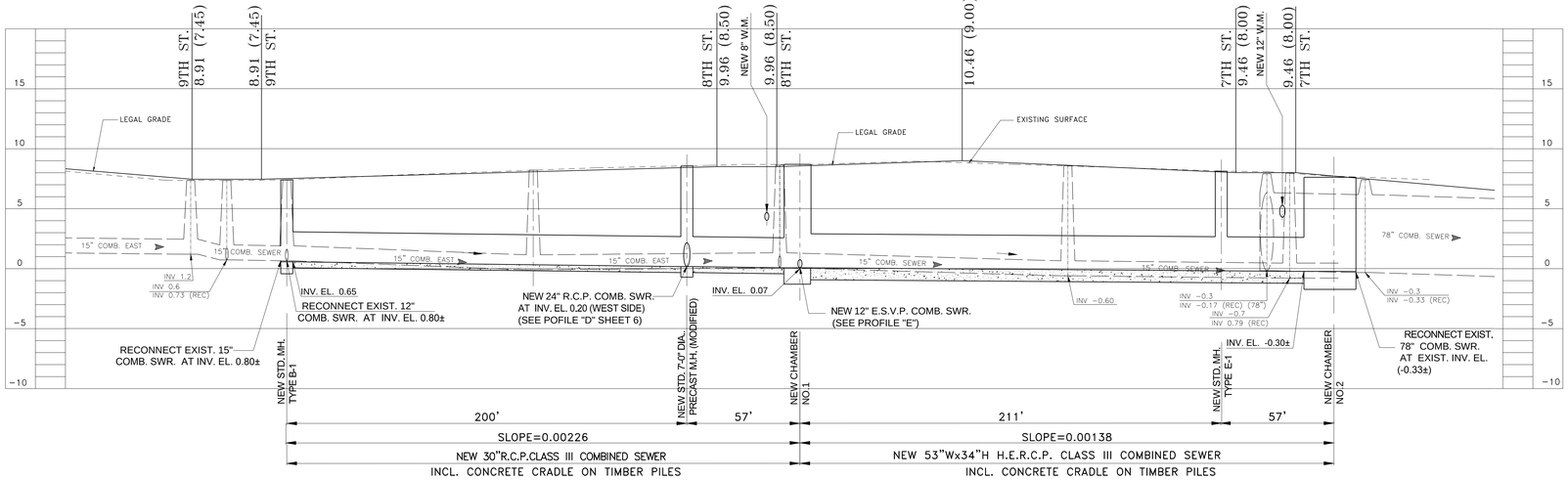
PLAN

SCALE: 1" = 30'



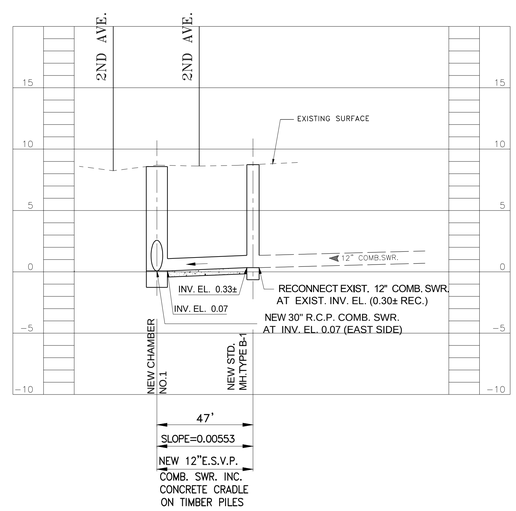
STD. 7'-0" DIA. PRECAST MANHOLE (MODIFIED)

(THE COST OF THIS MODIFICATION SHALL BE INCLUDED IN THE PRICE BID FOR CONTRACT ITEM "STD. 7'-0" DIA. PRECAST M.H.")



SEWER PROFILE ALONG 2ND AVENUE (EAST SIDE)

SCALE: VERT: 1" = 5'
HORIZ: 1" = 30'



SEWER PROFILE ALONG W.8TH STREET PROFILE "E"

SCALE: VERT: 1" = 5'
HORIZ: 1" = 30'

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NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
KS ENGINEERS, P.C.
494 BROAD STREET, 4TH FL.
NEWARK, NJ 07102
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED S.P.

SCALE AS SHOWN

CADD FILE

SHEFALEE PATEL, P.E.
ENGINEER-IN-CHARGE

FRANK LIN, P.E.
DIRECTOR

CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

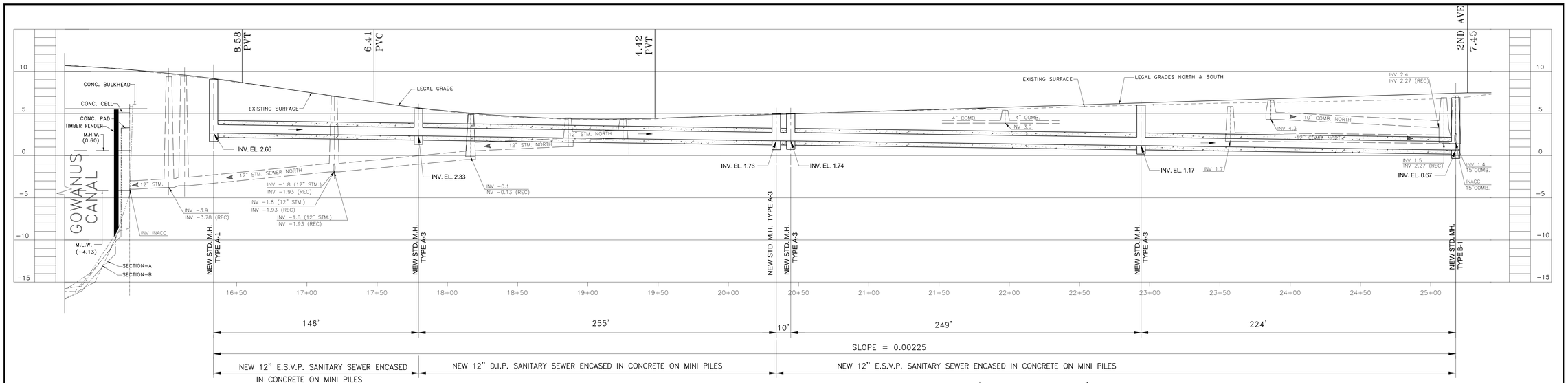
2ND AVENUE FROM 9TH STREET TO 7TH STREET
PLAN AND PROFILE
MODIFIED PRECAST MANHOLE DETAIL

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

PROJECT ID: SEK 20068 | DATE: 08-22-16 | SHEET 4 OF 14 | U4

IN-HOUSE DESIGN

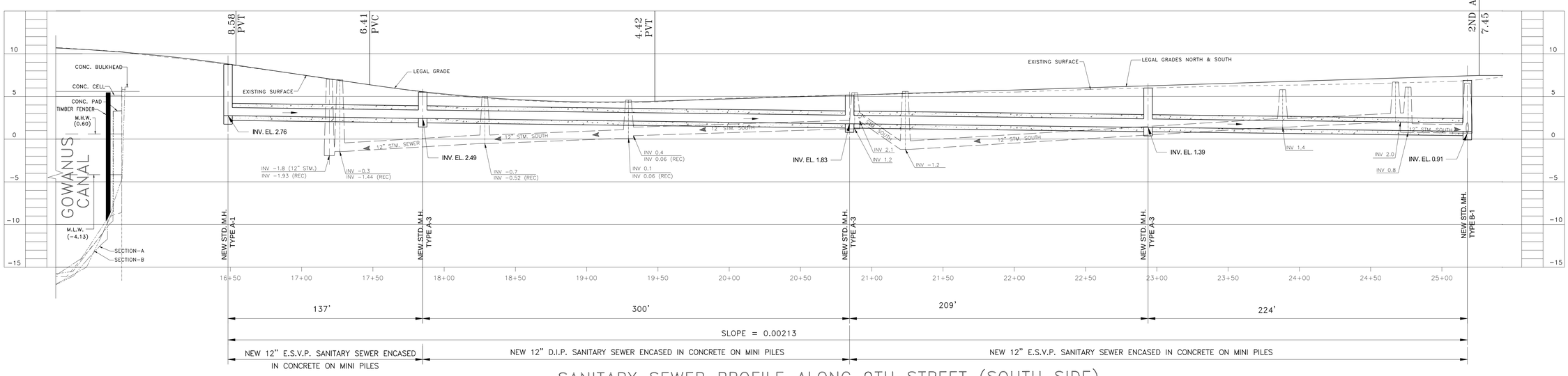
CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



SANITARY SEWER PROFILE ALONG 9TH STREET (NORTH SIDE)
EAST SIDE OF GOWANUS CANAL
PROFILE "A"

SCALE: VERT: 1" = 5'
HORIZ: 1" = 30'

FOR PLAN SEE SHEETS 2 & 3



SANITARY SEWER PROFILE ALONG 9TH STREET (SOUTH SIDE)
EAST SIDE OF GOWANUS CANAL
PROFILE "B"

SCALE: VERT: 1" = 5'
HORIZ: 1" = 30'

FOR PLAN SEE SHEETS 2 & 3

FIELD SURVEY WAS COMPLETED IN: MONTH 00, 2011

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NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
KS ENGINEERS, P.C.
494 BROAD STREET, 4TH FL.
NEWARK, NJ 07102
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED S.P.

SCALE AS SHOWN

CADD FILE

SHEFALEE PATEL, P.E.
ENGINEER-IN-CHARGE

FRANK LIN, P.E.
DIRECTOR

CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

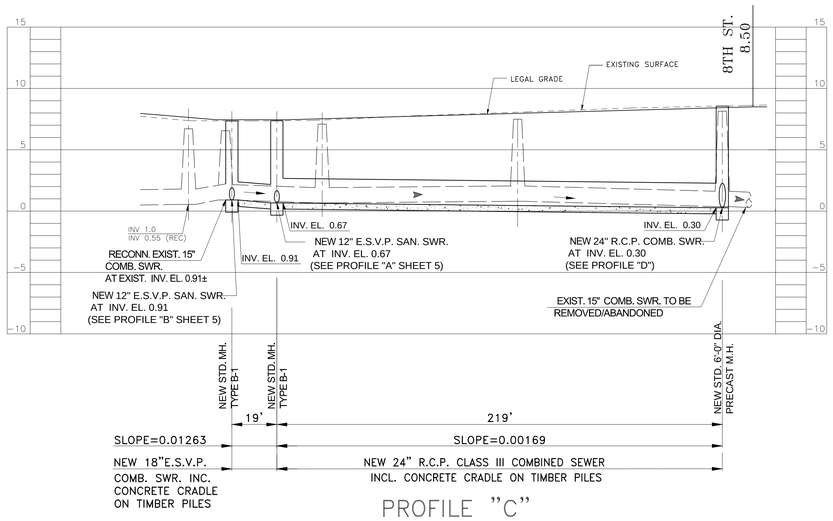
9TH STREET FROM SMITH STREET TO 2ND AVENUE
SANITARY SEWER PROFILES

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

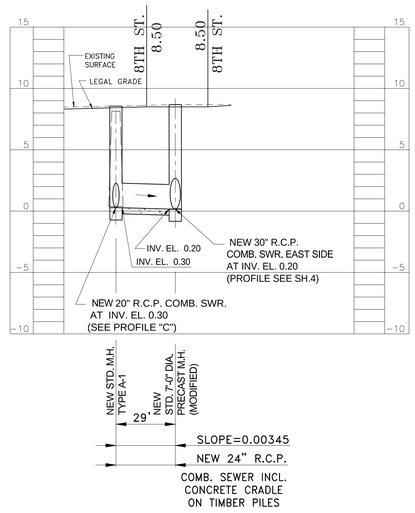
PROJECT ID: SEK 20068 | DATE: 10-22-16 | SHEET 5 OF 14 | U5

IN-HOUSE DESIGN

CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



PROFILE "C"

