HISTORICAL PERSPECTIVES INC.

New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore

New Creek Watershed
Phase IA Archaeological Documentary Study

OPRHP No. 10PRO2085

LPC No. 07DEP063R

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Prepared For:

AKRF
440 Park Avenue South, 7th Floor
New York, N.Y. 10016

and

DEP Bluebelt Program
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March 2011

MANAGEMENT SUMMARY

SHPO Project Review Number (if available): **10PRO2085**

Involved State and Federal Agencies:

Phase of Survey: **Phase IA Archaeological Documentary Study**

Location Information
- Location: **Multiple locations, New Creek Watershed.**
- Minor Civil Division: **08501, Staten Island**
- County: **Richmond**

Survey Area
- Length: **varies**
- Width: **varies**
- Number of Acres Surveyed: **Total footprint of 19 BMPs is ca. 60.2 acres**

USGS 7.5 Minute Quadrangle Map: **The Narrows**

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

Results of Archaeological Survey
- Number & name of precontact sites identified: **None**
- Number & name of historic sites identified: **None**
- Number & name of sites recommended for Phase II/Avoidance: **None**

Report Authors(s): **Julie Abell Horn, M.A., R.P.A. and Dawn Louise Brown, Historical Perspectives, Inc.**

Date of Report: **March 2011**

EXECUTIVE SUMMARY

The New York City Department of Environmental Protection (DEP) has developed a drainage plan for the stormwater management of the New Creek Watershed in Staten Island, New York. The New Creek Watershed is approximately 2,249 acres in size and generally bounded by Miller Field and New Dorp Lane to the southwest. The northwestern boundary extends northeast to southwest through and incorporating portions of Richmond County Country Club and the Reeds Basket Willow Swamp Park (the northwestern limits being Ocean Terrace). Seaview and Burgher Avenues form the northeastern boundary and Lower Bay is the southeastern boundary. The proposed stormwater management plan is composed of storm sewers to collect runoff and Best Management Practices (BMPs) at the points where runoff discharges into the wetlands. A new outfall connecting the BMPs to Lower Bay is proposed at BMP NC-10, and an existing outfall at Seaview Avenue is proposed to be supplemented with a new barrel (14 feet in width) placed adjacent to the existing barrel. The location of the overall watershed, the 19 proposed BMP locations, and the proposed outfall locations within the watershed are shown in Figures 1-2. The individual BMPs are further shown in Figures 3a-h and Figures 4a-m. Figures 3a-h represent the most conservative estimate of BMP footprint areas, whereas Figures 4a-m are, in some cases, more tightly restricted to proposed impact areas. For this report, the more conservative BMP footprints as shown in Figures 3a-h were the ones that were studied and are presented in subsequent figures. The BMPs proposed for the watershed are listed in the following table.

New Creek Watershed—BMP List

BMP Number	BMP Name/ Location	Appx BMP Footprint (acres)	Drainage Area (acres)	BMP Conceptual Design	Ownership/ Jurisdiction
NC-1	Merrick Ave	0.1	19.7	Velocity attenuator and drop pipe	DPR Parkland (Reeds Basket Willow Swamp Park) NYCDOT mapped but unbuilt street ROW
NC-2	Ocean Terrace	0.1	18.2	Velocity attenuator and drop pipe	DPR Parkland (Reeds Basket Willow Swamp Park) and private easement
NC-3	Annfield Court	0.2	17.5	Extended detention wetland and stream stabilization	DPR Parkland (Reeds Basket Willow Swamp Park)
NC-4	Whitlock Avenue	0.3	104.6	Extended detention wetland and detention chamber	NYSDEC (Richmond County Country Club Golf Course) sewer easement to be acquired
NC-5	Todt Hill Road	0.9	57.4	Extended detention wetland	NYSDEC (Richmond County Country Club Golf Course) sewer easement to be acquired
NC-6	Boundary Avenue	3.0	111.5	Extended detention wetland	DPR Parkland
NC-7	Nugent Street	4.7	189.4	Extended detention wetland, flood plain creation and stream realignment	DEP Bluebelt
NC-8	Freeborn Street	0.7	1.9	Extended detention wetland, flood plain creation and stream realignment	DEP Bluebelt
NC-9	Graham Boulevard	4.4	3.5	Extended detention wetland, flood plain creation and stream realignment	DEP Bluebelt
NC-10	Jefferson Ave	4.5	50.7	Extended detention wetland and new ocean outfall	DEP Bluebelt
NC-11	Last Chance Pond	8.8	174.5	Extended detention wetland	DPR Parkland/ DEP Bluebelt
NC-12	Joyce Street	0.1	5.4	Outlet stilling basin	DEP Bluebelt
NC-13	Hylan Boulevard	2.9	52.8	Extended detention wetland	DEP Bluebelt
NC-14	Meadow Place	0.2	8.6	Outlet stilling basins	DEP Bluebelt
NC-15	Laconia Avenue	0.1	9.2	Outlet stilling basin	DEP Bluebelt
NC-16	Olympia Boulevard	12.0	28.5	Extended detention wetland	DEP Bluebelt
NC-17	Slater Boulevard	9.7	11.0	Extended detention wetland flood plain creation and stream realignment	DEP Bluebelt
NC-18	Patterson Avenue	7.4	57.1	Extended detention wetland	DEP Bluebelt
NC-19	Buel Avenue	0.1	13.2	Outlet Stilling Basin	DEP Bluebelt

Note:	DEP Bluebelt refers to lands owned by DEP or pending acquisition.
Source:	DEP, Hazen and Sawyer, November 2010.

BMP installations, both within and outside of streetbeds and right-of-ways, will include below-grade impacts. Since the proposed project is located in New York City and subject to both City Environmental Quality Review (CEQR) and the State Environmental Quality Review Act (SEQRA), impact assessment guidance from the *New York City Environmental Quality Review Technical Guidance Manual* (CEQR Technical Manual 2010) will be used in the preparation of an environmental review. The environmental review process, including an evaluation of archaeological sensitivity by the New York City Landmarks Preservation Commission (LPC) and the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) was initiated in 2010. As a function of the standard coordination for a Draft Environmental Impact Statement, both the LPC and OPRHP requested a research-based study, known as a Phase IA Archaeological Documentary Study, to fully assess the archaeological sensitivity of the impact areas of the three watersheds: Oakwood Beach, New Creek and South Beach (4/14/10 and 4/29/10, respectively).

Historical Perspectives, Inc. (HPI) has been contracted by AKRF to complete the requested Phase IA Archaeological Documentary Study for the New Creek Watershed and BMP sites. This study was prepared to comply with the standards of the OPRHP and the LPC (New York Archaeological Council 1994; NYSOPRHP 2005; LPC 2002; CEQR 2010). Where guidelines for the archaeological evaluation and report format of the LPC and the NYSOPRHP varied, those of the LPC, which specifically address New York City conditions and resources, took precedent. The HPI project team consisted of Julie Abell Horn, M.A., R.P.A., who undertook the majority of the research, and wrote the majority of the report; Dawn Louise Brown, who conducted the site visits and wrote portions of the report, and Cece Saunders, M.A., R.P.A. who assisted with the research, managed the project, and provided editorial and interpretive assistance.

The Area of Potential Effect (APE) is defined as the area that could be affected by project development. Since project plans have not been finalized as of this writing, the APE includes the entire footprint of each proposed BMP site and the proposed outfall sites. Typically, the BMP final designs will restrict actual construction impacts to more limited areas. However, this comprehensive approach provides the most sensitive input for planning purposes. The total New Creek Watershed area also is addressed in terms of general history and archaeological sensitivity.

The Phase IA study concluded that the proposed BMP NC-4 site and a portion of the proposed BMP NC-6 site have a high precontact archaeological sensitivity. The remaining proposed BMPs and the proposed outfalls contain no precontact archaeological sensitivity. None of the proposed BMP locations or the proposed outfall locations contains historic period archaeological sensitivity. Assessment of both precontact and historic period archaeological sensitivity for the New Creek Watershed as a whole was undertaken at a general level, but disturbance across the watershed obviously varies according to the level of development and earthmoving that has occurred at any given spot, and would need to be assessed on an individual basis according to site-specific conditions. At this time, there are no additional BMPs defined for the New Creek Watershed; any further consideration of new sites as part of this project would need to be addressed separately.

Based on these conclusions, HPI recommends that a program of Phase IB archaeological testing be conducted on the proposed site of BMP NC-4 and a portion of the proposed site of BMP NC-6 designated as having a high archaeological sensitivity for precontact resources, as shown in Figure 11, if these areas will experience subsurface impacts as part of BMP construction. All archaeological testing should be conducted according to applicable archaeological standards (New York Archaeological Council 1994; NYSOPRHP 2005; LPC 2002; CEQR 2010). Professional archaeologists, with an understanding of and experience in urban archaeological excavation techniques, would be required to be part of the archaeological team. No further archaeological investigations are recommended for the remaining 17 proposed BMPs or the proposed outfall sites.

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I. INTRODUCTION

DEP has developed a drainage plan for the stormwater management of the New Creek Watershed in Staten Island, New York. The New Creek Watershed is approximately 2,249 acres in size and generally bounded by Miller Field and New Dorp Lane to the southwest. The northwestern boundary extends northeast to southwest through and incorporating portions of Richmond County Country Club and the Reeds Basket Willow Swamp Park (the northwestern limits being Ocean Terrace). Seaview and Burgher Avenues form the northeastern boundary and Lower Bay is the southeastern boundary. The proposed stormwater management plan is composed of storm sewers to collect runoff and Best Management Practices (BMPs) at the points where runoff discharges into the wetlands. A new outfall connecting the BMPs to Lower Bay is proposed at BMP NC-10, and an existing outfall at Seaview Avenue is proposed to be supplemented with a new barrel (14 feet in width) placed adjacent to the existing barrel. The location of the overall watershed, the 19 proposed BMP locations, and the proposed outfall locations within the watershed are shown in Figures 1-2. The individual BMPs are further shown in Figures 3a-h and Figures 4a-m. Figures 3a-h represent the most conservative estimate of BMP footprint areas, whereas Figures 4a-m are, in some cases, more tightly restricted to proposed impact areas. For this report, the more conservative BMP footprints as shown in Figures 3a-h were the ones that were studied and are presented in subsequent figures. The BMPs proposed for the watershed are listed in the following table.

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II. METHODOLOGY

This study entails review of various resources. Because the proposed BMP sites consist of land that was undeveloped during the nineteenth century, many standard resources normally consulted to meet LPC standards were not necessary, as described below.

- Primary and secondary sources concerning the general precontact period and history of Staten Island and specific events associated with the project site were reviewed at the New York Public Library, the Staten Island Historical Society, and using online resources.
- Historic maps and aerial photographs were reviewed at the New York Public Library, the Staten Island Historical Society, the Staten Island Museum, the Staten Island Topographical Bureau, and using various online websites. These maps and photographs provided an overview of the changing shoreline, the topography, and a chronology of land usage and ownership. While all maps and photographs that were consulted for this report are cited, due to the volume of materials, only a selection of these images is presented in this report.
- Deeds, tax assessment records, federal census records, and city directories, which are standard resources consulted as part of a documentary study, were not reviewed for this project because the proposed BMP sites were not developed during the nineteenth century.
- There are no Department of Building records for most of the proposed BMP locations because these sites do not contain buildings.
- Information about previously recorded archaeological sites and surveys in the area was compiled from data available at the NYSOPRHP, which includes data files from the New York State Museum (NYSM), and the LPC.
- DEP, Hazen and Sawyer, and AKRF provided various survey maps and site data for the property, including block and lot listings for each proposed BMP. Most of the proposed BMPs have been assigned block and

lot numbers by the City of New York. A table that lists the block and lots included in each proposed BMP is provided as Appendix A. However, there are no visible distinctions between these block and lots within the undeveloped acreage and the city's numbering system has minimal utility for this study.