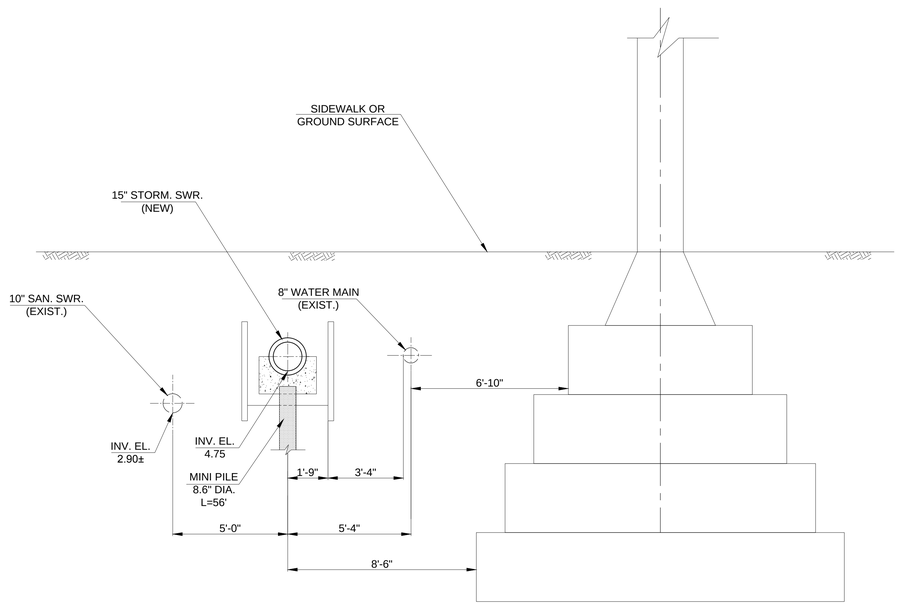


PROFILE "D"

SEWER PROFILES ALONG 2ND AVENUE (WEST SIDE)

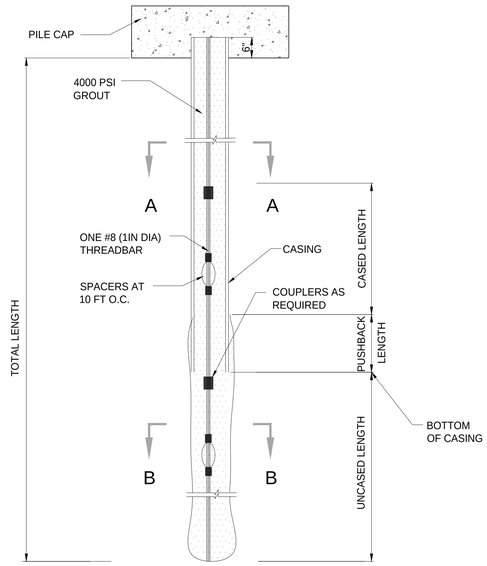
SCALE: VERT: 1" = 5'
HORIZ: 1" = 30'

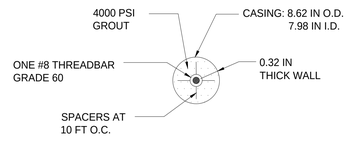
FOR PLAN SEE SHEET 4



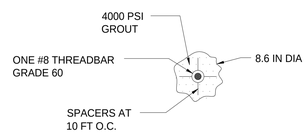
SECTION C-C

FOR PLAN AND PROFILE SEE SHEET No. 2
9TH STREET FROM SMITH STREET TO WEST SIDE OF GOWANUS CANAL





SECTION A-A



SECTION B-B

TABLE OF MINI PILES PARAMETERS

LOCATION	CASED LENGTH, ft.	PUSHBACK LENGTH, ft.	CASING LENGTH, ft.	UNCASED LENGTH, ft.	SAFETY FACTOR	GROUT TO GROUND BOND STRENGTH, psf.	CAPACITY, tons DESIGN	CAPACITY, tons ULTIMATE	DIAMETER, in.	TOTAL LENGTH, ft.	FOR PLAN & PROFILE SEE SH. NO.
9th ST. BETWEEN SMITH ST. & GOWANUS CANAL	24	2	26	30	2.5	2,880	35	98	8.6	56	2
9th ST.- OUTFALL No.2 (150' EAST OF OUTFALL No.2 on 9th ST.)	30	2	32	29	2.5	2,880	35	95	8.6	61	2
9th ST. - 150' to 550' EAST OF OUTFALL No.2 on 9th ST.)	23	2	25	28	2.5	2,880	35	91	8.6	53	2,3
9th ST. - 550' EAST OF OUTFALL No.2 to 2nd AVE. on 9th ST.)	13	2	15	28	2.5	2,880	35	89	8.6	43	3

NOTES: FOR MINI PILE SPECIFICATIONS SEE ADDENDUM NO. 2 FOR DETAILS.

35 TON GROUTED FRICTION PILE (MINI PILE)

SCALE: N.T.S.

"ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S BLUE INKED OR EMBOSSED SEAL SHALL BE CONSIDERED TO BE A TRUE VALID COPY"

"UNAUTHORIZED ALTERATIONS OR ADDITION TO A LAND SURVEYING DRAWING BEARING A LICENSED PROFESSIONAL LAND SURVEYOR'S SEAL IS A VIOLATION OF ARTICLE 145, SECTION 7209, PARAGRAPH 2 OF THE NEW YORK STATE EDUCATION LAW"

FIELD SURVEY WAS COMPLETED IN: MONTH 00, 2011

LOCATIONS, EXTENT AND SIZES OF UNDERGROUND UTILITIES AND SUBSTRUCTURES HAVE BEEN DETERMINED FROM RECORD INFORMATION, SUPPLEMENTED BY DATA OBTAINED IN THE FIELD. ACCURACY OF THIS UTILITY DATA IS NOT GUARANTEED, NOR IS THERE ANY GUARANTEE THAT ALL EXISTING UTILITIES AND SUBSTRUCTURES, WHETHER FUNCTIONAL OR ABANDONED, ARE SHOWN ON THIS MAP.

NOTES:
1. HORIZONTAL DATUM: NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE (NAD83), ESTABLISHED BY GLOBAL POSITIONING SYSTEM METHODOLOGY.
2. ALL ELEVATIONS REFER TO THE BOROUGH OF BROOKLYN HIGHWAY DATUM, WHICH IS 2.560 FEET ABOVE MEAN SEA LEVEL AT SANDY HOOK, NEW JERSEY AS ESTABLISHED BY THE U.S. COAST AND GEODETIC SURVEY.

NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
KS ENGINEERS, P.C.
494 BROAD STREET, 4TH FL.
NEWARK, NJ 07102
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED S.P.

SCALE AS SHOWN

CADD FILE

SHEFALEE PATEL, P.E.
ENGINEER-IN-CHARGE

FRANK LIN, P.E.
DIRECTOR

CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

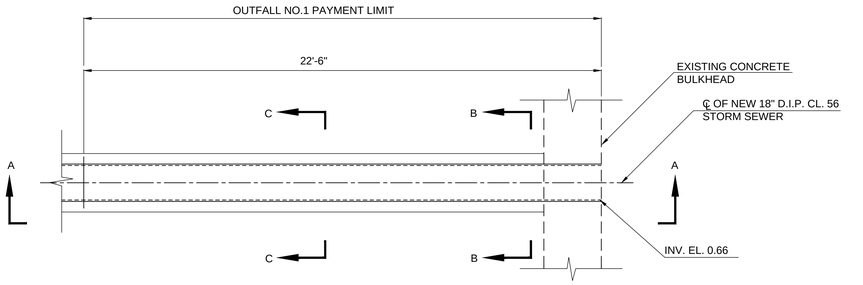
ADDITIONAL PROFILES ALONG 2ND AVENUE.
SECTION A-A. MINI PILE DETAIL.

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

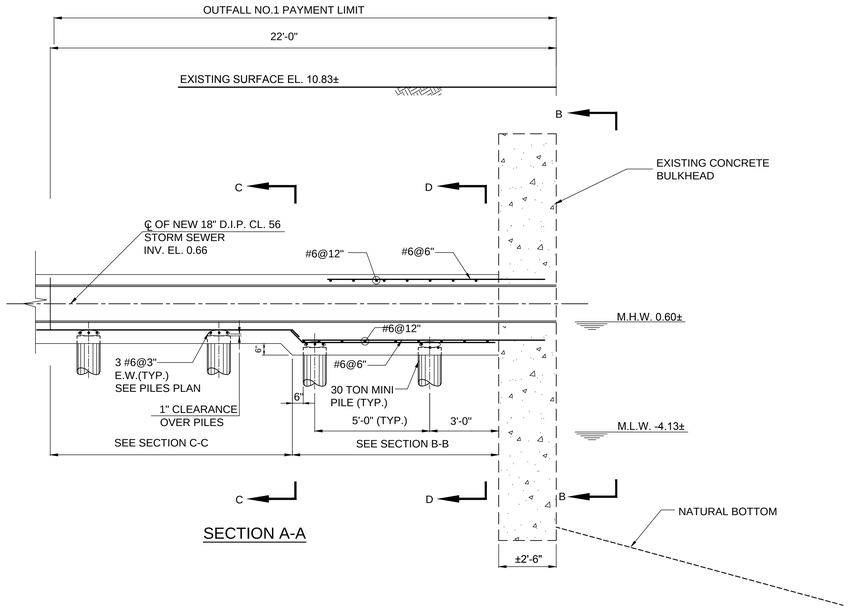
PROJECT ID: SEK 20068
DATE: 10-22-16
SHEET 6 OF 14
U6

IN-HOUSE DESIGN

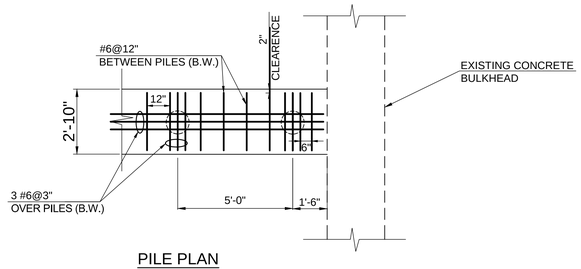
CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



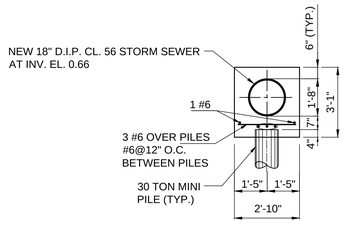
OUTFALL PLAN



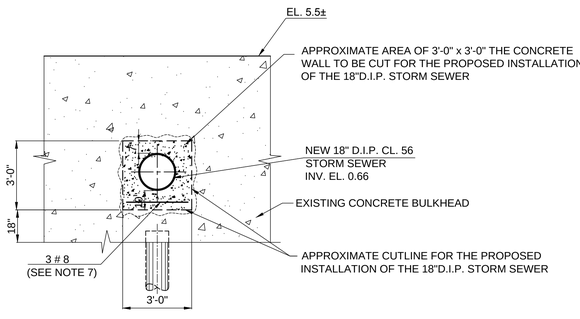
SECTION A-A



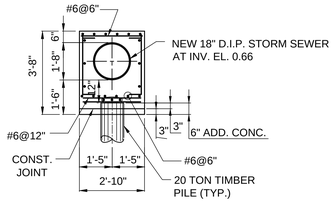
PILE PLAN



SECTION C-C



SECTION B-B



SECTION D-D

NOTES:

1. THE NYCDOT WEST 9TH ST. BRIDGE SHALL BE MONITORED FOR MOVEMENT AND VIBRATION DURING THE ENTIRE CONSTRUCTION OPERATION. THE MONITORING PROGRAM SHALL BE SUBMITTED UNDER A SEPARATE DRAWING.
2. THE MAXIMUM LIMITS FOR MOVEMENT AND VIBRATIONS SHALL BE ESTABLISHED BY NYCDOT PRIOR TO THE START OF MONITORING.
3. ALL DIMENSIONS SHALL BE VERIFIED PRIOR TO COMMENCEMENT OF WORK.
4. THE CONTRACTOR SHALL ACCURATELY LOCATE THE EXTENT AND DEPTH OF THE CONCRETE BULKHEAD.
5. ALL REBARS SHALL BE #5@12" UNLESS OTHERWISE NOTED.
6. THE CONTRACTOR SHALL MAKE USE OF THE EXISTING PILES IF THEY ARE IN GOOD CONDITION AS DIRECTED BY THE ENGINEER.
7. AFTER CUTTING OF THE WALL AS SHOWN DRILL 2'-0" ON ONE SIDE AND 1'-0" ON OTHER SIDE IN THE CENTER OF THE WALL INSERT 3 # 8 L=5'-0" AND FILL THE ENTIRE SPACE WITH PRESSURE CEMENT GROUT. COST OF ALL SUCH WORK TO BE INCLUDED IN THE PRICE BID FOR THE OUTFALL ITEM IN THE CONTRACT.
8. ANY DAMAGE TO THE CONCRETE WALL SHALL BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE WITHOUT ANY ADDITIONAL COST TO THE CITY AND TO THE SATISFACTION OF THE ENGINEER IN THE FIELD.

OUTFALL NO. 1

9 TH STREET AND GOWANUS CANAL

NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
X
X
X
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED A.C.

SCALE 3/8"= 1'-0"

CADD FILE

ANAND CHADDA, P.E.
ENGINEER-IN-CHARGE

FRANK LIN, P.E.
DIRECTOR

CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

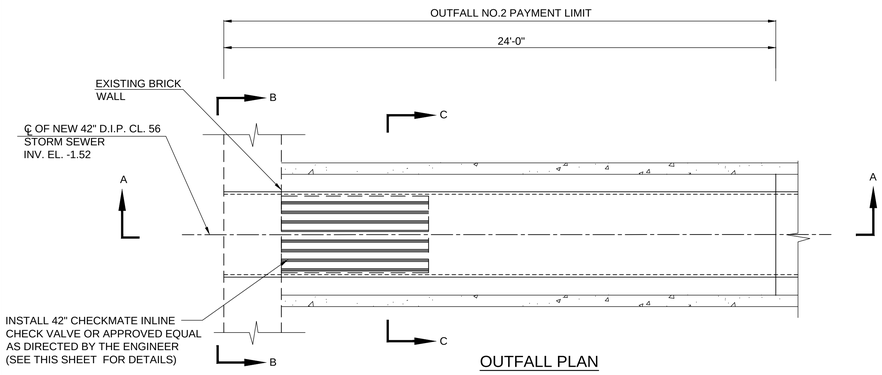
OUTFALL NO. 1
9TH STREET AND GOWANUS CANAL.

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

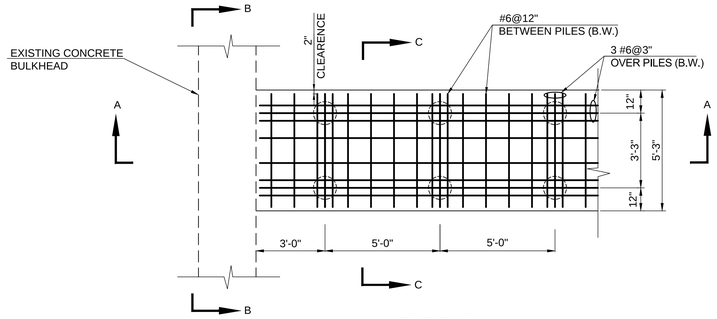
PROJECT ID: SEK 20068 | DATE: 02-08-15 | SHEET 9 OF 14

IN-HOUSE DESIGN

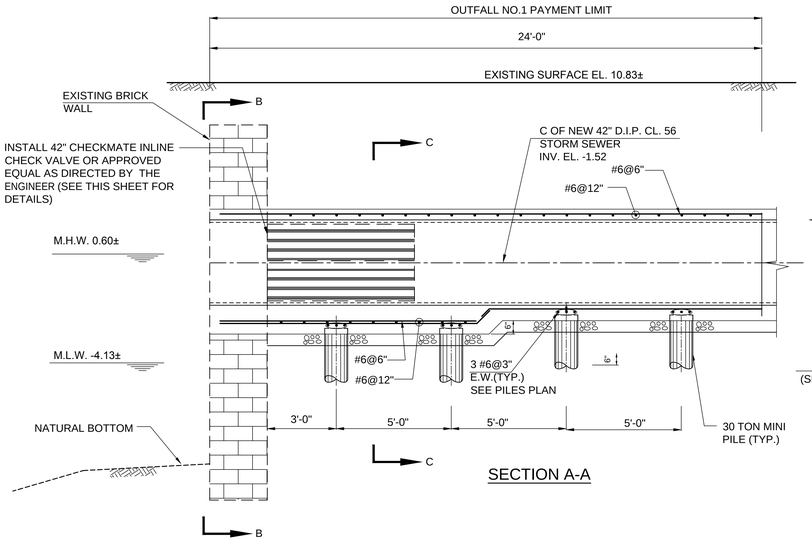
CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN



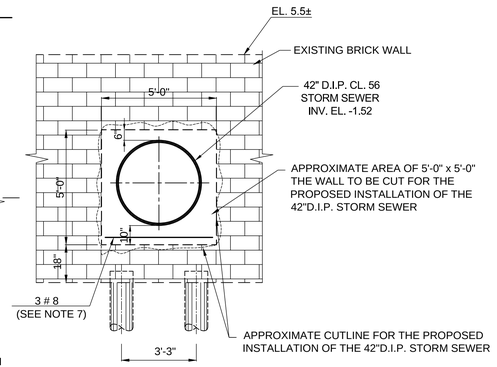
OUTFALL PLAN



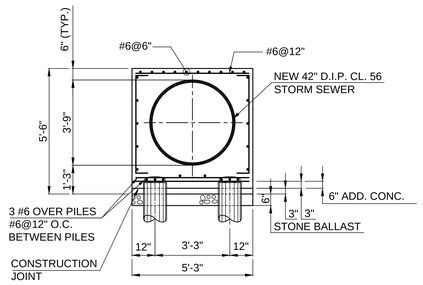
PILE PLAN



SECTION A-A



SECTION B-B



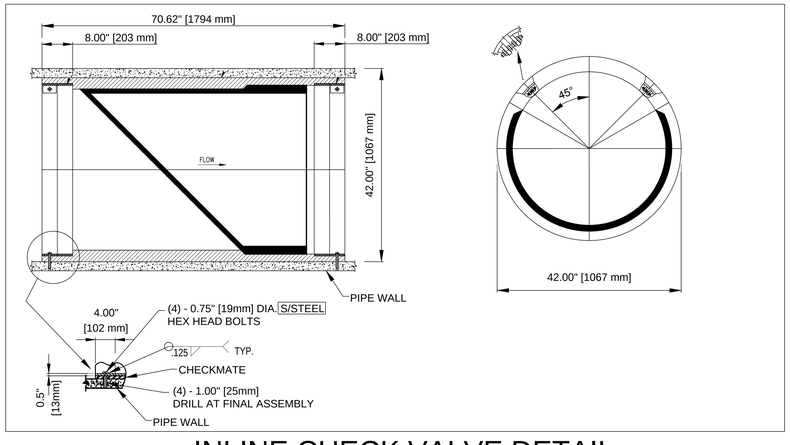
SECTION C-C

NOTES:

1. THE NYCDOT WEST 9TH ST. BRIDGE SHALL BE MONITORED FOR MOVEMENT AND VIBRATION DURING THE ENTIRE CONSTRUCTION OPERATION. THE MONITORING PROGRAM SHALL BE SUBMITTED UNDER A SEPARATE DRAWING.
2. THE MAXIMUM LIMITS FOR MOVEMENT AND VIBRATIONS SHALL BE ESTABLISHED BY NYCDOT PRIOR TO THE START OF MONITORING.
3. ALL DIMENSIONS SHALL BE VERIFIED PRIOR TO COMMENCEMENT OF WORK.
4. THE CONTRACTOR SHALL ACCURATELY LOCATE THE EXTENT AND DEPTH OF THE CONCRETE BULKHEAD.
5. ALL REBARS SHALL BE #5@12" UNLESS OTHERWISE NOTED.
6. THE CONTRACTOR SHALL MAKE USE OF THE EXISTING PILES IF THEY ARE IN GOOD CONDITION AS DIRECTED BY THE ENGINEER.
7. AFTER CUTTING OF THE WALL AS SHOWN DRILL 2'-0" ON ONE SIDE AND 1'-0" ON OTHER SIDE IN THE CENTER OF THE WALL INSERT 3 # 8 L=5'-0" AND FILL THE ENTIRE SPACE WITH PRESSURE CEMENT GROUT. COST OF ALL SUCH WORK TO BE INCLUDED IN THE PRICE BID FOR THE OUTFALL ITEM IN THE CONTRACT.
8. ANY DAMAGE TO THE CONCRETE WALL SHALL BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE WITHOUT ANY ADDITIONAL COST TO THE CITY AND TO THE SATISFACTION OF THE ENGINEER IN THE FIELD.

OUTFALL NO. 2

9 TH STREET AND GOWANUS CANAL



INLINE CHECK VALVE DETAIL

N.T.C.

INLINE CHECK VALVES

PART 1: GENERAL

1.01 SUBMITTALS

A. Submit product literature that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, headloss, flow data and pressure ratings.

B. Upon request, provide shop drawings that clearly identify the valve materials of construction and dimensions.

1.02 QUALITY ASSURANCE

A. Supplier shall have at least twelve (12) years experience in the design and manufacture of elastomeric check valves.

B. Manufacturer shall have designed, fabricated and have at least five (5) current installation of an elastomeric check valve in the 72" (1800mm) size. Manufacturer must provide documentation, including project name, location, and references.

C. Manufacturer shall have conducted independent hydraulic testing to determine headloss, jet velocity and vertical opening height characteristics on a minimum of three (3) sizes of valves ranging from 6" (150mm) through 24" (600mm). The testing must have been conducted for free discharge (pressurized and open channel flow discharging to atmosphere) and submerged conditions.

PART 2: PRODUCTS

2.01 ELASTOMERIC CHECK VALVES

A. Check Valves are to be all rubber and the flow operated check type with slip-in cuff connection. The entire valve shall be ply reinforced throughout the body, saddle and bill, which is cured and vulcanized into a one-piece unibody construction. A separate valve body or pipe used as the housing is not acceptable. The valve shall be manufactured with no metal, mechanical hinges or fasteners, which would be used to secure any component of the valve to a valve housing. The port area of the saddle shall contour into a circumferential sealing area concentric with the pipe which shall allow passage of flow in one direction while preventing reverse flow. The entire valve shall fit within the pipe inside diameter. The saddle area of the valve must be flat, not conical, and integral with the rubber body above centerline in order to not produce any areas or voids that can collect or trap debris. The valve must be easily installed in pipes with poor end condition without the need to modify or utilize the headwall or structure to seal and anchor the valve. Once installed, the valve shall not protrude beyond the face of the structure or end of the pipe.

B. The outside diameter of the upstream and downstream sections of the valve must be circumferentially in contact with the inside diameter of the pipe.

C. Slip-in style valves will be furnished with a set of stainless steel expansion clamps. The clamps, which will secure the valve in place, shall be installed in the upstream or downstream cuff of the valve, depending on installation orientation, and shall expand outwards by means of a turnbuckle. Each band shall be pre-drilled allowing for the valve to be pinned and secured into position in accordance with the manufacturer's installation instructions.

D. Manufacturer must have flow test data from an accredited hydraulics laboratory to confirm pressure drop and hydraulic data.

E. Company name, plant location, valve size patent number, and serial number shall be bonded to the check valve.

2.02 FUNCTION

A. When line pressure exceeds the backpressure, the line pressure forces the bill and saddle of the valve open, allowing flow to pass. When the backpressure exceeds the line pressure, or in the absence of any upstream or downstream pressure, the bill and saddle of the valve is forced closed, preventing backflow.

2.03 MANUFACTURER

A. All valves shall be Series CM-SL slip-in CheckMate™ Valves as manufactured by Tideflex Technologies®, A Division of Red Valve Company, Carnegie, PA 15106 or approved equal. All valves shall be manufactured in the U.S.A.

PART 3: EXECUTION

3.01 INSTALLATION

A. Valve shall be installed in accordance with manufacturer's written Installation and Operation Manual and approved submittals.

3.02 MANUFACTURER'S CUSTOMER SERVICE

A. Manufacturer's authorized representative shall be available for customer service during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

B. If specified, the manufacturer shall also make customer service available directly from the factory in addition to authorized representatives for assistance during installation and start-up, and to train personnel in the operation, maintenance and troubleshooting of the valve.

NO.	DATE	DESCRIPTIONS	BY	APPR'D
		REVISIONS		

TOPOGRAPHIC SURVEY PREPARED BY:
X
X
X
LICENSED LAND SURVEYOR

DESIGNED T.K.
DRAWN T.K.
CHECKED A.C.

SCALE 3/8"= 1'-0"

CADD FILE

ANAND CHADDA, P.E.
ENGINEER-IN-CHARGE

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CITY OF NEW YORK
DEPARTMENT OF DESIGN + CONSTRUCTION
DIVISION OF INFRASTRUCTURE
BUREAU OF DESIGN

OUTFALL NO. 2
9TH STREET AND GOWANUS CANAL.