- DEP also provided a Limited Subsurface Investigation, which includes soil borings, for areas within proposed BMP NC-16 and in proximity to proposed BMP NC-10, BMP NC-13, BMP NC-15, BMP NC-16, and BMP NC-18. The soil borings are included as Appendix B. No soil borings were available for the remaining proposed BMPs.
- AKRF provided project descriptions. Text generated by AKRF is included within various sections of this report.
- Last, site visits to the proposed BMPs were conducted by Dawn Louise Brown of HPI on December 6-7, 2010 to assess any obvious or unrecorded subsurface disturbance (Photographs 1-43; Figures 4a-m).

III. CURRENT CONDITIONS AND ENVIRONMENTAL SETTING

The following text discusses the Current Conditions and Environmental Setting for the watershed as a whole, and individually by proposed BMP locations.

A. Current Conditions

New Creek Watershed

The New Creek Watershed is located adjacent to and northeast of the Oakwood Beach Watershed. It is generally bounded by Miller Field and New Dorp Lane to the southwest. The northwestern boundary extends northeast to southwest through and incorporating portions of Richmond County Country Club and the Reeds Basket Willow Swamp Park (the northwestern limits being Ocean Terrace). Seaview and Burgher Avenues form the northeastern boundary and Lower Bay is the southeastern boundary. This watershed occupies about 2,249 acres. The topography and natural features of the watershed are a contrast of elevated rolling terrain with some very steep slopes, woods and ponds in the northern portion of the watershed (above Railroad Avenue) and flat relief with low lying *phragmites* dominated marshes in the southern portion of the watershed.

The predominant land use in the watershed is residential with commercial uses along the major thoroughfares, such as Hylan Boulevard and Richmond Avenue. There are large tracts of open space including Richmond County Country Club, Reeds Basket Willow Swamp Park and other open spaces associated with the Staten Island Greenbelt in the northern portion of the watershed. Larger City parklands in the lower watershed include Last Chance Pond and the Boundary Avenue wetlands as well as the shoreline and beaches fronting on Lower Bay, which are under New York City Department of Parks and Recreation (DPR) jurisdiction (e.g., the Franklin D. Roosevelt Boardwalk and Beach). There are also 94.4 acres of Bluebelt properties (including lands that have been acquired or will be acquired) within the watershed. The Staten Island Railway runs northeast to southwest through the center of the watershed.

The lower New Creek Watershed is characterized by three stream reaches: the Main Channel originates at Last Chance Pond; the West Branch originates at about Midland Avenue (and the Boundary Avenue wetlands), and the East Branch starts at the southern end of Dongon Hills Avenue. Additional watercourses originate in the open spaces of the northern portion of the watershed (including the St. Francis Seminary open space and Reeds Basket Willow Swamp Park). These streams are open water courses as they flow south but become piped as they enter the lower more developed portion of the watershed. This watershed also includes a number of existing tide-gate controlled outfalls to Lower Bay.

BMP NC-1

The proposed site of BMP NC-1, measuring about 0.1 acre, is located at the east end of Merrick Avenue within the unbuilt terminal segment of the Avenue. This site is east of the mapped but unbuilt right-of-way of Woodhaven Avenue, adjacent to a residential neighborhood on Todt Hill Road and near Reeds Basket Willow Swamp Park (Photograph 1). The proposed site of the BMP, which is at the headwaters of the watershed, is located at the top of a steep, rocky ravine, which has suffered from instability and head cutting due to uncontrolled flows. A velocity attenuator, composed of gabion baskets, is presently at this BMP location. It accepts flow from two catch basins at

the end of Merrick Avenue. It was an emergency measure to stop bank failure. The proposed BMP is bordered to the north and east by rocky slopes, to the south by a rocky slope and an abandoned trail head, and to the west by Merrick Avenue. Surrounding the area to the north, south and east are woods with deciduous trees and brush. A storm drainage pipe is visible slightly downslope (Photograph 2). Further downslope is a drainage within Reeds Basket Willow Swamp Park. Heavy rock has been deposited on the slope, most likely to halt erosion. The placement of the original storm drainage pipe and the grading/paving for Merrick Avenue has completely disturbed this area. Erosion is also a factor. The aforementioned trail has been closed due to serious erosion.

BMP NC-2

The proposed site of BMP NC-2, measuring about 0.1 acre, is located on Todt Hill Road, at the headwaters of the watershed. The proposed BMP is located at the top of a steep ravine which has also suffered from instability and head cutting due to uncontrolled storm flows. The proposed BMP is bordered on the north by Ocean Terrace, to the east by a single family dwelling at 440 Ocean Terrace and a downslope, to the south by a downslope which leads to Reeds Basket Willow Swamp Park, and to the west by another single family dwelling and a downslope. The area to the south is wooded with deciduous trees and brush. A concrete storm drainage channel is visible leading from Ocean Terrace traveling along the west side of 440 Ocean Terrace (Photograph 3).

BMP NC-3

The proposed site of BMP NC-3, measuring about 0.2 acre, is located on DPR property within Reeds Basket Willow Swamp Park and along the north side of Annfield Court, at the headwaters of the watershed (Photograph 4). A storm drain/culvert and cement retaining wall divert storm drainage/rain runoff onto a small stream bed within proposed BMP NC-3 (Photograph 5). This stream then feeds into a small pond off the APE within the Reeds Basket Willow Swamp Park. The proposed site of BMP NC-3 is bordered on the north and east by a wooded area, and on the south and west by Annfield Court. The proposed BMP itself is located within a wooded area; deciduous trees and brush are present, and the terrain is sloped. Disturbance of the entire proposed BMP is not obvious; however, the placement of the storm drainage system as well as the road bed construction for Annfield Court has undoubtedly impacted the southwestern bank of the proposed BMP.

BMP NC-4

The proposed site of BMP NC-4, measuring about 0.3 acre, is located on New York State Department of Environmental Conservation (NYSDEC) property that is leased to the Richmond County Country Club and used as a golf course. It is situated at the end of Whitlock Avenue, at the headwaters of the west flowing branch of the New Creek Watershed. Currently the site of the proposed BMP contains a swale that conveys uncontrolled flow that comes down Whitlock Avenue and into an existing stream that runs through the golf course. The proposed site of BMP NC-4 is bordered on the north by a wooded area, with deciduous trees and brush, and an abandoned stream bed. To the east lies a wooded unlandscaped portion of the golf course. To the south lies wetlands with *phragmites* and then a fairway, and to the west lies a cart path and tee for the golf course; all of the golf course property to the south and west is landscaped (Photograph 6). Disturbance to the proposed BMP site is not obvious. A wooded unlandscaped strip between the golf course wetlands and a chain link fence, separating the golf course from the surrounding neighborhood, appears undisturbed (Photograph 7).

BMP NC-5

The proposed site of BMP NC-5, measuring about 0.9 acre, is also located on NYSDEC property that is leased to and part of the Richmond County Country Club. Currently, a small stream/drainage swale flows under Todt Hill Road between Coventry Road and Windy Hollow Way and into the golf course, passing very close to existing residences before feeding another stream that crosses the golf course. The proposed BMP location is within the landscaped portion of the golf course property southeast of this stream. This area contains a cart path and the edge of a fairway bordering the stream, which runs under a small wooden bridge where it joins the second stream within the golf course (Photograph 8). The proposed BMP is lined with deciduous trees and brush. Unnatural berming runs along the southern bank of the stream (Photograph 9). Disturbance from earthmoving associated with the golf course construction is likely, as is manipulation of the stream channel.

BMP NC-6

The proposed site of BMP NC-6, measuring about 3.0 acres, is located within a fenced DPR property that is bounded by Lincoln Avenue to the west, Boundary Avenue to the north, Midland Avenue to the east, and P.S. 38 to the south. The DPR parcel, referred to as the Boundary Avenue Wetlands, is a natural area open space located at the headwaters of the West Branch of the New Creek Watershed. Currently, the West Branch originates at an existing storm sewer outlet situated at Lincoln Avenue and Boundary Avenue. This small stream runs directly through the property and empties under Midland Avenue (Photograph 10). The proposed BMP is wooded with deciduous trees and brush. The northern portion of proposed BMP NC-6 appears heavily disturbed with large mounds and heavy debris (Photographs 11 and 12). Trees have grown in and around these mounds; it appears that these piles have been at the proposed BMP site for some time. However, the area to the south along the stream bank is relatively level and does not appear to be disturbed (Photograph 13).

BMP NC-7

The proposed site of BMP NC-7, measuring about 4.7 acres, is located on DEP Bluebelt property that is bounded by Hunter Avenue to the west, Nugent Avenue to the north, residential properties to the east (these residential properties are close to Graham Boulevard), and Freeborn Street to the south. This proposed BMP lies on level ground and is fed by a very slow moving, almost stagnant stream, filled with sediment, which runs along Hunter and Bedford Avenues (Photograph 14). This area contains deciduous trees and brush. The stream then empties into a wetlands dominated by *phragmites*, which is a common reed associated with disturbed wetland landforms, and standing water (Photograph 15). Some mounding or berming can be seen on the edges of the proposed BMP from Freeborn Street (Photograph 16). However, the majority of the site is thick with *phragmites*, making it difficult to determine whether the entire area is disturbed. This area is also being used for the dumping of trash and debris.

BMP NC-8

The proposed site of BMP NC-8, measuring about 0.7 acre, is located on Bluebelt property situated between Freeborn Street to the north and Olympia Boulevard to the south and immediately downstream of proposed BMP NC-7 in the West Branch of New Creek. Residential properties form the site boundary to the east and west (these properties are close to Graham Boulevard to the east and Hunter Avenue to the west). This proposed BMP lies on level ground; it is fed by proposed BMP NC-7 and empties into proposed BMP NC-9. It is dominated by *phragmites*, which is a common reed associated with disturbed wetland landforms, although no water could be seen through the vegetation. Some mounding or berming is visible on the edges of the proposed BMP from Freeborn Street (Photograph 17). However, the majority of the site is thick with *phragmites*, making it difficult to determine whether the entire area is disturbed. This area is also being used for the dumping of trash and debris (Photograph 18). On the portion of proposed BMP NC-8 that is accessed by Olympia Boulevard, a manhole cover is visible in the wetlands (Photograph 19).

BMP NC-9

The proposed site of BMP NC-9, measuring about 4.4 acres, is located on Bluebelt property immediately south of proposed BMP NC-8. BMP NC-9 is proposed to be located on Bluebelt property immediately south of proposed BMP NC-8. The property is bounded approximately by Olympia Boulevard to the north and Patterson Avenue to the south with residential properties to the east and west (these residential properties are close to Graham Boulevard to the east and Hunter Avenue to the west). This proposed BMP lies on level ground; it is fed by proposed BMP NC-8 and empties into proposed BMP NC-17. It is dominated by *phragmites*, which is a common reed associated with disturbed wetland landforms, although no water could be seen through the vegetation. The majority of the site is thick with *phragmites*, making it difficult to determine whether the area is disturbed (Photographs 20 and 21). This area is also being used for the dumping of trash and debris.

BMP NC-10

The proposed site of BMP NC-10, measuring about 4.5 acres, is located on Bluebelt property that is bounded approximately by Baden Place to the north, Father Capodanno Boulevard to the south and Jefferson Avenue to the east, with residential properties to the west (these properties generally are close to Hunter Avenue). This proposed

BMP lies on level ground. It is dominated by *phragmites,* which is a common reed associated with disturbed wetland landforms, and water is visible when the wetlands approach Jefferson Avenue, where it forms into a slow moving stream which then passes under Graham Boulevard (Photograph 22). Deciduous trees and brush are present on the riverbank. The majority of the proposed BMP is thick with *phragmites,* making it difficult to determine whether the entire area is disturbed. On Baden Place, a fire hydrant is present in the *phragmites* (Photograph 23). This area is also being used for the dumping of trash and debris. When the wetlands begin to open up near Jefferson Avenue, mounding can be seen on the riverbank.