CONSTRUCTION OF STORM AND COMBINED SEWERS, WATER MAINS AND APPURTENANCES IN 9TH STREET ETC.
BOROUGH OF BROOKLYN

PROJECT ID: SEK 20068 | DATE: 02-08-15 | SHEET 10 OF 14

IN-HOUSE DESIGN

CAPITAL PROJECT ID: SEK20068 STORM AND COMBINED SEWERS AND APPURTENANCES IN 9TH STREET ETC., BOROUGH OF BROOKLYN

Appendix B: Soil Borings

EXPLANATION OF TERMS

SOIL SIZES

Description Term	Pass Sieve No.	Retained Sieve No.	Size Range
Clay / Silt	200	(Note 1)	< 0.075 mm
Fine Sand (F)	40	200	0.075 to 0.420 mm
Medium Sand (M)	10	40	0.420 to 2.00 mm
Coarse Sand (C)	4	10	2.00 to 4.75 mm
Gravel (Note 2)	-----	-----	4.75 to 75 mm (3")
Cobbles	-----	-----	3" to 12"
Boulders	-----	-----	>12"

NOTES: 1. Atterberg limit can be conducted to classify fine grained soil to classify the sample in addition to field tests.
2. For visual identification, NYC Building Code does not distinguish between Fine and Coarse Gravel.

QUANTITATIVE ESTIMATE

Minor Components	Percentage Range
AND	35 - 50
SOME	20 - 35
LITTLE	10 - 20
TRACE	<10

FINE-GRAINED SOIL

Soil Type	Thread Dia.	Plasticity Index
SILT	None	Zero
CLAYEY SILT	1/4 inch thread	1 to 5
SILT & CLAY	1/8 inch thread	5 to 10
CLAY & SILT	1/16 inch thread	10 to 20
SILTY CLAY	1/32 inch thread	20 to 40
CLAY	1/64 inch thread	40 or more

UNIFIED SOIL CLASSIFICATION SYSTEM

USCS	Typical Descriptions	USCS	Typical Descriptions
GW	Well-graded gravels, gravel - sand mixtures, less than 5% fines.	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
GP	Poorly-graded gravels, gravels - sand mixtures, less than 5% fines.	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
GM	Silty gravels, gravel - sand - silt mixtures, more than 12% fines.	OL	Organic silts and organic silty clays of low plasticity
GC	Clayey gravels, gravel-sand-clay mixtures, more than 12% fines.	MH	Inorganic silt, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
SW	Well-graded sands, gravelly sands, less than 5% fines.	CH	Inorganic clays of high plasticity. Fat clays.
SP	Poorly-graded sands, gravelly sands, less than 5% fines.	OH	Organic clays of medium to high plasticity, organic silts.
SM	Silty sands, sand - silt mixtures, more than 12% fines.	PT	Peat and other highly organic soils.
SC	Clayey sands, sand - clay mixtures, more than 12% fines.		

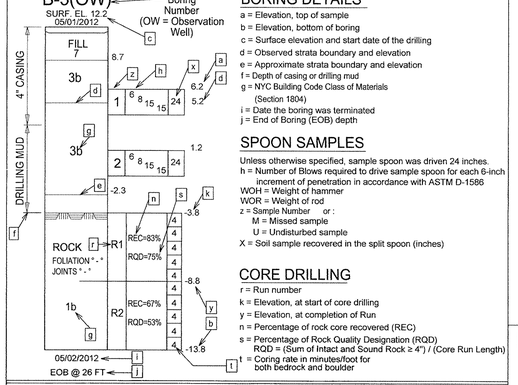
ROCK CLASSIFICATION

HARDNESS:	WEATHERING:
Extremely (Ext) Hard - Intact specimen can only be chipped, not broken, by repeated, heavy blows of a geological hammer	Fresh (Fr) - No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces
Very (V) Hard - Cannot be scratched with a steel nail. Inact specimen breaks only by repeated, heavy blows with geological hammer	Slightly - Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition
Hard - Intact hand-held specimen requires more than one hammer blow to break it. Can be faintly scratched by steel nail	
Moderately (Mod) Hard - Can't be peeled or scraped with knife. Can be distinctly scratched with a steel nail	Moderately (Mod) - Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones
Moderately (Mod) Soft - Shallow indentations (0.04 to 0.12 in.) can be made by firm blows with point of geologic pick. Can be peeled with pocket knife with difficulty	Highly - More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones
Soft - Hand-held specimen crumbles under firm blows with point of geologic pick	
Very (V) Soft - Can be scratched with fingernail. Slight indentation produced by light blow of point of geologic pick. Requires power tools for excavation	Completely (Comp) - All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact

FRACTURE SPACING (Sp.):	
Extremely (Ext) Close: <3/4 inch	Moderate (Mod): 8 inches to 2 feet
Very (V) Close: 3/4 inch to 2-1/2 inches	Wide: 2 to 6 feet
Close: 2-1/2 to 8 inches	Very (V) Wide: 6 to 20 feet

GENERAL NOTES:
1. Soil analyzed with organic content greater than 12 percent is classified as organic soil (OL or OH). Soil with less than 12 percent is classified as "trace organics" and not classified as organic soil. Soil with 30 percent or more organic content is classified as Peat (PT).
2. When laboratory results are not available, the group symbols are assigned based on the DDC soil description by visual identification and field tests by the inspector.
3. All Borings unless otherwise noted are cleared for utilities using either hand auger or vacuum extraction method to 6 feet below ground surface. Strata elevations and soil classification indicated in the borings within this zone are inferred based on visual observations and field judgement by the field inspector.
4. If any of the f-m-c grain size is less than 10 percent by weight of the sample then the grain size is not included in the sample description. If any of the two grain sizes is less than 10 percent by weight but the summation of the two equals or greater than 10 percent, then report all sizes.
5. *Joints:* The average natural angle of observed rock fractures in that particular core run. Mechanical breaks from drilling equipment are not accounted in the joint angle.
6. *Foliation:* A general term for, the planar arrangement of textural or structural features in any rock, especially the planar structure that results from flattening of the constituent grains of a metamorphic rock.

BORING LEGEND



BORING DETAILS

a = Elevation, top of sample
b = Elevation, bottom of boring
c = Surface elevation and start date of the drilling
d = Observed strata boundary and elevation
e = Approximate strata boundary and elevation
f = Depth of casing or drilling mud
g = NYC Building Code Class of Materials (Section 1804)
i = Date the boring was terminated
j = End of Boring (EOB) depth

SPOON SAMPLES

Unless otherwise specified, sample spoon was driven 24 inches.
h = Number of Blows required to drive sample spoon for each 6-inch increment of penetration in accordance with ASTM D-1586
WOH = Weight of hammer
WOR = Weight of rod
z = Sample Number or :
M = Missed sample
U = Undisturbed sample
X = Soil sample recovered in the split spoon (inches)

CORE DRILLING

r = Run number
k = Elevation, at start of core drilling
y = Elevation, at completion of Run
n = Percentage of rock core recovered (REC)
s = Percentage of Rock Quality Designation (RQD) RQD = (Sum of Intact and Sound Rock ≥ 4") / (Core Run Length)
t = Coring rate in minutes/foot for both bedrock and boulder

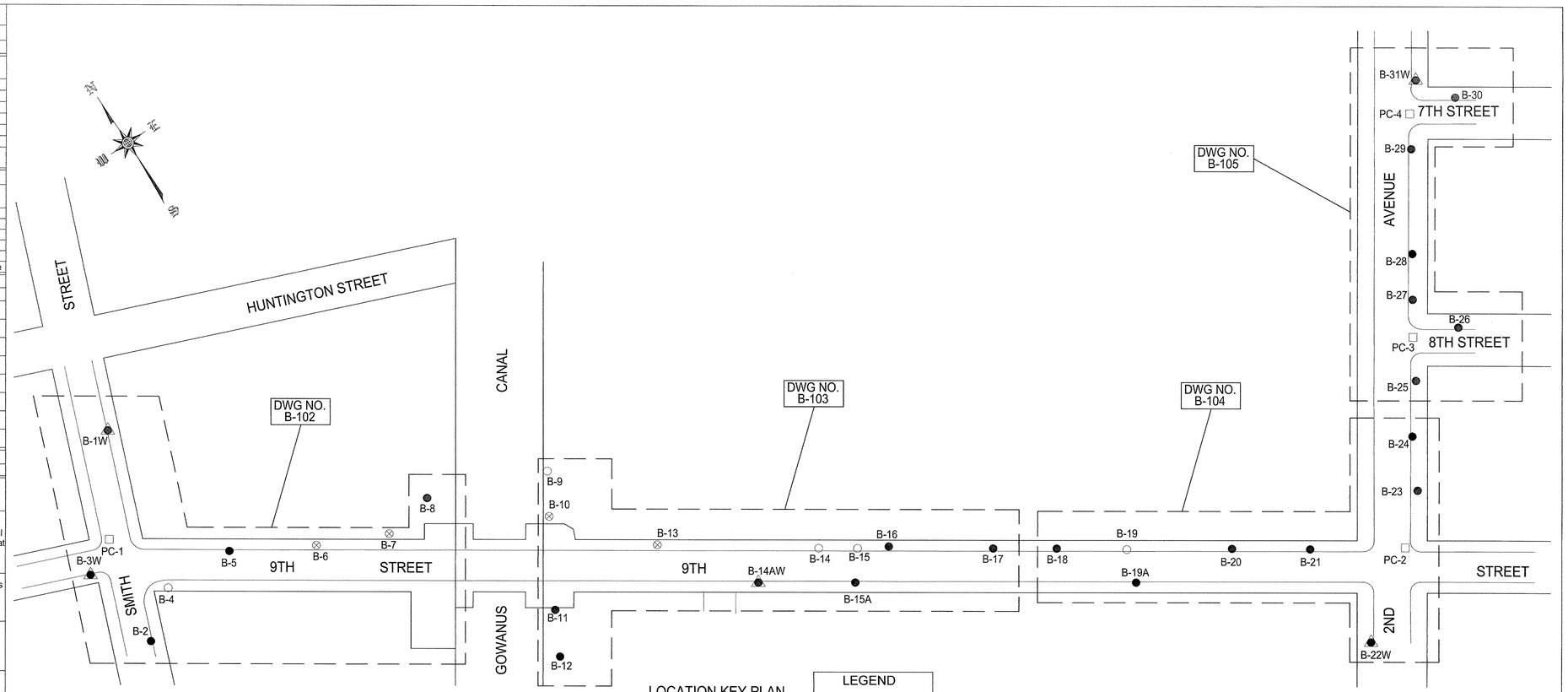
EQUIPMENT (Unless otherwise noted)

Type of spoon hammer	AUTOMATIC	Size of Split spoon	2.0 inches.
Weight of casing hammer	140 lbs.	Size of Core Bit	N/A inches.
Weight of spoon hammer	140 lbs.	Type of Core Barrel	N/A
Size of Casing	4.0 inches.		

DATUM NOTE: All Elevations refer to the Borough of BROOKLYN HIGHWAY Datum, which is 2.560 Feet above Mean Sea Level at Sandy Hook as established by the U.S. Coast & Geodetic Survey.

D. PATEL / S. EVEREST / J. LUO
SOIL AND ROCK ANALYSIS BY

ANDREW LEUNG, P.E.
GEOTECHNICAL ENGINEER
YU-PARSONS BRINCKERHOFF, JV



LOCATION KEY PLAN

SCALE: 1" = 60'

60 0 60

LEGEND

- TEST BORING
- TEST BORING WITH OBSERVATION WELL
- TEST BORING (FAILED ATTEMPT)
- TEST BORING (CANCELLED)
- PAVEMENT CORE

DRAWING INDEX

DWG NO.	CONTENTS
B-101	BORING LOCATION KEY PLAN
B-102	BORINGS B-1W THROUGH B-5 AND B-8 PAVEMENT CORE PC-1
B-103	BORINGS B-9, B-11, B-12, B-14 THROUGH B-17
B-104	BORINGS B-18 THROUGH B-24 PAVEMENT CORE PC-2
B-105	BORINGS B-25 THROUGH B-31W PAVEMENT CORES PC-3 AND PC-4

GENERAL NOTES:
1. BORINGS B-6 , B-7, B-10, AND B-13 WERE CANCELLED BY NYC DDC. SEE SUBSEQUENT SHEETS FOR DETAILS.
2. BASE PLAN TOPOGRAPHIC SURVEY WAS PROVIDED BY NYC DDC.
3. BORING LOCATIONS ARE BASED ON FIELD MEASUREMENTS FROM EXISTING SITE FEATURES.
4. SURFACE ELEVATIONS WERE ESTIMATED BASED ON TOPOGRAPHIC SURVEY.

IMPORTANT NOTES:

1. The Boring Logs shown on this sheet are the result of inferences drawn by the engineers or scientists during boring operations at the site, and from certain visual evidence such as: (a) samples of subsurface materials recovered during boring operations; (b) the logs kept by the drill operator and the inspector, which contain, among other things, expression of their opinions as to the nature of subsurface materials encountered during boring operations; and (c) other records concerning the site deemed pertinent by the engineers. The driller's log, the inspector's log, the samples and the records, together with the engineer's reports, are made available for inspection and study by the bidders so that they may draw their own inferences from all of the available evidence.
2. Bidders are warned that in the subsurface, other than that actually penetrated by the borings, obstructions, both natural and man-made, and which are not indicated on the Boring Logs, may be encountered, and that the Boring Logs make no representations or warranties either as to the presence or absence of such obstructions, or as to their nature and extent. Where possible, borings are located to avoid all obstructions and previous construction which can be found by inspection of the surface, and the bidder is required to estimate the influence of such features from his own inspection of the site.
3. In addition, bidders are warned that in the subsurface other than that actually penetrated by the borings, soil or rock may vary widely, with regard to elevation, composition, texture, structure, perviousness, soundness, and other characteristics, from the descriptions given on the Boring Logs and all reports.
4. The "groundwater reading", shows the elevation of groundwater in the boring holes at the times indicated. They may or may not indicate the elevations of perched water or true groundwater table during boring operations or subsequently thereafter.
5. The samples are described using the DDC Soil Description and Rock Classification, followed by Group Symbols from the Unified Soil Classification System and the 2008 NYC Building Code Class of Materials.

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SAFETY AND SITE SUPPORT

NO.	DATE	DESCRIPTIONS	APPR'D
		REVISIONS	

CITY OF NEW YORK
DEPARTMENT OF
DESIGN & CONSTRUCTION

SEK20068
4105

PREPARED FOR:
DIVISION OF PROGRAM MANAGEMENT
SAFETY AND SITE SUPPORT
BUREAU OF ENVIRONMENTAL
AND GEOTECHNICAL SERVICES

CONSULTANT NAME:
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CONTRACTOR NAME:
AQUIFER DRILLING & TESTING, INC.
75 EAST 2ND STREET
MINEOLA, NEW YORK 11501

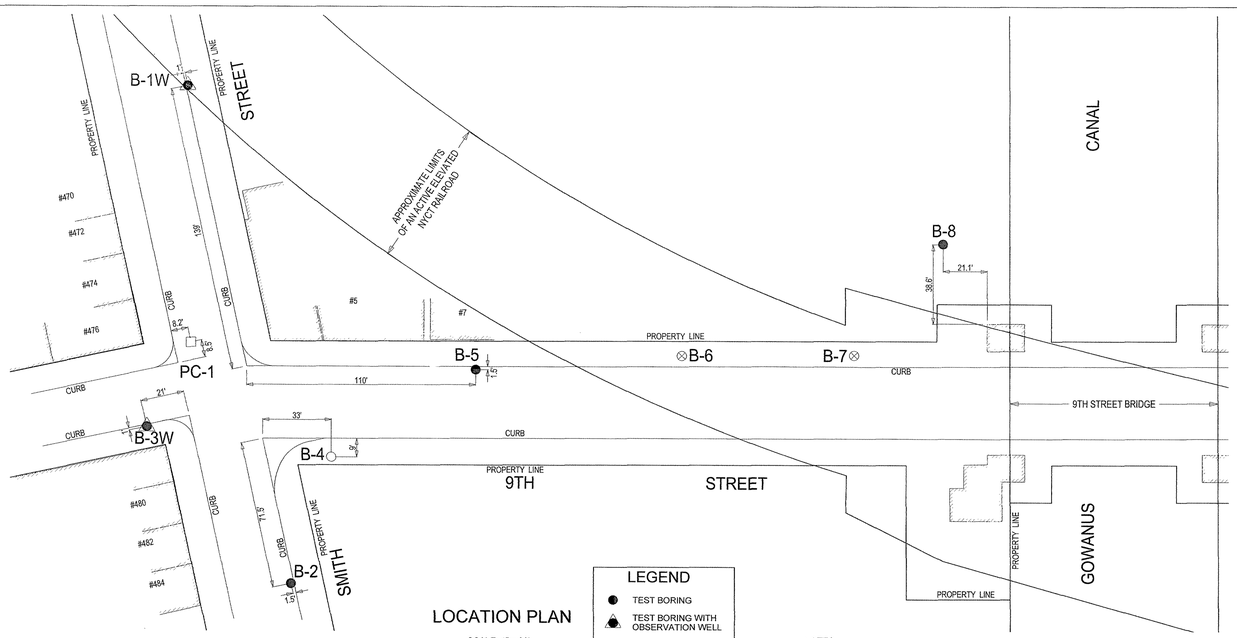
PROJECT NAME:
NEW STORM AND COMBINED SEWERS
AND WATER MAIN WORK IN 9TH STREET
9TH STREET BETWEEN 2ND AVENUE AND SMITH STREET
BOROUGH OF BROOKLYN

RECORD OF BORINGS

SEAL AND SIGNATURE

STATE OF NEW YORK · ANDREW LEUNG · 055019 · LICENSED PROFESSIONAL ENGINEER

DATE:	JANUARY 23, 2015
PROJECT NO:	SEK20068
DRAWING BY:	ADAM MOUTAFIS
CHK BY:	REY CLAVEL / JUDY LUO
DWG No:	B-101.00
CADD FILE No :	4105-ROB-01
SHEET	1 OF 5



LOCATION PLAN

SCALE: 1" = 30'

30 0 30

LEGEND

- TEST BORING
- TEST BORING WITH OBSERVATION WELL
- TEST BORING (FAILED ATTEMPT)
- TEST BORING (CANCELLED)
- PAVEMENT CORE

NOTES:
1. BORING B-6 WAS CANCELLED BY NYC DDC DUE TO PROXIMITY TO 9TH STREET BRIDGE.
2. BORING B-7 WAS CANCELLED BY NYC DDC DUE TO LIMITED ACCESS AND ONGOING CONSTRUCTION OF ADJACENT ACTIVE ELEVATED NYCT RAILROAD.

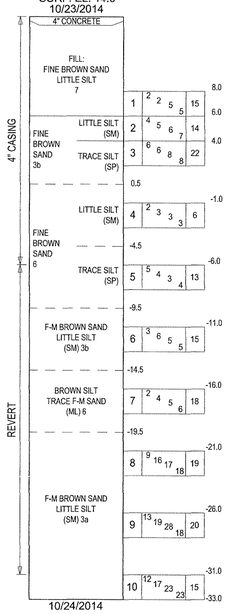
LABORATORY ANALYSIS SUMMARY *

Soil Sample Identification And Index Properties

BORING NO.	SAMPLE NO.	DEPTH, ft	D100, mm	D60, mm	D30, mm	D10, mm	% GRAVEL (>#4 SIEVE)	%SAND	% SILT OR CLAY (<#200 SIEVE)	WC %	Cc	Cu	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	ORGANIC CONTENT (%)	USCS SYMBOL
B-1W	S-7	30-32	1.18	-	-	-	0.0	5.3	94.7	-	-	-	NV	NP	NP	-	ML
B-2	S-3B	11-12	-	-	-	-	-	-	-	65.1	-	-	-	-	-	10.3	-
B-2	S-6A	25-26	4.75	-	-	-	0.0	14.6	85.4	-	-	-	NV	NP	NP	-	ML
B-3W	S-7	30-32	2.36	-	-	-	0.0	38.7	61.3	-	-	-	21	12	9	-	CL
B-5	S-6	25-27	2.36	-	-	-	0.0	7.0	93.0	-	-	-	NV	NP	NP	-	ML
B-5	S-7	30-32	2.36	0.09	-	-	0.0	44.1	55.9	-	-	-	21	16	5	-	CL-ML
B-8	U-1	27-29	9.53	0.09	-	-	0.9	40.7	58.4	61.3	-	-	77	45	32	11.8	MH

* Refer to detailed laboratory analysis data for additional information regarding the results presented herein.

B-1W
SURF. EL. 14.0
10/23/2014

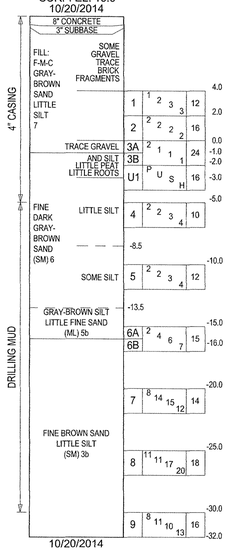


10/24/2014

2"-DIA. WELLPOINT INSTALLED TO ELEVATION -6.0
GROUND WATER OBSERVATIONS FOR WELLPOINT

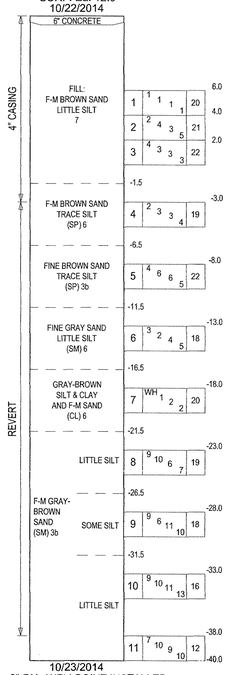
DATE	TIME	DEPTH, FT	ELEVATION
10/28/14	8:30 AM	13.9	0.1
10/28/14	1:45 PM	13.9	0.1
11/07/14	9:00 AM	14.1	-0.1
11/11/14	9:00 AM	14.1	-0.1
11/14/14	8:00 AM	14.2	-0.2

B-2
SURF. EL. 10.0
10/20/2014



10/20/2014

B-3W
SURF. EL. 12.0
10/22/2014

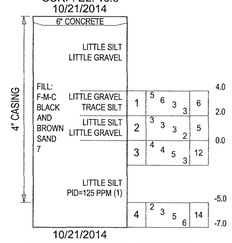


10/23/2014

2"-DIA. WELLPOINT INSTALLED TO ELEVATION -8.0
GROUND WATER OBSERVATIONS FOR WELLPOINT

DATE	TIME	DEPTH, FT	ELEVATION
10/29/14	9:45 AM	11.8	0.2
10/29/14	2:00 PM	11.8	0.2
11/07/14	9:00 AM	11.9	0.1
11/11/14	9:00 AM	11.9	0.1
11/14/14	8:00 AM	11.9	0.1

B-4
SURF. EL. 10.0
10/21/2014

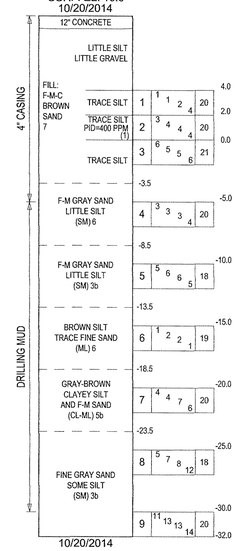


10/21/2014

(1) PID DENOTES PHOTOIONIZATION DETECTOR READINGS OF VOLATILE ORGANIC COMPOUND (VOC) CONCENTRATIONS IN PARTS PER MILLION (PPM).

NOTE:
BORING B-4 TERMINATED PER NYC DDC AT ABOUT EL. -7.0 DUE TO SUSTAINED PID READINGS OVER 50 PPM IN BREATHING ZONE.

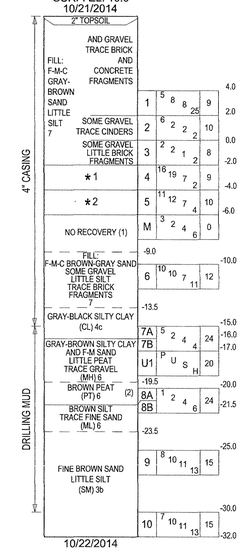
B-5
SURF. EL. 10.0
10/20/2014



10/20/2014

(1) PID DENOTES PHOTOIONIZATION DETECTOR READINGS OF VOLATILE ORGANICS COMPOUND (VOC) CONCENTRATIONS IN PARTS PER MILLION (PPM).

B-8
SURF. EL. 10.0
10/21/2014



10/22/2014

(1) COARSE GRAVEL STUCK AT TIP OF SPOON.
(2) 8" PIECE OF WOOD FROM ABOUT EL. -20.0 TO EL. -20.5.