BMP NC-11

The proposed site of BMP NC-11, measuring about 8.8 acres, is located within Last Chance Pond Park and is surrounded by a residential neighborhood. The site is bounded by Stobe Avenue to the west, Zoe Street to the north, Naughton Avenue to the east, and Joyce Street to the south. DPR manages the parcel as a natural area open space. This proposed BMP lies on relatively level ground. It is wooded around its perimeter; deciduous trees and brush are present, as well as some landscaping. Walking trails are present. The interior of proposed BMP NC-11 contains standing water and *phragmites,* which is a common reed associated with disturbed wetland landforms. A slow moving stream is near the intersection of Seaver Avenue and Husson Street. The wooded strip along Husson Street appears disturbed; the area is less disturbed along Naughton Avenue (Photograph 24). The section along Zoe Street is disturbed with berming, mounding and debris (Photograph 25). Stobe Avenue is undisturbed with some landscaping in specific areas (Photograph 26).

BMP NC-12

The proposed site of BMP NC-12, measuring about 0.1 acre, is located on Bluebelt property at the stub end of Joyce Street one block north of Hylan Boulevard. The proposed site of BMP NC-12 is bordered to the north by Joyce Street and wetlands connected to proposed BMP NC-11, to the east by a commercial strip mall and parking area, to the south by Hylan Boulevard, and to the west by Strobe Avenue. Standing water is visible (Photograph 27). Deciduous trees, brush and *phragmites* are present. Disturbance by heavy development surrounding the proposed BMP on three sides was noted during the site inspection. An unnatural berm appears along the edges of the proposed BMP. Large mounds are visible within the wetlands.

BMP NC-13

The proposed site of BMP NC-13, measuring about 2.9 acres, is located on Bluebelt property downstream of proposed BMP NC-12 on the opposite side of Hylan Boulevard. The property is bounded approximately by Hylan Boulevard to the north, Meadow Place (mapped but not built) to the south, and residential properties to the east (these residential properties generally front on Seaver Avenue). To the west, a car dealership abuts the site; it fronts on Hylan Boulevard. The proposed site of BMP NC-13 is bordered to the north by commercial properties and the intersection of Hylan Boulevard and Seaver Avenue, to the east by residential properties and Seaver Avenue, to the south by proposed BMP NC-14, Meadow Place, and residential properties, and to the west by commercial properties, Hylan Boulevard and proposed BMP NC-12. A slow moving stream runs under Hylan Boulevard from proposed BMP NC-12 and empties into proposed BMP NC-13. The area appears relatively level and water is visible. *Phragmites* are present, in addition to trees and brush. Some new trees have been planted on proposed BMP NC-13 along Hylan Boulevard at his site (Photograph 28). The southwest section of this site appears disturbed with mounding present (Photograph 29).

BMP NC-14

The proposed site of BMP NC-14, measuring 0.2 acre, is located on Bluebelt property immediately adjacent to proposed BMP NC-13. The property is bounded approximately by the mapped but unbuilt segment of Boundary Avenue to the north (and proposed BMP NC-13) and a segment of Meadow Place (mapped and partially built) to the south. Residences abut the project site with a garden apartment complex on the other side of Meadow Place. This proposed BMP is split into two adjacent sections, one near the intersection of Strobe Avenue and Boundary Avenue and the other off of Meadow Place. The surrounding area is level and developed. At the Strobe Avenue and Boundary Avenue location the ground is undulating and no water is visible (Photograph 30). Deciduous trees, brush and *phragmites* are present. Along Meadow Place the ground bordering proposed BMP NC-14 is a strip of

mounded earth in which deciduous trees and brush have grown (Photograph 31). This area also contains construction debris (e.g., chunks of concrete and asphalt) and trash. Here, proposed BMP NC-14 sits within a depression which contains the wetlands and is dominated by *phragmites*. Standing water is visible at the Meadow Place location. Disturbance caused by the raising of the road bed (Meadow Place) and manipulation of the wetlands is evident. There appears to be berming against the road bed as well as a possible dredging of the wetlands.

BMP NC-15

The proposed site of BMP NC-15, measuring 0.1 acre, is located on Bluebelt property immediately south of Laconia Avenue and east of the intersection with Rowan Avenue. The surrounding area is level and developed with residences. The proposed BMP is bordered to the north by wetlands connected to proposed BMP NC-13, to the east by what appears to be former wetlands, to the south by Rowan Avenue, and to the west by Laconia Avenue. There is no water visible at this proposed BMP site. However, it appears to be a large depression that may have once been wetlands (Photograph 32). Dried and dead *phragmites* are present, as are deciduous trees and brush along the depression's edge. This area also contains construction debris (e.g., chunks of concrete and asphalt) and trash which are mounded with soil along the bank of this depression (Photograph 33). Disturbance is evident from berming and mounding against the road bed (Laconia Avenue and Rowan Avenue), as well as a possible dredging of the wetlands.

BMP NC-16

The proposed site of BMP NC-16, measuring about 12 acres, is located on Bluebelt property bounded approximately by both opened and unopened segments of Mason Avenue to the northwest, a mapped and built segment of Olympia Boulevard to the southeast, Graham Boulevard to the southwest, and Seaver Avenue to the southeast. It is bordered to the north by residential properties, Slater Boulevard, Nugent Avenue and Mason Avenue, to the east by Olympia Boulevard and wetlands associated with proposed BMP NC-17, to the south by residential properties, Graham Boulevard, Nugent Avenue and Stobe Avenue, and to the west by additional wetlands. This proposed BMP lies on level ground; it is fed by proposed BMP NC-15 and empties into proposed BMP NC-17. From Olympia Boulevard, the proposed BMP is dominated by *phragmites* and standing water is visible (Photograph 34). Areas along Graham Boulevard and Mason Avenue are drier and contain woods with deciduous trees and brush. From Graham Boulevard, BMP proposed BMP NC-16 appears level and undisturbed (Photograph 35). However, heavy mounding and disturbance can be viewed from Mason Avenue (Photograph 36). The majority of the site is thick with *phragmites*, making it difficult to determine whether the entire area is disturbed. This area is also being used for the dumping of trash and debris.

BMP NC-17

The proposed site of BMP NC-17, measuring about 9.7 acres, is located on Bluebelt property, some of which is already owned by New York City, the balance in the process of acquisition by the City). It is bounded approximately by Graham Boulevard to the southwest, Olympia Boulevard to the northwest, Slater Boulevard to the northeast, and residential properties that front on Quincy Avenue to the southeast (as well as the street ends of Seaver Avenue, Ionia and Cherokee Streets). The proposed BMP is located at the convergence of the West Branch and Main Channel of the New Creek stream system. The topography is level. From Olympia Boulevard, the proposed BMP is dominated by *phragmites* and standing water is visible. The area along Graham Boulevard is drier and contains woods with deciduous trees and brush. The majority of the site is thick with *phragmites*, making it difficult to determine whether the entire area is disturbed (Photograph 37). From Graham Boulevard the area appears level and undisturbed (Photograph 38). However, some mounding and an unnatural stream bank (fill or siltation) can be seen from Olympia Boulevard (Photograph 39). The area is also being used for the dumping of trash and debris.

BMP NC-18

The proposed site of BMP NC-18, measuring 7.4 acres, is located on Bluebelt property (some of which is already owned by New York City, the balance in the process of acquisition by the City). The site is bounded approximately by Buel Avenue to the northwest, Dongan Hills Avenue and Naughton Avenue to the southwest, Quincy Avenue to the southeast, and residential properties that front on Seaview and Patterson Avenues to the northeast. This

proposed BMP is located at the head of the East Branch of the New Creek stream system. This proposed BMP is located in a residential neighborhood that is within several blocks of the shoreline, and is low-lying and within a depression. It appears Dongan Hills Avenue has been raised to function as a dike and contain these wetlands (Photograph 40). The interior is dominated by *phragmites* and standing water is visible (Photograph 41). The berming along Dongan Hills Avenue contains deciduous trees and brush. Trash and debris are also present. An interview with life-long resident of Quincy Avenue, Dianne Hague (Dec. 6, 2010), reveals that the present state of the wetlands in proposed BMP NC-18 and BMP NC-19 was artificially created. In the 1950s, this section of New Creek was a true creek and was intertidal. Marsh grasses dominated at that time. Over the years development has closed off the wetland's drainage to the open water, the creek became stagnant and the *phragmites* took over. Today, disturbance is present caused by the raising of the road bed (Dongan Hill Avenue) and manipulation of the wetlands (Photograph 42). There is berming to contain the wetlands on two sides (north and south).

BMP NC-19

The proposed site of BMP NC-19, measuring about 0.1 acre, is located on Bluebelt property located at the west end of Buel Avenue, west of the intersection with Quincy Avenue. This proposed BMP is located in a residential neighborhood that is in a low-lying area within a block of the shoreline. It is bordered to the north and south by wetlands, to the east by Quincy Avenue, and to the west by wetlands connected to proposed BMP NC-18. Along Quincy Avenue bordering proposed BMP NC-19 is a small strip of mounded ground in which deciduous trees and brush have grown (Photograph 43). This area also contains construction debris (e.g., chunks of concrete) and trash. Vegetation within proposed BMP NC-19 is dominated by *phragmites*. It appears the road (Quincy Avenue) has been raised to contain these wetlands. Although undoubtedly present, water could not be viewed through the thick *phragmites*. As noted above, the present wetlands at this proposed BMP were artificially created in the 1950s. Disturbance is present at this site from the raising of the Quincy Avenue road bed and manipulation of the wetlands.

New and Supplemental Outfalls

The proposed new outfall would be located on the southeast side of BMP NC-10, and would empty into the Lower Bay. This proposed outfall would be located on City waterfront property that is parkland under the jurisdiction of DPR (Franklin Delano Roosevelt Boardwalk and Beach) that is bounded approximately by Father Capodanno Boulevard to the north and Lower Bay to the south. It would also cross beneath Father Capodanno Boulevard which is a city street under the jurisdiction of NYCDOT. The outfall pipe would exit proposed BMP NC-10 between Hunter Avenue and Jefferson Avenue and would also include a new tide gate that would be installed under Father Capodanno Boulevard.

The proposed supplemental outfall would be located adjacent to the existing outfall at Seaview Avenue. The existing outfall is located under the streetbed and beaches.

B. Topography and Hydrology

The following discussion outlines the topography and hydrology for the overall New Creek Watershed, for the individual proposed BMPs, and for the proposed outfalls. Of note, topographic maps on Staten Island use several different elevation datums. Borough of Richmond Datum is 3.192 feet above the U.S.C.S. Sandy Hook Datum (and is also the datum used on the series of 1911 Borough of Richmond Topographical maps cited below and shown as Figures 10a-g). Modern survey maps (Figures 4a-m) use the NAVD Datum, which is 2.112 feet higher than the Borough of Richmond Datum. Thus, the difference between elevations on these two sets of maps is approximately 2 feet. Where elevations are noted in the below discussion, the appropriate datum is given in parentheses.

New Creek Watershed

The New Creek Watershed covers about 3.5 square miles of mostly urbanized development with semi-attached and detached residences, as well as commercial development. Approximately 1.2 square miles of this area drain directly into New Creek (as opposed to draining to existing trunk sewers and outfalls to Lower Bay), and several miles of stream channels meander between streets and homes, which at times are within the floodplain. The upper portion of the watershed is characterized by steep topography (resulting from its location at the edge of the terminal glacial

moraine) and less dense development. More than half of the watershed is at a very low elevation—within five feet or less of mean high tide in many locations.