★1 FILL: GRAVEL SOME F-M-C BROWN SAND TRACE SILT TRACE CONCRETE FRAGMENTS 7

★2 FILL: F-M-C BLACK-GRAY SAND AND GRAVEL LITTLE SILT LITTLE CINDERS TRACE WOOD AND BRICK FRAGMENTS 7

PAVEMENT CORE DATA	
P.C. NO.	PC-1
ASPHALT	3.5"
CONCRETE	8.5"

D. PATEL / S. EVEREST / J. LUO
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SAFETY AND SITE SUPPORT

NO.	DATE	DESCRIPTIONS	APPR'D
		REVISIONS	

CITY OF NEW YORK
DEPARTMENT OF
DESIGN & CONSTRUCTION

SEK20068
4105

PREPARED FOR:
DIVISION OF PROGRAM MANAGEMENT
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CONSULTANT NAME:
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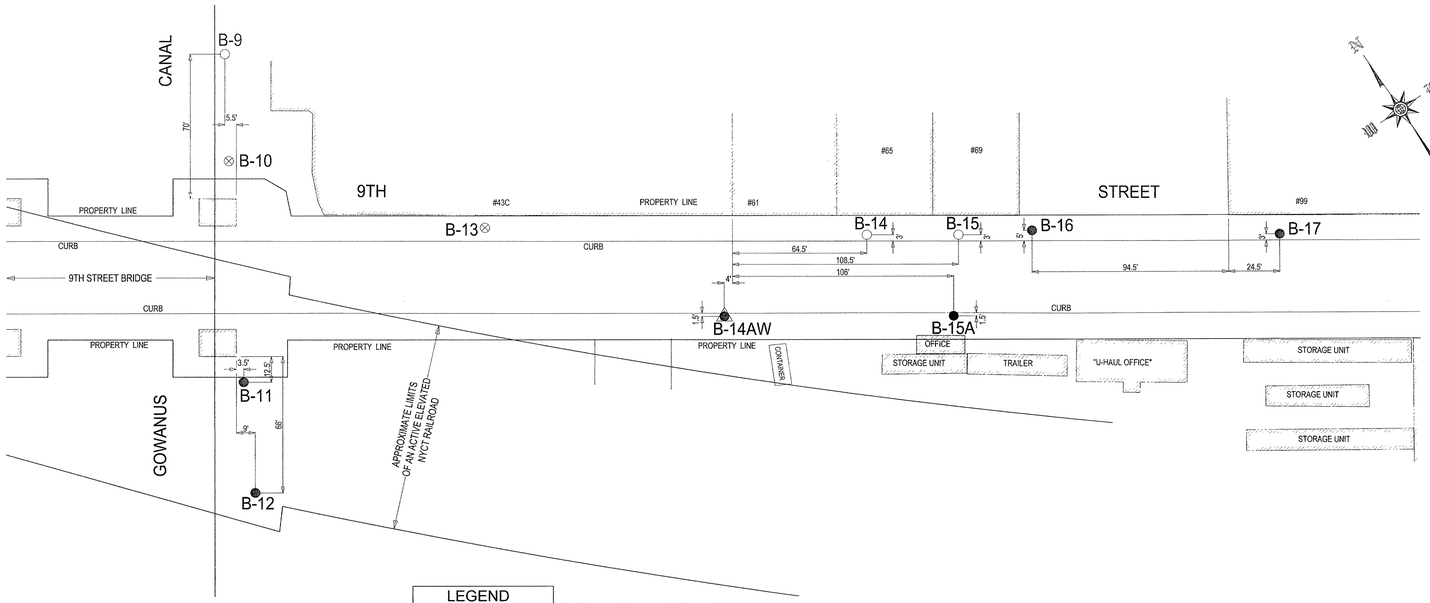
BOROUGH OF BROOKLYN

RECORD OF BORINGS

SEAL & SIGNATURE

STATE OF NEW YORK · ANDREW LEUNG · 080316 · LICENSED PROFESSIONAL ENGINEER

DATE:	JANUARY 23, 2015
PROJECT NO:	SEK20068
DRAWING BY:	ADAM MOUTAFIS
CHK BY:	REY CLAVEL / JUDY LUO
DWG No:	B-102.00
CADD FILE No :	4105-ROB-01
SHEET	2 OF 5



LEGEND

- TEST BORING
- TEST BORING WITH OBSERVATION WELL
- TEST BORING (FAILED ATTEMPT)
- TEST BORING (CANCELLED)

LOCATION PLAN

SCALE: 1" = 30'

30 0 30

NOTES:
1. BORING B-10 WAS CANCELLED BY NYC DDC DUE TO PROXIMITY TO 9TH STREET BRIDGE.
2. BORING B-13 WAS CANCELLED BY NYC DDC DUE TO LIMITED ACCESS AND ONGOING CONSTRUCTION OF THE ADJACENT ACTIVE ELEVATED NYCT RAILROAD.

LABORATORY ANALYSIS SUMMARY *

Soil Sample Identification And Index Properties

BORING NO.	SAMPLE NO.	DEPTH, ft	D100, mm	D60, mm	D30, mm	D10, mm	% GRAVEL (>#4 SIEVE)	%SAND	% SILT OR CLAY (<#200 SIEVE)	WC %	Cc	Cu	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	ORGANIC CONTENT (%)	USCS SYMBOL
B-11	S-9	40-42	4.75	-	-	-	0.0	27.6	72.4	-	-	-	NV	NP	NP	-	ML
B-12	S-4	15-17	4.75	-	-	-	0.0	17.9	82.1	61.0	-	-	82	32	50	4.3	CH
B-12	S-8	30-32	4.75	-	-	-	0.0	19.9	80.1	62.0	-	-	81	32	49	7.8	CH
B-14AW	S-3	12-14	4.75	-	-	-	0.0	13.7	86.3	95.5	-	-	133	48	85	11.9	CH
B-14AW	S-7	25-27	1.18	-	-	-	0.0	23.2	76.8	-	-	-	22	16	6	-	CL-ML
B-15A	U-1	12-14	-	-	-	-	-	-	-	-	-	-	242	97	145	-	PT
B-15A	S-4A	14-15.5	9.53	2.18	0.56	0.09	12.2	79.2	8.6	-	1.60	24.22	257	119	138	56.1	PT
B-15A	S-7	30-32	4.75	0.08	-	-	0.0	41.7	58.3	-	-	-	NV	NP	NP	-	ML
B-16	S-5	17-19	0.60	-	-	-	0.0	30.4	69.6	27.0	-	-	30	24	6	1.0	ML
B-16	S-8	30-32	9.53	0.08	-	-	0.2	43.9	55.9	-	-	-	NV	NP	NP	-	ML
B-17	S-6	16-18	4.75	-	-	-	0.0	5.8	94.2	73.3	-	-	108	41	67	6.0	CH

Consolidation Test / Triaxial Tests

Boring No.	Sample No	Depth, ft.	Initial Void Ratio (e_o)	Preconsolidation Pressure (tsf)	Compression Index (Cc)	Recompression Index (Cr)	Test Type	Peak Deviator Stress (tsf)	Undrained Shear Strength (tsf)
B-15A	U-1	12-14	3.942	1.3	2.293	0.188	UU at 13 ft	1.33	0.665

* Refer to detailed laboratory analysis data for additional information regarding the results presented herein.
UU = Unconsolidated-Undrained Compressive Strength Test
tsf = Tons Per Square Foot

B-9
SURF. EL. 5.0
10/23/2014

4" ASPHALT; AND F-M-C GRAY SAND TRACE BRICK AND WOOD FRAGMENTS; FILL: TRACE CINDERS; GRAVEL LITTLE SILT 7; ★1; AND F-M-C BLACK SAND LITTLE CINDERS; AND F-M-C BLACK SAND; 9" WOOD PIECE IN SPOON; NO RECOVERY (1); 4" CASING

1	12	8	12	51	11	-1.0	-3.0		
2	25	12	6	18	10	-3.0	-5.0		
3	7	7	8	25	6	-5.0	-8.5		
4	3	3	7	7	9	-10.0	-13.5		
M	16	50/3"			0	-15.0	-18.0		

10/23/2014

★1 FILL: GRAVEL SOME F-M-C BLACK SAND LITTLE SILT LITTLE CONSTRUCTION DEBRIS TRACE WOOD FRAGMENTS 7

(1) BORING B-9 ENCOUNTERED BURIED METAL OBSTRUCTION AT ABOUT EL. -18.0. BORING WAS ABANDONED PER NYC DDC.

B-11
SURF. EL. 6.0
10/25/2014

8" CONCRETE; FILL: GRAVEL AND F-M-C BROWN SAND LITTLE SILT 7; ★1; ★2; ★3; FILL: GRAY CLAY SOME GRAVEL LITTLE F-M-C SAND 7; 8" WOOD PIECE IN SPOON; FILL: GRAY CLAY TRACE FINE SAND TRACE GRAVEL 7; 6" WOOD PIECE IN SPOON; FINE GRAY SAND LITTLE SILT (SM) 6; DARK BROWN SILT TRACE FINE SAND (ML) 6; FINE GRAY SAND LITTLE SILT (SM) 3b; BROWN SILT SOME F-M SAND (ML) 5b; FINE BROWN SAND LITTLE SILT (SM) 3b; 4" CASING; DRILLING MUD

1A	6	12	8	5	20	0.0	-1.3		
1B						-1.3	-2.0		
2A	7	25	50/8"		8	-3.0	-4.0		
2B									
3	WH	1	2	3	7				
(1)						-7.5	-8.0		
4	17	46	12	13	8	-9.0	-12.5		
5	6	4	3	8	12	-14.0	-17.5		
6	16	36	18	9	6	-19.0	-22.5		
7A	2	2	4	4	18	-24.0	-27.5		
7B						-25.0			
8	3	5	5	5	16	-29.0	-32.5		
9	10	11	12	13	15	-34.0	-37.5		
10	6	10	12	14	10	-39.0	-41.0		

10/27/2014

★1 FILL: F-M-C BROWN SAND SOME GRAVEL LITTLE SILT 7

★2 FILL: DARK GRAY CLAY TRACE FINE SAND 7

★3 FILL: GRAVEL SOME F-M-C GRAY SAND LITTLE SILT 7

(1) WOOD FRAGMENTS OBSERVED IN CUTTINGS FROM ABOUT EL. -8.0 TO EL. -9.0.

(2) LOSS OF DRILLING FLUID OBSERVED AT ABOUT EL. -16.0.

B-12
SURF. EL. 6.0
10/28/2014

9" CONCRETE; FILL: F-M-C BROWN SAND AND SILT SOME GRAVEL LITTLE BRICK FRAGMENTS 7; ★1; FILL: SOME SILT LITTLE GRAVEL; FILL: F-M-C BLACK SAND 7; SOME GRAVEL LITTLE SILT TRACE BRICK FRAGMENTS; LITTLE F-M SAND; GRAY-BLACK CLAY TRACE ORGANICS (CH) 6; SOME F-M SAND; LITTLE F-M SAND; FINE GRAY-BROWN SAND LITTLE SILT (SM) 6; FINE GRAY-BROWN SAND LITTLE SILT (SM) 3b; 4" CASING; DRILLING MUD

1	6	17	10	4	6	0.0	-2.0		
2	6	4	4	4	10	-4.0	-5.0		
3	2	2	2	3	8				
4	WH	WH	WH	2	24	-7.5	-9.0		
5	WH	WH	2	2	16	-11.0	-13.0		
6	WH	1	WH		12				
7	WH	1	WH	1	24	-17.0	-19.0		
8	WH	WH	1	1	18	-22.5	-24.0		
9	1	2	4	7	20	-27.5	-29.0		
10	5	9	9	10	17	-32.5	-34.0		
11	5	9	9	6	20	-37.5	-39.0		
12	4	6	7	6	19	-42.5	-44.0		

10/28/2014

★1 FILL: GRAVEL SOME F-M-C BLACK SAND LITTLE SILT TRACE BRICK FRAGMENTS 7

B-14AW
SURF. EL. 5.0
10/27/2014

7" CONCRETE; FILL: F-M-C BROWN SAND AND GRAVEL LITTLE SILT 7; F-M-C BROWN SAND SOME SILT (SM) 6; NO RECOVERY (1); GRAY CLAY LITTLE F-M-C SAND TRACE ORGANICS (CH); BROWN SILT TRACE FINE SAND (ML) 6; FINE BROWN SAND LITTLE SILT (SM) 3b; BROWN SILT & CLAY SOME F-M SAND (CL-ML) 6; FINE BROWN SAND LITTLE SILT (SM) 3b; BROWN SILT TRACE FINE SAND (ML) 5b; FINE BROWN SAND LITTLE SILT (SM) 3b; 4" CASING; REVERT

1	WH	WH	WH		12	-1.0	-3.0		
2	WH	WH	WH		20	-5.0	-5.5		
M	WH	WH	WH		0	-7.0	-7.5		
3	4	8	2	2	24	-9.0	-9.5		
4	2	2	3	10	20	-11.0	-14.0		
5	WH	2	1	2	21				
6	2	4	9	10	16	-15.0	-18.5		
7	4	3	2	5	17	-20.0	-23.5		
8	4	7	8	8	18	-25.0	-28.5		
9A	5	6	8	10	19	-30.0	-31.5		
9B									
10	6	8	13	17	16	-35.0	-37.0		

10/27/2014

2"-DIA. WELLPOINT INSTALLED TO ELEVATION -15.0

GROUND WATER OBSERVATIONS FOR WELLPOINT

DATE	TIME	DEPTH, FT	ELEVATION
10/30/14	9:05 AM	3.7	1.3
10/30/14	1:30 PM	3.7	1.3
11/07/14	9:00 AM	3.4	1.6
11/11/14	9:00 AM	3.7	1.3
11/14/14	8:00 AM	3.7	1.3

NOTE:
BORING B-14 ENCOUNTERED BURIED OBSTRUCTION AND TRAPPED WATER AT ABOUT EL. 3.0 DURING HAND AUGERING. BORING B-14 OFFSET AS B-14AW.