The lower New Creek Watershed is characterized by three stream reaches: the Main Channel originates at Last Chance Pond; the West Branch originates at about Midland Avenue (and the Boundary Avenue wetlands); and the East Branch starts at the southern end of Dongon Hills Avenue. Additional watercourses originate in the open spaces of the northern portion of the watershed (including the St. Francis Seminary open space and Reeds Basket Willow Swamp Park). These streams are open water courses as they flow south but become piped as they enter the lower more developed portion of the watershed. This watershed also includes a number of existing tide-gate controlled outfalls to Lower Bay.

BMP NC-1

The proposed site of BMP NC-1 is located on a steep ravine, at approximately elevation 359 (NAVD). This ravine has experienced erosion over time from uncontrolled water flows. An unnamed stream, which drains into Reeds Basket Willow Swamp Park, is located approximately 250 feet to the north of the proposed BMP site. This stream does not appear on the earlier historic maps, presumably because it is not a large waterway, but is depicted on the 1891 Bien and Vermeule map (Figure 9) and on the 1911 Borough of Richmond map (Figure 10a). Although there has been erosion in the proposed BMP vicinity, comparison with the modern survey map (Figure 4a) indicates the topography of the area appears to have experienced little overall change.

BMP NC-2

The proposed site of BMP NC-2 also is located on a steep ravine, at approximately elevation 294 (NAVD). This ravine has experienced erosion over time from uncontrolled water flows. An unnamed stream, which drains into Reeds Basket Willow Swamp Park, is located approximately 400 feet to the south of the proposed BMP. This stream does not appear on the earlier historic maps (presumably because it is not a large waterway), but is depicted on the 1891 Bien and Vermeule map (Figure 9) and on the 1911 Borough of Richmond map (Figure 10a). Although there has been erosion in the proposed BMP vicinity, comparison with the modern survey map (Figure 4b) indicates the topography of the area appears to have experienced little overall change.

BMP NC-3

The proposed site of BMP NC-3 is located in a small stream bed at approximately elevation 232 (NAVD). This unnamed stream does not appear on either the 1891 Bien and Vermeule map (Figure 9), or the 1911 Borough of Richmond map (Figure 10a). However, both maps show the existing stream bed swale and wetlands just downstream of this drainage. Although there has been erosion in the proposed BMP vicinity, comparison with the modern survey map (Figure 4c) indicates that the topography of the area appears to have experienced little overall change.

BMP NC-4

The proposed site of BMP NC-4 is located in a small stream bed at approximately elevation 208 (NAVD). This unnamed stream merges with the upper reach of the West Branch of New Creek just downstream from the proposed BMP, and appears on both the 1891 Bien and Vermeule map (Figure 9) and the 1911 Borough of Richmond map (Figure 10b). Although there has been erosion in the proposed BMP vicinity, comparison with the modern survey map (Figure 4d) indicates the topography of the area appears to have experienced little overall change.

BMP NC-5

The proposed site of BMP NC-5 is located at the confluence of two small streams, both of which run west and south towards New Creek. The elevation of the proposed BMP is approximately 121 (NAVD). Both streams are shown on the 1891 Bien and Vermeule map (Figure 9) and the 1911 Borough of Richmond map (Figure 10c). The 1911 map notes that a portion of the proposed BMP site was formerly low-lying wetlands. The current landform, as shown in Figure 4e, suggests that there has been filling within the proposed BMP to raise the grade and create a level surface for the golf course and cart path, as well as to stabilize the banks of the streams.

BMP NC-6

The proposed site of BMP NC-6 is located along the route of the West Branch of New Creek, which runs through the southeastern side of the proposed BMP. In its natural state, the northwestern side of the proposed BMP was on firm ground, at approximately 2 feet above Borough of Richmond Datum, and the southeastern side contained the creek and associated wetlands, as shown on the 1891 Bien and Vermeule map (Figure 9) and the 1911 Borough of Richmond map (Figure 10d). This proposed BMP has had a series of pumping stations on the northwestern side of the property, the first location shown on the 1911 map and a later, larger station along the line of Boundary Avenue. There was also a roadway running through the proposed BMP, from Lincoln Avenue to Midland Avenue, as shown on the 1911 map. Sanborn maps (1937, 1951) note that there was a subsurface water line running from Boundary Avenue to the creek, through the proposed BMP area. The disturbance visible at the proposed BMP along the line of Boundary Avenue no doubt stems from the grading and filling associated with these multiple construction and demolition episodes in this location. The portion of the proposed BMP closest to the stream channel appears to be less disturbed. Comparison of the modern survey map for this proposed BMP (Figure 4f) with the 1911 map confirms that there has been significant earthmoving on the Boundary Avenue side of the proposed BMP, with mounds of soil reaching up to elevation 14 (NAVD). The portion of the proposed BMP closest to the stream channel is now at elevation 4-6 (NAVD), which is equivalent to elevation 2-4 (Borough of Richmond Datum). Thus, it appears that this area has not had a marked change in elevation over time.

BMPs NC-7 through BMP NC-19

The proposed sites of these proposed BMPs are located in areas that originally had low-lying landforms, at about sea level, and contained wetlands and branches of New Creek, as shown on the 1891 Bien and Vermeule map (Figure 9) and the 1911 Borough of Richmond maps (Figures 10e, 10f, and 10g). Proposed BMPs NC-7, NC-8, NC-9, and NC-10 are located along the lower reaches of the west branch of New Creek. Proposed BMPs NC-11 and NC-12 are located at the headwaters of the main channel of New Creek, whereas proposed BMPs NC-13, NC-14, NC-15, and NC-16 are located along the lower reaches of the main channel of New Creek. Proposed BMP NC-17 is located at the confluence of the lower west branch and the main channel of New Creek. Last, proposed BMPs NC-18 and NC-19 are located along the east branch of New Creek. Over time, some of the proposed BMPs have experienced various degrees of landfilling, as can be seen by the now raised and irregular topography shown in places throughout the proposed BMPs as seen in Figures 4g-m, and many of the proposed BMPs have sedimentation buildup within the stream channels.

C. Geology

The majority of the New Creek Watershed sits within the inner lowland subprovince of the Coastal Plain Province. As described by Boesch (after Wolfe 1977 and Isachsen et al. 1991),

> Generally this province is a broad, low-lying land form that slopes gently towards the Atlantic Ocean. The inner lowland subprovince consists of generally level to gently undulating terrain that is between 20 and 50 feet in elevation. Most of the inner Coastal Plain is underlain with gently southeastward dipping, unconsolidated marine and fluvial deposits of clay, silt, sand, and gravel of Late Cretaceous and Tertiary age. Large areas are also covered with interglacial fluvial deposits of Quaternary age. The Piedmont Lowlands and the portion of the inner Coastal Plain present on Staten Island, were greatly affected by the Wisconsin glaciation. Glacial drift covers most of these areas north of the terminal moraine of the Wisconsin glaciation. The inner Coastal Plain, in particular, is not much more than a ridge of glacial and glacial outwash sediments that almost completely overly [sic] the Cretaceous and Tertiary layers. The moraine extents [sic] northward roughly from Perth Amboy along the Atlantic shore line (routes of van Duzer Street, Richmond Road, and Amboy Road run, approximately, along the front [or southern] edge of the moraine) crossing the Narrows to Brooklyn where it becomes the Ronkonkoma moraine (Boesch 1994: 3).

The terminal moraine is located along the northwestern edge of the New Creek Watershed, and accounts for the steep topography northwest of Richmond Road.

D. Soils

Figure 5 illustrates the location of the overall New Creek Watershed, as well as the proposed BMP locations and the proposed outfall locations, on the soil survey map for New York City. The following text discusses soil characteristics for the watershed as a whole and, subsequently, by individual proposed BMP locations and proposed outfall locations.

New Creek Watershed Area

Soils mapped for the overall New Creek Watershed area can be roughly divided into three groups: land areas closest to the shoreline on the southeast, those lands within the interior section and generally southeast of Richmond Road; and the land areas north and west of the interior area, in the upland portion of the watershed.

The soils that are mapped closest to the shoreline consist primarily of natural swamps, tidal marshes, or water, as well as low lying areas, which have been filled to various degrees. Soils here include Ipswich-Pawcatuck-Matunuck mucky peats (6), Bigapple-Fortress complex (99), and Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (101). Adjacent areas to these wetlands include Branford-Pompton complex (270) and Pavement & buildings-Flatbush-Branford complex (274).

The soils that are mapped within the interior section of the watershed area consist of soils formed over glacial outwash and glacial till. Soils here include Pavement & buildings, outwash substratum (3), Branford-Pompton complex (270), and Pavement & buildings-Flatbush-Branford complex (274).

The soils that are mapped within the upland portion of the watershed consist of soils formed over glacial till plains, hills, or moraines. Soils here include Wethersfield-Ludlow-Wilbraham complex (262), Greenbelt-Foresthills-Pavement & buildings complex (254), Wethersfield-Ludlow complex (264), Wethersfield-Foresthills-Pavement & buildings complex (280), Wethersfield-Foresthills complex (283 and 284), Wotalf-Todthill-Cheshire loams (306), Pavement & buildings-Greenbelt-Cheshire complex (324), Wotalf-Todthill-Pavement & buildings complex (344), Wethersfield-Foresthills-Pavement & buildings complex (346) and Pavement & buildings-Wotalf-Todthill complex (348).

BMP NC-1 and BMP NC-2

The footprints of these two proposed BMPs are mapped as Wotalf-Todthill-Cheshire loams, 15 to 50 percent slopes (306), described as:

> Moderately steep to very steep areas of bedrock controlled hills and ridges modified by glacial action, relatively undisturbed and mostly wooded; a mixture of shallow, moderately deep, and deep till soils over serpentinite; located in Staten Island (U.S.D.A. 2005:17).

The different soil series found within the APE are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Wotalf Series	*A* 0-3 in *AB1* 3-8 in *Bw2* 8-17 in *2R* 17 in	10YR 3/2 7.5YR 3/2 5YR 4/4 10Y 6/1	Lo GrlLo VGrlLo Bedrock	15-50	Well	Bedrock controlled hills and ridges, modified by glacial action
Todthill Series	*A* 0-7 in *AB1* 7-12 in *Bw2* 12-30 in *2R* 30 in	10YR 3/1 5YR 3/3 5YR 3/4 10YR 6/1	Lo GrlLo VGrlFiSaLo Bedrock	15-50	Well	Bedrock controlled hills and ridges, modified by glacial action

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Cheshire Series	*A* 0-2 in *Bw1* 2-5 in *Bw2* 5-10 in *Bw3* 10-28 in *C* 28-60 in	7.5YR 3/2 5YR 4/3 5YR 4/6 2.5YR 4/4 2.5YR 3/4	Lo Lo FiSaLo Lo GrlSaLo	15-50	Well	Till plains and hills, and moraines

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, Fi-Fine

No soil borings were conducted at these BMPs.

BMP NC-3

This proposed BMP is mapped as Pavement & buildings-Greenbelt-Cheshire complex, 0 to 8 percent slopes (324), described as:

> Nearly level to gently sloping areas of till plains and moraines that have been partially filled with natural soil materials, mostly for residential use; a mixture of anthropogenic soils and red till soils, with up to 80 percent impervious pavement and buildings covering the surface; located in eastern Staten Island (U.S.D.A. 2005:17-18).

The different soil series found within the APE are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Greenbelt Series	*A* 0-3 in *Bw* 3-13 in *C* 13-57 in *Ab* 57-58 in *Bwb* 58-65 in	7.5YR 4/4 5YR 4/6 2.5YR 4/4 7.5YR 3/2 5YR 4/6	Lo Lo GrlLo Lo Lo	0-8	Well	Anthropogenic fill areas on urbanized till plains
Cheshire Series	*A* 0-2 in *Bw1* 2-5 in *Bw2* 5-10 in *Bw3* 10-28 in *C* 28-60 in	7.5YR 3/2 5YR 4/3 5YR 4/6 2.5YR 4/4 2.5YR 3/4	Lo Lo FiSaLo Lo GrlSaLo	0-8	Well	Till plains and hills, and moraines

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, Fi-Fine

No soil borings were conducted at this proposed BMP.

BMP NC-4

This proposed BMP is mapped as Wethersfield-Ludlow complex, 8 to 15 percent slopes (264), described as:

> Strongly sloping to moderately steep areas of till plains and hills, relatively undisturbed and mostly wooded; a mixture of well drained and moderately well drained soils developed in red till; located in Staten Island (U.S.D.A. 2005:16).

The different soil series found within the APE are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Wethersfield Series	*A* 0-3 in *Bw1* 3-13 in *Bw2* 13-27 in *Cd* 27-65 in	7.5YR 3/2 5YR 4/4 5YR 3/3 2.5YR 4/4	Lo Lo GrlLo GrlLo	8-15	Well	Till plains and hills
Ludlow Series	*Ap* 0-8 in *Bw1* 8-20 in *Bw2* 20-26 in *Cd* 26-65 in	7.5YR 3/2 5YR 4/4 5YR 3/4 2.5YR 3/4	SiLo SiLo SiLo GrlLo	8-15	Moderately well	None given

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, V-Very, Co-Coarse, Ext-Extremely, Cob-Cobbly, Fi-Fine

No soil borings were conducted at this proposed BMP.

BMP NC-5

This proposed BMP is mapped as Wethersfield-Foresthills complex, 0 to 8 percent slopes (283), described as:

> Nearly level to gently sloping areas of till plains and hills that have been partially cut and filled for parkland and golf courses; a mixture of red till soils and anthropogenic soils; located in Staten Island (U.S.D.A. 2005:17).

The different soil series found within the APE are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Foresthills Series	*A* 0-2 in *Bw* 2-15 in *Ab* 15-17 in *BAb* 17-28 in *Bwb* 28-42 in *Cd* 42-60 in	10YR 3/2 7.5YR 4.4 10YR 2/1 7.5YR 4/3 5YR 4/4 5YR 4/6	Lo SiLo Lo Lo Lo Lo	0-8	Well	Anthropogenic fill areas on urbanized till plains
Wethersfield Series	*A* 0-3 in *Bw1* 3-13 in *Bw2* 13-27 in *Cd* 27-65 in	7.5YR 3/2 5YR 4/4 5YR 3/3 2.5YR 4/4	Lo Lo GrlLo GrlLo	0-8	Well	Till plains and hills

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, V-Very, Co-Coarse, Ext-Extremely, Cob-Cobbly, Fi-Fine

No soil borings were conducted at this proposed BMP.

BMP NC-6

This proposed BMP is mapped as Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (101), described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (USDA 2005:12).

The different soil series that make up this mapping unit are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Laguardia Series	*Ap* 0-8 in *Bw* 8-26 in *C* 26-79 in	10YR 4/3 10YR 4/3 10YR 4/3	GrlSaLo VGrlCoSaLo VGrlCoSaLo	0-8	Well	Anthropogenic urban fill plains
Ebbets Series	*A* 0-4 in *Bw* 4-8 in *C* 8-60 in	10YR 3/2 10YR 4/4 10YR 4/4	Lo GrlSaLo GrlSaLo	0-8	Well	Anthropogenic urban fill plains

Key: Soils: Lo-Loam, Sa-Sand
Other Grl-Gravelly, V-Very, Co-Coarse

No soil borings were conducted at this proposed BMP.

BMP NC-7 through BMP NC-10 and BMP NC-13 through BMP NC-19

These 11 proposed BMPs are all within two soil mapping units. The first is Ipswich-Pawcatuck-Matunuck mucky peats (6), described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

The second is Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (101), described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (USDA 2005:12).

The different soil series that make up these mapping units are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh
Laguardia Series	*Ap* 0-8 in *Bw* 8-26 in *C* 26-79 in	10YR 4/3 10YR 4/3 10YR 4/3	GrlSaLo VGrlCoSaLo VGrlCoSaLo	0-8	Well	Anthropogenic urban fill plains
Ebbets Series	*A* 0-4 in *Bw* 4-8 in *C* 8-60 in	10YR 3/2 10YR 4/4 10YR 4/4	Lo GrlSaLo GrlSaLo	0-8	Well	Anthropogenic urban fill plains

Key: Soils: Lo-Loam, Sa-Sand
Other Grl-Gravelly, V-Very, Co-Coarse

In 2005 Metcalf & Eddy conducted a Limited Subsurface Investigation within portions of six blocks in the Midland Beach area of the New Creek Watershed. These blocks had been identified by NYSDEC as containing fill material. These blocks had also been investigated in a previous Phase II Environmental Site Assessment (ESA) prepared by the NYSDEC, but which was not available for review. As part of the Limited Subsurface Investigation, nine soil borings were excavated to a depth of 20 feet below ground surface (bgs) within these blocks. The locations of the soil borings and the soil boring logs are included as Appendix B. The following is a list of the blocks, the location of the BMPs in relation to the borings, and the boring numbers for each block.

- Block 3661, located in proximity to proposed BMP NC-13 and BMP NC-15 (Boring B5)
- Block 3771, located in proximity to proposed BMP NC-16 (Borings B3 and B4)
- Block 3714, within proposed BMP NC-16 (B1 and B2)
- Block 3716, located in proximity to proposed BMP NC-16 (B6 and B7)
- Block 3747, located in proximity to proposed BMP NC-18 (B8)
- Block 3856, located in proximity to proposed BMP NC-10 (B9)

The Limited Subsurface Investigation reported:

> The materials encountered in the soil borings consist of a mix of construction debris including, but not limited to ash, cinders, brick, concrete, wood and plastic in a matrix of sand, gravel, silts and clays. A peat layer was present in Borings B4, B6 and B7 which was encountered at a depth of approximately 7 feet below grade (Metcalf & Eddy 1005:9-10).

The boring logs note that in all cases, groundwater was encountered within the fill stratum.

BMP NC-11 and BMP NC-12

These two proposed BMPs are mapped as Branford-Pompton complex, 0 to 8 percent slopes (270), described as:

> Nearly level to gently sloping areas of outwash plains, relatively undisturbed; a mixture of well drained and moderately well drained soils formed in red outwash materials; located in southern Staten Island (U.S.D.A. 2005:17).

The different soil series found within the APE are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Branford Series	*Ap* 0-8 in *Bw1* 8-16 in *Bw2* 16-29 in *BC* 29-32 in *C* 32-72 in	10YR 4/2 10YR 4/4 7.5YR 4/6 7.5YR 4/4 5YR 4/6	Lo Lo GrlLo GrlSaLo SaGrl	0-8	Well	Outwash plains and terraces
Pompton Series	*Ap* 0-10 in *Bw1* 10-20 in *Bw2* 20-40 in *C* 40-72 in	10YR 3/2 7.5YR 5/4 7.5YR 4/6 7.5YR 4/6	Lo Lo Lo SaLo	0-8	Moderately well to somewhat poorly	Not given

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, V-Very, Co-Coarse, Ext-Extremely, Cob-Cobbly, Fi-Fine

No soil borings were conducted at either of these proposed BMPs.

New and Supplemental Outfalls

The inland portion of the proposed new outfall at proposed BMP NC-10 has two mapping units. The first mapping unit is Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (USDA 2005:12).

The second mapping unit is Ipswich-Pawcatuck-Matunuck mucky peats, described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

The terminus of the proposed new outfall is mapped as Beaches, described as:

> Nearly level to gently sloping areas of sand or sand and gravel adjacent to the Atlantic Ocean, inundated by saltwater twice each day at high tide. Frequently reworked by wave and wind action, these areas do not support vegetation (U.S.D.A. 2005:11).

The inland portion of the proposed supplemental outfall at Seaview Avenue has two mapping units. The first mapping unit is Pavement & buildings-Flatbush-Branford complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas of outwash plains that have been cut and filled for residential use; a mixture of anthropogenic soils and red outwash soils, with up to 80 percent impervious pavement and buildings covering the surface; located in southern Staten Island (USDA 2005:17).

The second mapping unit is Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes, described above.

The terminus of the proposed Seaview Avenue supplemental outfall is mapped as Beaches, described above.

The different soil series for the proposed outfalls are further described in the table, below.

Name	**Soil Horizon Depth**	**Color**	**Texture, Inclusions**	**Slope %**	**Drainage**	**Landform**
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh
Laguardia Series	*Ap* 0-8 in *Bw* 8-26 in *C* 26-79 in	10YR 4/3 10YR 4/3 10YR 4/3	GrlSaLo VGrlCoSaLo VGrlCoSaLo	0-8	Well	Anthropogenic urban fill plains
Ebbets Series	*A* 0-4 in *Bw* 4-8 in *C* 8-60 in	10YR 3/2 10YR 4/4 10YR 4/4	Lo GrlSaLo GrlSaLo	0-8	Well	Anthropogenic urban fill plains
Flatbush Series	*A* 0-13 in *Ab* 13-21 in *Bwb* 21-50 in *2C* 50-79 in	10YR 3/2 10YR 4/3 10YR 5/6 10YR 4/6	FiSaLo SiLo SiLo Sa	0-8	Well	Anthropogenic urban fill plains

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Branford Series	*Ap* 0-8 in *Bw1* 8-16 in *Bw2* 16-29 in *BC* 29-32 in *C* 32-72 in	10YR 4/2 10YR 4/4 7.5YR 4/6 7.5YR 4/4 5YR 4/6	Lo Lo GrlLo GrlSaLo SaGrl	0-8	Well	Outwash plains and terraces

Key: Soils: Lo-Loam, Sa-Sand
Other Grl-Gravelly, Fi-Fine, Str-Stratified

IV. BACKGROUND RESEARCH/HISTORICAL OVERVIEW

A. Precontact Summary

For this report, the word precontact is used to describe the period prior to the use of formal written records. In the western hemisphere, the precontact period also refers to the time before European exploration and settlement of the New World. Archaeologists and historians gain their knowledge and understanding of precontact Native Americans on Staten Island from three sources: ethnographic reports, Native American artifact collections, and archaeological investigations.

The Paleo Indian Period (c. 10,500 B.C. - c. 8000 B.C.) represents the earliest known human occupation of Staten Island. Approximately 14,000 years ago the Wisconsin Glacier retreated from the area leading to the emergence of a cold dry tundra environment. Sea levels were considerably lower than modern levels during this period (they did not reach current levels until circa 5,000 B.C., in the Early to Middle Archaic Period). As such, Staten Island was situated much further inland from the Atlantic Ocean shore than today, and was characterized by higher ground amid glacial lakes and rivers (Boesch 1994). The material remains of the Paleo Indians include lithic tools such as Clovis-type fluted projectile points, bifacial knives, drills, gravers burins, scrapers, flake cores, and flake tools, although sites generally are represented by limited small surface finds. The highly mobile nomadic bands of this period specialized in hunting large game animals such as mammoth, moose-elk, bison, and caribou and gathering plant foods. It has been theorized that the end of the Paleo-Indian Period arose from the failure of over-specialized, big-game hunting (Snow 1980:150-157). Based on excavated Paleo-Indian sites in the Northeast, there was a preference for high, well-drained areas in the vicinity of streams or wetlands (Boesch 1994). Sites have also been found near lithic sources, rock shelters and lower river terraces (Ritchie 1980). Paleo-Indian materials have been recovered at several sites on Staten Island including Port Mobil, the Cutting site, Smoking Point and along the beach in the Kreischerville area. One isolated fluted point was reportedly found in the Great Kills Park area.