(1) COARSE GRAVEL STUCK AT TIP OF SPOON.

B-15A
SURF. EL. 4.5
10/17/2014

7" CONCRETE; FILL: F-M-C GRAY-BROWN SAND 7; SOME GRAVEL LITTLE SILT; SOME SILT LITTLE GRAVEL; LITTLE SILT TRACE GRAVEL; LITTLE SILT; BROWN PEAT AND F-M-C SAND LITTLE GRAVEL TRACE CLAY (PT) 6; GRAY SILTY CLAY (CL) 6; FINE GRAY SAND LITTLE SILT (SM) 3b; GRAY CLAY AND FINE SAND (CL) 4c; F-M GRAY SAND LITTLE SILT (SM) 6; BROWN SILT AND F-M SAND (ML) 5b; FINE BROWN SAND LITTLE SILT (SM) 3b; 4" CASING; DRILLING MUD

1	2	10	6	6	10	-1.5	-3.5		
2	5	5	4	2	12	-5.5	-7.0		
3A	6	12	5	3	15				
3B						-7.5			
U1	P	U	S	H	24				
4A	1	1	2	3	24	-9.5	-11.0		
4B									
5	6	10	8	11	13	-15.5	-19.0		
6A	WH	1	3	4	18	-20.5	-22.2		
6B									
7	4	6	10	8	15	-25.5	-29.0		
8	11	14	12	12	19	-30.5	-37.5		
9	8	11	12	18	19				

10/17/2014

NOTE:
BORING B-15 ENCOUNTERED BURIED OBSTRUCTION AND TRAPPED WATER AT ABOUT EL. 2.5 DURING HAND AUGERING. BORING B-15 OFFSET AS BORING B-15A.

(1) THIN GRAY ORGANIC SILT LAYERS AT ABOUT EL. -9.0.

B-16
SURF. EL. 5.0
10/24/2014

7" CONCRETE; FILL: F-M-C GRAY-BROWN SAND 7; AND GRAVEL TRACE SILT; SOME GRAVEL TRACE SILT; SOME CLAYEY SILT TRACE GRAVEL; BROWN PEAT (PT) 6; GRAY-BROWN SILT & CLAY SOME FINE SAND TRACE ORGANICS (ML) 6; FINE GRAY SAND LITTLE SILT (SM) 3b; GRAY-BROWN ORGANIC CLAY & SILT LITTLE FINE SAND (OL) 6; FINE GRAY SAND LITTLE SILT (SM) 6; BROWN SILT AND F-M SAND TRACE GRAVEL (ML) 6; F-M-C BROWN SAND LITTLE SILT (SM); TRACE GRAVEL 3b; 4" CASING; DRILLING MUD

1	5	6	4	6	6	-1.0	-3.0		
2	7	1	4	3	8	-5.0	-8.5		
3	2	1	2	1	12				
4A	WH	WH	WH		24	-10.0	-11.0		
4B									
5	WH	2	2	3	20	-12.0	-14.5		
6	4	7	9	10	14	-15.0	-18.5		
7A	1	3	5	6	18	-20.0	-21.0		
7B									
8	4	4	5	9	19	-23.5	-28.5		
9	8	15	19	22	20	-30.0	-33.5		
10	6	6	7		24	-35.0	-38.5		
11	8	10	12	12	20	-40.0	-42.0		

10/24/2014

B-17
SURF. EL. 5.0
10/16/2014

6" CONCRETE; FILL: F-M-C GRAY SAND LITTLE SILT LITTLE GRAVEL 7; ★1; FILL: FINE GRAY SAND LITTLE SILT LITTLE GRAVEL 7; DARK GRAY CLAY 6; SOME PEAT (CL); AND PEAT (OL); DARK GRAY CLAY TRACE F-M SAND TRACE PEAT (CH) 4c; F-M GRAY SAND LITTLE SILT (SM) 3b; F-M BROWN AND GRAY SAND LITTLE SILT (SM) 6; F-M-C GRAY-BROWN SAND SOME GRAVEL LITTLE SILT (SM); 4" CASING; DRILLING MUD

1	1	1	1	1	10	-1.0	-3.0		
2	1	1	2	1	6	-5.0	-7.0		
3	WH	WH	WH		6				
4	1	WH	WH	1	4	-7.0	-9.0		
5	WH	1	WH	1	10	-11.0	-14.0		
6	2	3	2	4	20				
7	5	6	7	10	18	-15.0	-20.0		
8	7	9	10	11	14	-23.5	-25.0		
9	4	3	1	6	12	-28.5	-30.0		
10	8	8	11	13	16	-33.5	-35.0		
11	14	13	21	39	3				

10/16/2014

★1 FILL: GRAY CLAYEY SILT AND FINE SAND 7

D. PATEL / S. EVEREST / J. LUO
SOIL AND ROCK ANALYSIS BY

ANDREW LEUNG, P.E.
GEOTECHNICAL ENGINEER
YU-PARSONS BRINCKERHOFF, JV

RICHARD G. MESEROLE
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B.E.G.S.

MARK A. CANU
ASSOCIATE COMMISSIONER
DIVISION OF PROGRAM MANAGEMENT
SAFETY AND SITE SUPPORT

NO.	DATE	DESCRIPTIONS	APPR'D
		REVISIONS	

CITY OF NEW YORK
DEPARTMENT OF
DESIGN & CONSTRUCTION

SEK20068
4105

PREPARED FOR:
DIVISION OF PROGRAM MANAGEMENT
SAFETY AND SITE SUPPORT
BUREAU OF ENVIRONMENTAL
AND GEOTECHNICAL SERVICES

CONSULTANT NAME:
YU-PARSONS BRINCKERHOFF, JV
200 RIVERFRONT BOULEVARD
ELMWOOD PARK, NEW JERSEY 07407

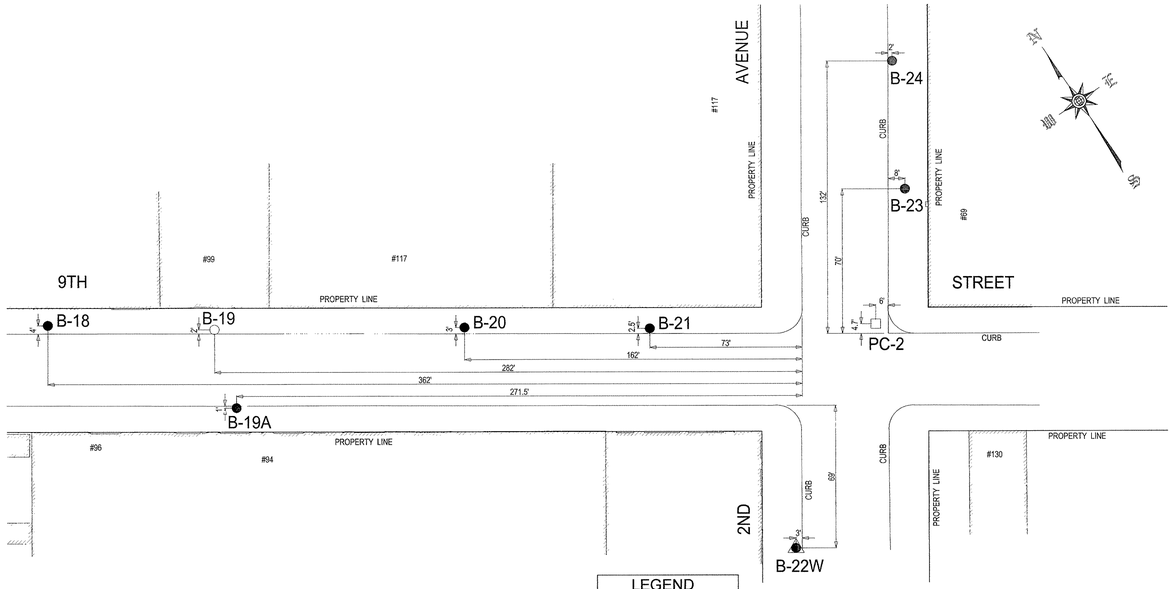
CONTRACTOR NAME:
AQUIFER DRILLING & TESTING, INC.
75 EAST 2ND STREET
MINEOLA, NEW YORK 11501

PROJECT NAME:
NEW STORM AND COMBINED SEWERS
AND WATER MAIN WORK IN 9TH STREET
9TH STREET BETWEEN 2ND AVENUE AND SMITH STREET
BOROUGH OF BROOKLYN

RECORD OF BORINGS

SEAL & SIGNATURE
STATE OF NEW YORK · ANDREW LEUNG · 069018 · LICENSED PROFESSIONAL ENGINEER

DATE:	JANUARY 23, 2015
PROJECT NO:	SEK20068
DRAWING BY:	ADAM MOUTAFIS
CHK BY:	REY CLAVEL / JUDY LUO
DWG No:	B-103.00
CADD FILE No :	4105-ROB-01
SHEET	3 OF 5



LOCATION PLAN

SCALE: 1" = 30'

30 0 30

LEGEND

- TEST BORING
- TEST BORING WITH OBSERVATION WELL
- TEST BORING (FAILED ATTEMPT)
- PAVEMENT CORE

NOTE:
PAVEMENT CORE PC-2 WAS CORED LESS THAN 8' FROM THE CURB PER NYC DDC DUE TO TRAFFIC CONFIGURATION.

LABORATORY ANALYSIS SUMMARY *

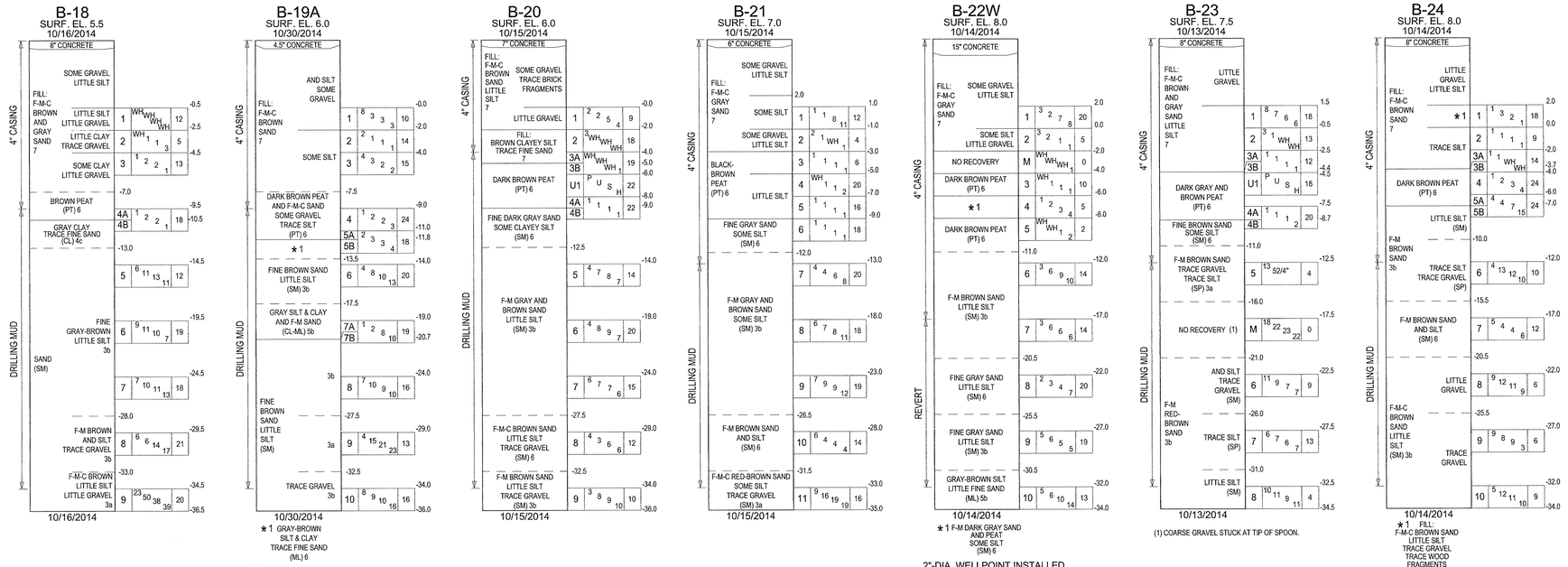
Soil Sample Identification And Index Properties