During the Archaic Period (c. 8000 B.C. - 1000 B.C.) a major shift occurred in the subsistence and settlement patterns of Native Americans. Archaic period peoples still relied on hunting and gathering for subsistence, but the emphasis shifted from hunting large animal species, which were becoming unavailable, to smaller game and collecting plants in a deciduous forest. The settlement pattern of the Archaic people consisted of small bands that occupied larger and relatively more permanent habitations sites along the coast of Staten Island, its estuaries and streams and inland areas (Boesch 1994). Typically such sites are located on high ground overlooking water courses. This large period has been divided up into four smaller periods, the Early, Middle, Late and Terminal Archaic.

The environment during the Early Archaic (c. 8000 B.C. - 6000 B.C.) displayed a trend toward a milder climate and the gradual emergence of a deciduous-coniferous forest with a smaller carrying capacity for the large game animals of the previous period (Ritchie and Funk 1971). The large Pleistocene fauna of the previous period were gradually replaced by modern species such as elk, moose, bear, beaver, and deer. New species of plant material suitable for human consumption also became abundant. The increasing diversification of utilized food sources is further demonstrated by a more complex tool kit. The tool kit of the Early Archaic people included bifurcated or basally notched projectile points generally made of high quality stone. Tool kits were more generalized than during the Paleo-Indian period, showing a wider array of plant processing equipment such as grinding stones, mortars and pestles. Although overall evidence of Early Archaic sites on Staten Island is sparse, there are some significant Early Archaic component sites from this period, including the Old Place, Hollowell, Charleston Beach, Wards Point, Travis, and Richmond Hill sites (Ritchie and Funk 1971; Boesch 1994).

The archaeological record suggests that a population increase took place during the Middle Archaic Period (c. 6000 - c. 4000 B.C.). This period is characterized by a moister and warmer climate and the emergence of an oak-hickory forest. The settlement pattern during this period displays specialized sites and increasing cultural complexity. The exploitation of the diverse range of animal and plant resources continued with an increasing importance of aquatic resources such as mollusks and fish (Snow 1980). In addition to projectile points, the tool kits of Middle Archaic peoples included grinding stones, mortars, and pestles. Such artifacts have been found throughout Staten Island, including the Old Place and Wards Point sites (Boesch 1994).

Late Archaic people (c. 4000 - c. 1000 B.C.) were specialized hunter-gatherers who exploited a variety of upland and lowland settings in a well-defined and scheduled seasonal round. The period reflects an increasingly expanded economic base, in which groups exploited the richness of the now established oak-dominant forests of the region. It is characterized by a series of adaptations to the newly emerged, full Holocene environments. As the period progressed, the dwindling melt waters from disappearing glaciers and the reduced flow of streams and rivers promoted the formation of swamps and mudflats, congenial environments for migratory waterfowl, edible plants and shellfish. The new mixed hardwood forests of oak, hickory, chestnut, beech and elm attracted white-tailed deer, wild turkey, moose and beaver. The large herbivores of the Pleistocene were rapidly becoming extinct and the Archaic Indians depended increasingly on smaller game and the plants of the deciduous forest. The projectile point types attributed to this period include the Lamoka, Brewerton, Normanskill, Lackawaxen, Bare Island, and Poplar Island. The tool kit of these peoples also included milling equipment, stone axes, and adzes. A large number of Late Archaic Period sites have been found on Staten Island. These include the Pottery Farm, Bowman's Brook, Smoking Point, Goodrich, Sandy Brook, Wort Farm, Old Place, and Arlington Avenue sites (Boesch 1994).

During the Terminal Archaic Period (c. 1700 B.C. - c. 1000 B.C.), native peoples developed new and radically different broad bladed projectile points, including Susquehanna, Perkiomen and Orient Fishtail types. The use of steatite or stone bowls is a hallmark of the Terminal Archaic Period. Sites on Staten Island from the Terminal Archaic Period include the Old Place, Pottery Farm, Wards Point, and Travis sites (Boesch 1994).

The Woodland Period (c. 1000 B.C. - 1600 A.D.) is generally divided into Early, Middle and Late Woodland on the basis of cultural materials and settlement-subsistence patterns. Settlement pattern information suggests that the broad based strategies of earlier periods continued with a possibly more extensive use of coastal resources. The Early Woodland was essentially a continuation of the tool design traditions of the Late Archaic. However, several important changes took place. Clay pottery vessels gradually replaced the soapstone bowls during the Early Woodland Period (c. 1000 B.C. to A.D 1). The earliest ceramic type found on Staten Island is called Vinette 1, an interior-exterior cordmarked, sand tempered vessel. The Meadowood-type projectile point is a chronological indicator of the Early Woodland Period.

Cord marked vessels became common during the Middle Woodland Period (c. A.D. 1 to c. 1000 A.D.). Jacks Reef and Fox Creek-type projectile points are diagnostic of the Middle Woodland. Another characteristic projectile point of the early to Middle Woodland Period is the Rossville type, named for the site at Rossville where it predominated. It is believed to have originated in the Chesapeake Bay area and is found in New Jersey, southeastern New York and southern New England (Lenik 1989:29). The Early and Middle Woodland periods display significant evidence for a change in settlement patterns toward a more sedentary lifestyle. The discovery of large storage pits and larger sites in general has fueled this theory. Some horticulture may have been utilized at this point but not to the extent that it was in the Late Woodland period.

In the Late Woodland period (c. 1000 A.D. - 1600 A.D.), triangular projectile points such as the Levanna and Madison types, were common throughout the Northeast, including Staten Island (Lenik 1989:27). Made both of local and non-local stones, brought from as far afield as the northern Hudson and Delaware River Valleys, these artifacts bear witness to the broad sphere of interaction between groups of native peoples in the Northeast. Additionally, during this period collared ceramic vessels, many with decorations, made their appearance.

Woodland Period Native Americans in Staten Island and surrounding regions shared common attributes. The period saw the advent of horticulture and with it, the appearance of large, permanent or semi-permanent villages. Plant and processing tools became increasingly common, suggesting an extensive harvesting of wild plant foods. Maize cultivation may have begun as early as 800 years ago. The bow and arrow, replacing the spear and javelin, pottery

vessels instead of soap stone ones, and pipe smoking, were all introduced at this time. A semi-sedentary culture, the Woodland Indians moved seasonally between villages within palisaded enclosures and campsites, hunting deer, turkey, raccoon, muskrat, ducks and other game and fishing with dug-out boats, bone hooks, harpoons and nets with pebble sinkers. Their shellfish refuse heaps, called "middens," sometimes reached immense proportions of as much as three acres (Ritchie 1980:80, 267). Habitation sites of the Woodland Period Indians increased in size and permanence. A large number of Woodland Period archaeological sites have been found on Staten Island in a variety of environmental settings. A favored setting for occupation during this period was well-drained ground near stream drainages and coastal waterways. One such site, dating to the Middle Woodland period and including net and fabric impressed pottery, recently was discovered within DEP Bluebelt property overlooking Lemon Creek and was excavated in 2009 and 2010 (HPI 2009a, 2009b, 2010a, 2010b).

During the early Contact period (1500 to 1700 A.D.) there was a continuation of the Late Woodland settlement patterns of the coastal Algonquians. By the 17th century the Dutch settlers of lower New York were in frequent contact with the many Native Americans who lived in the vicinity. Historic accounts describe both peaceful and violent interchanges between these two groups (Brasser 1978, Flick 1933). Through at least the 1650s, Native Americans known as the Raritans occupied portions of Staten Island and New Jersey's Raritan Valley (Ruttenber 1872). The Raritans were but one of many native groups which as a whole were known as the Delaware Indians by the European settlers. As the European population increased, and internecine warfare due to increased competition for trade with the Europeans intensified, the Raritans, and the Delaware in general, retreated inland away from the eastern coast. By the 1800s their migration had scattered them across the Mid West and even into Canada (Weslager 1972), where they have continued living to the present day. Journal accounts by European explorers, settlers and travelers describe Native settlements and lifeways. However, only a few Historic Contact Period sites have been found on Staten Island. Sites include those at Wards Point, Old Place, Corsons Brook, Travis, New Springfield, and at the PS56R Site in Woodrow (Boesch 1994; HPI 1996).

B. Previously Recorded Archaeological Sites and Surveys

Records on file at the OPRHP and the NYSM as well as the Boesch (1994) *Archaeological and Sensitivity Assessment of Staten Island, New York* indicate that there have been a number of both precontact period archaeological sites and historic period archaeological sites documented within the New Creek Watershed. They are listed in the table, below. Of note, NYSM site locations and descriptions often are vague, due to the fact that many of these sites were documented based on non-professional records (such as information from local landowners, avocational collectors, or historic accounts); descriptions and distances of these sites from the project site are given based on available mapping and other data, but should not be considered definitive. Some sites have had different numbers and names applied to them over time; all known appellations are listed in the first column.

Site # and Name	Location	Time Period	Site Type
Boesch 98 STD-VM Vanderbilt Mausoleum	Moravian Cemetery	Unknown precontact	Unknown
NYSM 8480	Large area within Moravian Cemetery and Richmond County Country Club	Unknown precontact	Traces of occupation
Boesch 30 STD-TODT	Todt Hill	Unknown precontact	Unknown
Boesch 87 Midland Beach	Midland Beach	Unknown precontact	Unknown
Boesch M STD-OT Ocean Terrace	South of Ocean Terrace near Basket Willow Swamp	Unknown precontact	Unknown
Boesch K STD-GA Garretsin's	Area roughly bounded by Richmond Road, Staten Island Railroad, Raritan Avenue and Dongan Hills Avenue	Unknown precontact	Unknown

Site # and Name	Location	Time Period	Site Type
08501.000158 Vanderbilt Estate SI-1	Miller Field	Pre-1850	Farmhouse complex, no traces evident
08501.000169	Miller Field	Unknown precontact	Isolated cultural remains
08501.000127 SI-9 Remains of Administration Building	Miller Field	Ca. 1921	Concrete building remains
08501.000157 SI-19	Miller Field	Mid-20th century	Concrete foundation

There also have been a number of precontact and historic period archaeological sites recorded within one mile of the watershed boundaries, listed in the following table.

Site # and Name	Location	Time Period	Site Type
Boesch F STD-Court The Courthouse	Amboy Road and Richmond Road area	Unknown Precontact	Unknown
Boesch J STD-OW Old Wagon Road	Richmond Road area	Unknown Precontact	Unknown
NYSM 8481	Approx. intersection of Guyon Ave. and Lynn St.	Unknown Precontact	Camp
NYSM 4628 Boesch 60	Approx. area between New Dorp Lane, Old Mill Road, Tysens Lane and shoreline	Unknown Precontact	Traces of occupation
08501.000154 SI-15	New Dorp Beach shore area	20th-century	Concrete and brick foundation
08501.000153 SI-14	New Dorp Beach shore area	Mid-20th century	Concrete platform
08501.000129 SI-13	New Dorp Beach shore area	Mid-20th century	Concrete and brick structure
08501.000155 SI-16	New Dorp Beach shore area	Mid-20th century	Concrete foundation
08501.000156 SI-17	Oakwood Beach, near foot of Kissam Ave.	Mid-20th century	Concrete well
Boesch 22 Richmond Hill 30-RIC-5-AJA	Richmond Road area	Early Archaic	Lithic scatters and camps
08501.000126 SI-8	Miller Field	Ca. 1919-1920	Stone lined irrigation ditch
08501.000160 SI-3 Britton Cottage	Miller Field	Ca. 1687	Cottage location, no evidence remaining
08501.000161 Niewe Dorp	Miller Field	Ca. 1665	Early Dutch settlement, no evidence remaining
08501.000027 Old Town Oude Dorp	Southern corner of Fort Wadsworth Reservation, beach area, includes NYSM 750, below	Precontact (Archaic-Woodland), Dutch (1641+)	Precontact and Dutch settlement site

Site # and Name	Location	Time Period	Site Type
Boesch 104 STD-C	Near Old Town railroad station	Unknown	Unknown
NYSM 750 Walton-Stillwell Boesch 76	Southern corner of Fort Wadsworth Reservation, beach area	Dutch (1670+), unknown precontact	Historic house remains and aboriginal refuse pit/house
NYSM 8479	Area east of Grasmere Lake (Brady's Pond)	Unknown precontact	Camp
NYSM 8478	Large, vaguely shaped area on both sides of Staten Island Expressway in Arrochar and Grasmere neighborhoods	Unknown precontact	Traces of occupation
NYSM 8477	Area near intersection of Hylan Boulevard and Steuben Street	Unknown precontact	Camp
NYSM 4611 Boesch 75	Area roughly bounded by Fort Wadsworth, Robin Road, Major Road, and Sand Lane	Unknown precontact, possible Woodland	Camp, shell middens
Boesch 108 Brady's Pond Grasmere	West side of Brady's Pond (Grasmere Lake)	Woodland	Camp
Boesch 111 STD-25-4	Shoreline of South Beach between lines of Sand Lane and Vulcan Street	Unknown precontact	Unknown
08501.000007 Fountain-Moquin House	Fort Wadsworth	Woodland Period, 1790-1907	House site with precontact component
NYSM 7813	Large area near Clove Lake	Unknown precontact	Traces of occupation
Boesch 22 Richmond Hill 30-RIC-5-AJA	Richmond Road area	Early Archaic	Lithic scatters and camps
Boesch 99 STD-FH Fox Hills	Fox Hills area	Unknown precontact	Unknown
Boesch 102 STD-CL	Clove Valley and Lake	Woodland	Unknown

Two of the sites recorded by Boesch (1994), Site 30/Todt Hill and Site M are located within very close proximity to proposed BMP NC-1, BMP NC-2 and BMP NC-3. However, not much information is known about either site and Boesch does not report any clear site boundaries from the Staten Island Museum files. There also have been several precontact sites recorded within Moravian Cemetery, the Richmond County Country Club, and that vicinity, an area which is in close proximity to proposed BMP NC-4 and BMP NC-5. The remaining proposed BMP sites and the proposed outfall sites, which are located along the lower reaches of New Creek, are not in proximity to any previously recorded archaeological sites.

In addition to the previously documented archaeological sites, there have been a number of archaeological surveys conducted within the overall watershed boundaries and within a one mile radius of the watershed, submitted to both the NYSOPRHP and the LPC. Several studies addressed beachfront resources along the south shore of Staten Island and South Beach (Lipson et al. 1978, JMA 1978, U.S.A.C.O.E. 1994, Panamerican Consultants 2005). The Panamerican 2005 study included large portions of proposed BMP NC-17 and BMP NC-18, which at the time were labeled Pond 1 and Pond 2, respectively. The report concluded that wetland areas were not sensitive for archaeological resources, and only recommended testing for any raised landforms within or adjacent to the ponds. A large parcel just south of Seaview Avenue near Patterson Avenue (immediately adjacent to proposed BMP NC-18) and another parcel on Olympia Boulevard near Graham Boulevard (immediately adjacent to proposed BMP NC-9) also were investigated but no archaeological resources were identified (Pickman 2006, 2007).

Additional archaeological resources studies have been conducted within a one mile radius of the New Creek Watershed, including several that extended along adjacent shoreline areas, and others located at Miller Field (NPS 1982, Mueller and Linck 1991, Hunter Research 2005). Further north, a number of studies also have been conducted at Fort Wadsworth (Salwen et al. 1984; LBA 1985, 1990; NPS 1994). HPI recently completed a Phase IA Archaeological Documentary Study for the Cedar Grove Rehabilitation Project (HPI 2011). One study was completed for a new post office in New Dorp, near Miller Field (Meadows 1983). A Phase I Archaeological study also was performed on Block 3500, Lot 34 at South Beach, but no archaeological resources were discovered during the field testing (Pickman 2008). No archaeological sites, other than those noted in the above table, have been recorded as a result of these surveys within the New Creek Watershed.

C. Historic Period Summary

New Creek Watershed

The New Creek Watershed is located between the historic neighborhoods of Oude Dorp, or Old Town, which was established near the shoreline southwest of what is now Fort Wadsworth along Old Town Road (now Olympia Boulevard) in the 1660s, and New Dorp, which was established near the foot of modern New Dorp Lane in 1671. The Old Town settlement later moved inland, to an area near the original St. Mary's Cemetery on what is now Quintard Road (Leng and Davis 1930). Early roads within the watershed included Richmond Road and Todt Hill Road. The majority of the lower watershed area consisted of the branches and associated wetlands of New Creek. Revolutionary War era maps, such as the 1780-1783 Anglo-Hessian Map, the 1781 Taylor and Skinner map, and McMillen's *A Map of Staten Island During the Revolution, 1775-1783* (1933) shows that at this time there was only sparse settlement within the overall watershed area, with structures located along or branching off from the two major roads.

Mid nineteenth-century maps show that development in the watershed progressed slowly through 1860. The 1844 U.S.C.S. map shows that most of the watershed was still farmland, woodland, or wetland, with only minimal development along major roads. The 1856 U.S.C.S. map (Figure 6) and the 1860 Walling map (Figure 7) confirm the slow pace of interior development within the watershed, with settlement concentrated along the major arteries, now including Ocean Terrace Road, Four Corners Road, and Prospect Avenue. These maps also show the route of the Staten Island Railroad, which officially began service in 1860 from Clifton to Tottenville (Leng and Delavan 1924). The 1872 Dripps map (Figure 8) and the 1874 Beers map show that while creation of the railroad through the watershed had some impact on development, including creation of hamlets around railroad stations known as Grant City and Garretsons, for the most part land continued to be divided into large parcels owned by a relatively small pool of residents, and there continued to be few new roads or settlement clusters constructed within the area. The 1891 Bien and Vermeule map (Figure 9) shows conditions in the watershed just prior to consolidation with New York City, and indicates that while some additional roads had been built, much of the area was still sparsely developed.

Development within the New Creek Watershed increased after 1898, when Staten Island became part of New York City. In 1896 the Staten Island Electric Railroad Company had extended tracks from Clifton to South Beach, and in 1902 a connector railroad line, known as the Southfield Beach Railroad, opened along the shoreline from the South Beach Station to Midland Beach (Leng and Davis 1930). Beach communities, including hotels, cottages, and amusement areas were built along the Midland Beach shoreline during this period. The 1907 Robinson map and the 1917 Bromley map show that new cluster developments were planned as a city grid was projected over the area. However, many of these city streets remained paper roads well into the twentieth century. Aerial photographs show that it was not until the second half of the twentieth century that much of the New Creek Watershed area was more fully developed.

BMPs NC-1, NC-2, and NC-3

A review of historic maps indicates that proposed BMPs NC-1, NC-2, and NC-3 have been primarily undeveloped woodland over time. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) all show the area east of Todt Hill Road as undeveloped. By the mid-nineteenth century, maps had become more precise. The 1856 U.S.C.S. map (Figure 6) in particular shows that these proposed BMPs were in areas of

steep topography, and undeveloped, with the closest roadways being Todt Hill Road and Ocean Terrace Road. The 1860 Walling map (Figure 7) indicates the proposed BMPs were still completely undeveloped. Similar conditions are shown on the 1872 Dripps map (Figure 8) and the 1874 Beers map, both of which indicate that the proposed BMPs were owned by various individuals. The 1887 Beers map update showed much of the same information as the 1874 map.

Topographical maps made in the 1890s (Bien and Vermeule 1891 [Figure 9]) further show that proposed BMPs NC-1, NC-2, and NC-3 were located in areas of steep topography in proximity to local streams. The 1911 Borough of Richmond Topographical Survey map (Figure 10a), which remains one of the most detailed series of maps made of Staten Island to date, gives remarkable clarity concerning the topographical features within these proposed BMPs, and shows the rugged topography and drainages still seen today. None of these maps show structures in any of the proposed BMP footprints.

Atlases made during the first decades of the twentieth century (e.g. Robinson 1907, Bromley 1917) show that the area north of Todt Hill Road and east of Ocean Terrace Road, where the proposed BMPs are located, remained undeveloped, although a number of individuals continued to own various parcels of land within this area. The 1924 New York City Bureau of Engineering aerial photograph shows that the proposed BMPs and vicinity remained undeveloped and wooded. Aerial photographs (1954, 1966 and 1980) from the second half of the twentieth century (available on www.historicaerials.com) show that development on Todt Hill Road in the vicinity of the proposed BMPs consisted of residential construction on local streets, although there was no development of the proposed BMPs themselves. For several decades beginning by the 1950s, a roadway traversed what is now Basket Willow Swamp, in the vicinity of the proposed BMPs, connecting Todt Hill Road to Richmond Road. This roadway is no longer in use.

BMPs NC-4 and NC-5

A review of historic maps indicates that proposed BMPs NC-4 and NC-5 have been primarily undeveloped woodland or grassland over time. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) all show the area south of Todt Hill Road as undeveloped. By the mid-nineteenth century, maps had become more precise. The 1856 U.S.C.S. map (Figure 6) in particular shows that these proposed BMPs were in areas of relatively gentle topography, and undeveloped, with the closest roadway being Todt Hill Road. The 1860 Walling map (Figure 7) indicates the proposed BMPs were still completely undeveloped. Similar conditions are shown on the 1872 Dripps map (Figure 8) and the 1874 Beers map, both of which indicate that the proposed BMPs were owned by various individuals. The 1887 Beers map update showed much of the same information as the 1874 map.

Topographical maps made in the 1890s (Bien and Vermeule 1891 [Figure 9]) further show that proposed BMPs NC-4 and NC-5 were located in areas of gentle topography in proximity to local streams. The 1911 Borough of Richmond Topographical Survey map (Figures 10b and 10c), which remains one of the most detailed series of maps made of Staten Island to date, gives remarkable clarity concerning the topographical features within these proposed BMPs, and shows much of the same topography and drainages still seen today. As noted earlier, the proposed site of BMP NC-5 contained an area of low-lying wetland adjacent to the stream confluence, which appears to have been filled in. None of these maps show structures in any of the proposed BMP footprints.

The Richmond County Country Club Golf Course at Dongan Hills dates to 1897 (Richmond County Country Club n.d.), although the 1907 Robinson atlas still shows this area as individually owned. The 1911 survey map and the 1917 Bromley map both note the area in the vicinity of the proposed BMPs as a golf course. This golf course appears on all subsequent maps and photographs, including the 1924 New York City Bureau of Engineering aerial photograph, the 1937 and 1959 Sanborn maps, and aerial photographs (1954, 1966 and 1980) from the second half of the twentieth century (available on www.historicaerials.com). The residences adjacent to proposed BMP NC-5 appear to date to the second half of the twentieth century.