BORING NO.	SAMPLE NO.	DEPTH, ft	D100, mm	D60, mm	D30, mm	D10, mm	% GRAVEL (>#4 SIEVE)	%SAND	% SILT OR CLAY (<#200 SIEVE)	WC %	Cc	Cu	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	ORGANIC CONTENT (%)	USCS SYMBOL
B-18	S-8	35-37	25.40	0.22	-	-	8.9	47.2	43.9	-	-	-	NV	NP	NP	-	SM
B-19A	S-4	15-17	9.53	3.06	1.18	0.18	23.2	71.9	4.9	289.8	2.53	17.00	-	-	-	48.8	PT
B-19A	S-7A	25-26.7	1.18	0.08	-	-	0.0	42.1	57.9	-	-	-	22	15	7	-	CL-ML
B-20	U-1	12-14	-	-	-	-	-	-	-	-	-	-	377	161	216	-	PT
B-21	S-4	12-14	-	-	-	-	-	-	-	372.9	-	-	-	-	-	79.6	PT
B-22W	S-10	40-42	2.36	-	-	-	0.0	18.3	81.7	-	-	-	NV	NP	NP	-	ML
B-23	S-6	30-32	19.05	0.19	-	-	7.1	50.4	42.5	-	-	-	NV	NP	NP	-	SM
B-24	S-4	12-14	-	-	-	-	-	-	-	335.0	-	-	-	-	-	66.3	-
B-24	S-7	25-27	4.75	0.16	-	-	0.0	59.7	40.3	-	-	-	NV	NP	NP	-	SM

Consolidation Test / Triaxial Tests

Boring No.	Sample No	Depth, ft.	Initial Void Ratio (e_o)	Preconsolidation Pressure (tsf)	Compression Index (Cc)	Recompression Index (Cr)	Test Type	Peak Deviator Stress (tsf)	Undrained Shear Strength (tsf)
B-20	U-1	12-14	4.894	1.1	3.141	0.348	UU at 13.1 ft	1.13	0.565

* Refer to detailed laboratory analysis data for additional information regarding the results presented herein.
UU = Unconsolidated-Undrained Compressive Strength Test
tsf = Tons Per Square Foot



PAVEMENT CORE DATA

P.C. NO.	PC-2
ASPHALT	8.5"

D. PATEL / S. EVEREST / J. LUO SOIL AND ROCK ANALYSIS BY	ANDREW LEUNG, P.E. GEOTECHNICAL ENGINEER YU-PARSONS BRINCKERHOFF, JV	RICHARD G. MESEROLE SECTION CHIEF B.E.G.S.
JEFFREY K. AU, P.E. | JEAN M. JEAN-LOUIS GEOTECHNICAL ENGINEER | DIRECTOR B.E.G.S.	MARK A. CANU ASSOCIATE COMMISSIONER DIVISION OF PROGRAM MANAGEMENT SAFETY AND SITE SUPPORT	

NO.	DATE	DESCRIPTIONS	APPR`D
		REVISIONS	

SEAL & SIGNATURE

STATE OF NEW YORK · ANDREW LEUNG · 090116-1 · LICENSED PROFESSIONAL ENGINEER

CITY OF NEW YORK
DEPARTMENT OF
DESIGN & CONSTRUCTION

SEK20068
4105

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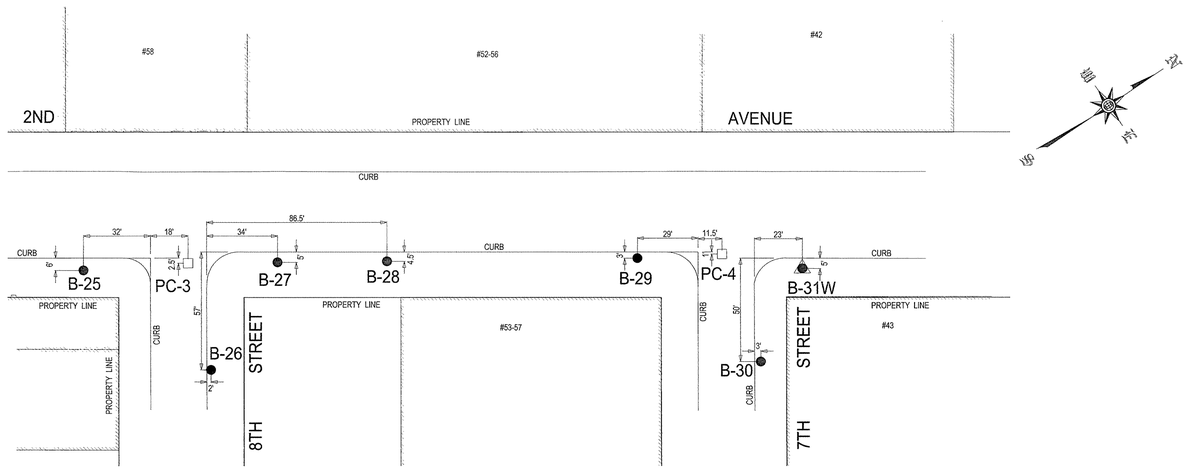
BOROUGH OF BROOKLYN

RECORD OF BORINGS

DATE:	JANUARY 23, 2015
PROJECT NO:	SEK20068
DRAWING BY:	ADAM MOUTAFIS
CHK BY:	REY CLAVEL / JUDY LUO
DWG No:	B-104.00
CADD FILE No :	4105-ROB-01
SHEET	4 OF 5



LOCATION PLAN

SCALE: 1" = 30'

30 0 30

LEGEND

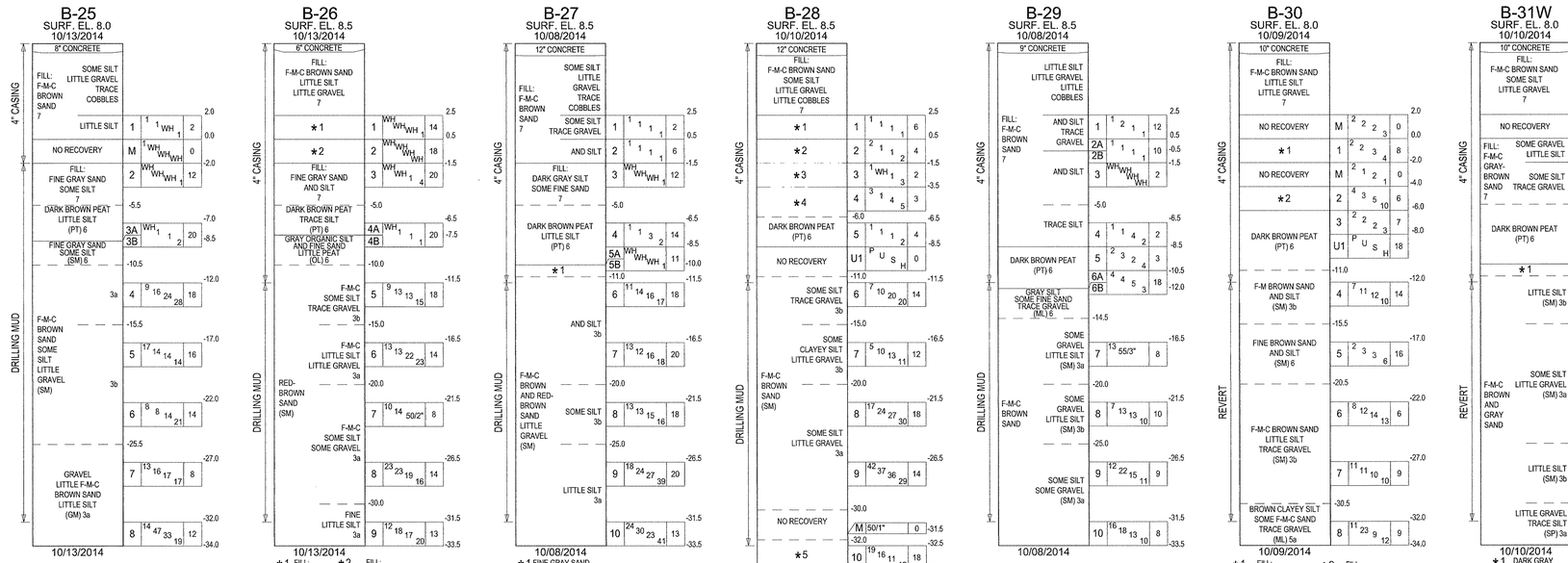
- TEST BORING
- TEST BORING WITH OBSERVATION WELL
- PAVEMENT CORE

LABORATORY ANALYSIS SUMMARY *

Soil Sample Identification And Index Properties

BORING NO.	SAMPLE NO.	DEPTH, ft	D100, mm	D60, mm	D30, mm	D10, mm	% GRAVEL (>#4 SIEVE)	%SAND	% SILT OR CLAY (<#200 SIEVE)	WC %	Cc	Cu	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	ORGANIC CONTENT (%)	USCS SYMBOL
B-25	S-3A	15-16.5	-	-	-	-	-	-	-	344.4	-	-	-	-	-	80.6	PT
B-25	S-7	35-37	-	-	-	-	-	-	-	-	-	-	NV	NP	NP	-	-
B-26	S-4B	16-17	4.75	0.09	-	-	0.0	45.2	54.8	-	-	-	20	20	0	54.8	OL
B-26	S-7	30-32	25.40	0.70	0.08	-	20.4	51.0	28.6	-	-	-	NV	NP	NP	-	SM
B-27	S-4	15-17	-	-	-	-	-	-	-	339.2	-	-	-	-	-	65.4	PT
B-27	S-7	25-27	19.05	0.27	-	-	10.9	53.3	35.8	-	-	-	-	-	-	-	SM
B-28	S-5	15-17	-	-	-	-	-	-	-	268.2	-	-	-	-	-	62.2	PT
B-28	S-8	30-32	19.05	0.35	-	-	17.2	48.7	34.1	-	-	-	-	-	-	-	SM
B-28	S-10	41-43	25.40	-	-	-	8.5	16.2	75.3	-	-	-	22	18	4	-	CL-ML
B-29	S-6A	19-20.5	-	-	-	-	-	-	-	163.4	-	-	-	-	-	38.0	PT
B-29	S-9	35-37	38.10	0.36	-	-	21.6	47.5	30.9	-	-	-	-	-	-	-	SM
B-30	S-4	20-22	4.75	0.15	-	-	0.0	63.6	36.4	-	-	-	-	-	-	-	SM
B-30	S-8	40-42	9.53	-	-	-	2.1	26.4	71.5	-	-	-	22	19	3	-	ML
B-31W	S-3	15-17	-	-	-	-	-	-	-	187.3	-	-	-	-	-	43.4	PT
B-31W	S-6	25-27	19.05	0.29	0.09	-	11.6	61.8	26.6	-	-	-	-	-	-	-	SM

* Refer to detailed laboratory analysis data for additional information regarding the results presented herein.



2"-DIA. WELLPOINT INSTALLED TO ELEVATION -12.0
GROUND WATER OBSERVATIONS FOR WELLPOINT

DATE	TIME	DEPTH, FT	ELEVATION
10/14/14	7:45 AM	5.9	2.1
10/15/14	2:10 PM	5.9	2.1
10/20/14	8:00 AM	6.1	1.9
10/24/14	1:15 PM	6.1	1.9
10/29/14	10:35 AM	6.3	1.7
10/29/14	2:30 PM	6.3	1.7
11/07/14	9:30 AM	6.2	1.8
11/11/14	9:30 AM	6.4	1.6
11/14/14	8:30 AM	6.4	1.6

PAVEMENT CORE DATA		
P.C. NO.	PC-3	PC-4
ASPHALT	9"	6"

CITY OF NEW YORK
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