BMP NC-6

A review of historic maps indicates that proposed BMP NC-6 was undeveloped land at the edge of New Creek through the nineteenth century. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783,

McMillen 1933) all show the area in the vicinity of proposed BMP NC-6 as undeveloped. By the mid-nineteenth century, maps had become more precise. The 1856 U.S.C.S. map (Figure 6) in particular shows that this proposed BMP was in an area containing level woodland immediately adjacent to New Creek and its marshlands. The 1860 Walling map (Figure 7) shows that the proposed BMP was still completely undeveloped, although the line of Lincoln Avenue had been laid out. Similar conditions are shown on the 1872 Dripps map (Figure 8) and the 1874 Beers map, both of which indicate that the proposed BMP was undeveloped and the surrounding area was owned by various individuals. The 1874 map confirms that the portion of the proposed BMP northwest of New Creek was on firm land. The 1887 Beers map update showed much of the same information as the 1874 map.

Topographical maps made in the 1890s (Bien and Vermeule 1891 [Figure 9]) further show that proposed BMP NC-6 was on woodland adjacent to New Creek. The 1911 Borough of Richmond Topographical Survey map (Figure 10d) shows that the proposed BMP contained firm land northwest of the New Creek channel. This map also notes a pumping station and an outbuilding on the proposed BMP, and a roadway running through the proposed BMP from Lincoln Avenue to Midland Avenue, roughly paralleling the alignment of the creek. The 1907 Robinson map and the 1917 Bromley map confirm that the proposed BMP was owned by the City of New York and used by the Department of Water Supply. The first pumping station building was wooden, and located near the Midland Avenue side of the proposed BMP. By 1917, a second, brick building had been constructed south of the original building, along the line of Boundary Avenue. Both buildings are shown on the 1924 New York City Bureau of Engineering aerial photograph, which also shows that the remainder of the proposed BMP was wooded. The 1937 Sanborn map notes that by this time, the first pumping station had been demolished and the second pumping station was called the Grant City Pumping Station. Subsurface water lines extended to the station from both Midland Avenue and Lincoln Avenue, and another water line extended east of the building towards the creek. No change was shown on the 1951 Sanborn map update.

Aerial photographs (1954, 1966 and 1980) from the second half of the twentieth century (available on www.historicaerials.com) show that by 1954 the roadway leading through the proposed BMP from Lincoln Avenue to Midland Avenue had been abandoned, but that otherwise there was little change to the proposed BMP over time. By the end of the twentieth century, the pumping station had been demolished and today woodland has been allowed to reclaim much of the area.

BMPs NC-7 through BMP NC-19

A review of historic maps indicates that proposed BMPs NC-7 through BMP NC-19 have been primarily undeveloped marshland over time. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) all show the area comprising New Creek and its tributaries as undeveloped and wet or marshy. All of these proposed BMPs fall within this area. Nineteenth-century maps, including the 1856 U.S.C.S. map (Figure 6), the 1860 Walling map (Figure 7), the 1872 Dripps map (Figure 8), the 1874 Beers map, the 1887 Beers map, and the 1891 Bien and Vermeule map (Figure 9) continually show all of the proposed BMPs as within wet or marshy undeveloped areas. The 1911 Borough of Richmond Topographical Survey map (Figures 10e-g), which remains one of the most detailed series of maps made of Staten Island to date, confirms that all of these proposed BMPs were still wet or marshy, and many contained drainage ditches coursing through them. No structures are shown in any of the proposed BMPs.

Atlases made during the first decades of the twentieth century (e.g. Robinson 1907, Bromley 1917) show that the proposed BMPs remained undeveloped, although were attributed to various owners. The 1924 New York City Bureau of Engineering aerial photograph confirms that the area containing the proposed BMPs remained wet or marshy. During the mid-twentieth century, the vicinity of the proposed BMPs began to be more fully developed with a city street grid and the construction of buildings, mostly residences, in the area (Sanborn 1937, 1951). Generally, streets and buildings extended just up to the edges of the wetlands, and in some cases wet or marshy areas were filled to bring land up to a standard grade, although it appears that the proposed BMPs footprints themselves likely were never built upon. Review of modern survey maps (Figures 4g-m) shows that some of the proposed BMPs experienced filling that brought the formerly level marshlands up to higher elevations. Aerial photographs (1954, 1966 and 1980) from the second half of the twentieth century (available on www.historicaerials.com) show that over time development in the vicinity of the proposed BMPs increased, creating the landscape visible today.

New and Supplemental Outfalls

The proposed new outfall at proposed BMP NC-10 and the proposed supplemental outfall at Seaview Avenue are, like proposed BMPs NC-7 through NC-19, within areas that historically have been undeveloped marshland or beach. A review of the historic maps and aerial photographs described above shows that Seaview Avenue dates to the late nineteenth century. In 1896 the Staten Island Electric Railroad Company had extended tracks from Clifton to South Beach, and in 1902 a connector railroad line, known as the Southfield Beach Railroad, opened along the shoreline from the South Beach Station to Midland Beach (Leng and Davis 1930). The proposed supplemental outfall at Seaview Avenue crosses the former line of this railroad and then terminates at the beach. The railroad was discontinued in the mid-twentieth century.

V. CONCLUSIONS

A. Precontact Archaeological Sensitivity and Disturbance Record

From what is known of precontact period settlement patterns on Staten Island, most habitation and processing sites are found in sheltered, elevated sites close to wetland features, major waterways, and with nearby sources of fresh water. The following discussion addresses the general precontact archaeological sensitivity for the New Creek Watershed and site-specific sensitivity for each of the proposed BMP and outfall locations.

New Creek Watershed

The New Creek Watershed area has had several precontact archaeological sites recorded within its boundaries, generally concentrated in areas closest to natural water features. However, much of the watershed has never been systematically surveyed for precontact archaeological resources and so survival of as of yet undiscovered sites is unknown. Boesch (1994), in his study of precontact archaeological sensitivity for Staten Island, has assigned a high archaeological sensitivity to areas of the watershed including the New Creek channels and associated wetlands (located southeast of the Staten Island Railroad tracks and between Midland Avenue and Seaview Avenue), as well as the area along the northwestern boundary of the watershed (located west of Moravian Cemetery and the Richmond County Country Club). Boesch has assigned a moderate sensitivity to most remaining areas of Midland Beach southeast of Hylan Boulevard, and all areas northwest of Richmond Road. Boesch assigns no, or low precontact archaeological sensitivity in the remaining areas of the watershed.

Boesch's study of precontact archaeological sensitivity does not take into account the level of ground disturbance in any given location, which may have destroyed or compromised the integrity of any extant precontact archaeological resources. Disturbance across the New Creek Watershed obviously varies according to the level of development and earthmoving that has occurred at any given spot, and would need to be assessed on an individual basis according to site-specific conditions. At this time, there are no additional BMPs defined for the New Creek Watershed; any consideration of new BMP sites as part of this project would need to be addressed separately.

BMPs NC-1, NC-2, and NC-3

The proposed sites of BMPs NC-1, NC-2, and NC-3 are in or immediately adjacent to an area that the NYSOPRHP GIS indicates is sensitive for archaeological resources, based on proximity to previously recorded sites. Boesch (1994) indicates these proposed BMPs are in an area of moderate precontact archaeological sensitivity. Boesch also reports two precontact archaeological sites in the overall Todt Hill area, although he provides no precise site locations.

Although these proposed BMPs are all in close proximity to natural fresh water streams and have well drained soils, their steep landforms argue that these would not be favorable locations for precontact occupation. HPI concludes that these proposed BMPs do not possess precontact archaeological sensitivity.

BMP NC-4

The proposed site of BMP NC-4 is in an area that the NYSOPRHP GIS indicates is sensitive for archaeological resources, based on proximity to previously recorded sites. Boesch (1994) indicates this proposed BMP is in an area

of moderate precontact archaeological sensitivity. A NYSM precontact site has been recorded in the general vicinity of this proposed BMP.

The proposed site of BMP NC-4 is located within and surrounding a small stream that joins the West Branch of New Creek approximately 50 feet downstream. The landform of the proposed BMP has only a gentle slope and the soils are well drained. Disturbance to this proposed BMP was not evident based on the visual field inspection. HPI therefore concludes that this proposed BMP has a high precontact archaeological sensitivity.

BMP NC-5

The proposed site of BMP NC-5 is in an area that the NYSOPRHP GIS indicates is sensitive for archaeological resources, based on proximity to previously recorded sites. Boesch (1994) indicates this proposed BMP is in an area of moderate precontact archaeological sensitivity. A NYSM precontact site has been recorded in the general vicinity of this proposed BMP.

Although this proposed BMP is located adjacent to the confluence of two streams, it is clear that there has been disturbance to the area from creation of the golf course and cart path. Comparison of the 1911 topographical map with the modern survey map confirms that this area, which originally contained some small wetlands, has been filled to create an artificially flat surface. The stream banks appear manipulated as well, with unnatural berms surrounding them within the proposed BMP. Due to the degree of disturbance at this proposed BMP, HPI concludes that it does not possess archaeological sensitivity.

BMP NC-6

The proposed site of BMP NC-6 is in an area that the NYSOPRHP GIS indicates is sensitive for archaeological resources, based on proximity to previously recorded sites. Boesch (1994) indicates this proposed BMP is located along the boundary of areas noted as possessing moderate and high precontact archaeological sensitivity.

Historic maps, including the 1911 topographical map, show that in its natural state proposed BMP NC-6 was in an area that would have had a high precontact archaeological sensitivity. The location was well drained, level woodland along the West Branch of New Creek, elevated several feet above the creek and its nearby marshland. Although the portion of the proposed BMP along Boundary Avenue, where the two pumping stations were formerly located, is clearly disturbed and exhibits large mounds of soil and debris, it is possible that the more central portion of the proposed BMP, in between the disturbed area and the creek, could have areas of intact landform, which if not disturbed would have a high precontact archaeological sensitivity. HPI concludes that this central section of the proposed BMP has a high precontact archaeological sensitivity, but that the remainder of the proposed BMP no longer possesses any sensitivity.

BMPs NC-7 through BMP NC-19

The proposed sites of BMPs NC-7 through BMP NC-19 are all in an area that the NYSOPRHP GIS indicates is not sensitive for archaeological resources, based on a lack of proximity to previously recorded sites. However, Boesch (1994) indicates that this entire area has a high precontact archaeological sensitivity, based on the location of fresh water from the branches of New Creek and its associated wetlands. As noted above, an archaeological study by Panamerican (2005) included large portions of proposed BMP NC-17 and BMP NC-18, which at the time were labeled Pond 1 and Pond 2, respectively. The report concluded that wetland areas were not sensitive for archaeological resources, and only recommended testing for any raised landforms within or adjacent to the ponds. HPI concurs with this assessment.

Based on review of historic maps (e.g. Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10e-g]), it appears that in their original state, these proposed BMPs contained branches of New Creek and/or surrounding wetlands. The maps do not show any naturally raised landforms, or hummocks, that were elevated above the wetlands. During the twentieth century, discrete portions of some of these proposed BMPs and their vicinity were filled, as evidenced by review of modern survey maps (Figure 4g-m), which show raised topography in certain spots. Review of the soil borings for these proposed BMPs and vicinity (Metcalf & Eddy 2005), coupled with the site visit results, suggest that any soils that are now above the water table in this area have been disturbed

from grading and filling. HPI therefore concludes that none of these proposed BMPs possess any precontact archaeological sensitivity.

New and Supplemental Outfalls

The proposed new outfall at BMP-NC-10 and the proposed supplemental outfall at Seaview Avenue are both in an area that the NYSOPRHP GIS indicates is not sensitive for archaeological resources, based on a lack of proximity to previously recorded sites. However, Boesch (1994) indicates that this entire area has a high precontact archaeological sensitivity, based on the location of fresh water from the branches of New Creek and its associated wetlands.

Based on review of historic maps (e.g. Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10e and 10g]), it appears that in their original state, these proposed outfalls were contained branches of New Creek and/or surrounding wetlands. The maps do not show any naturally raised landforms, or hummocks, that were elevated above the wetlands. The only land not shown as marshlands is the beachfront.

B. Historic Period Archaeological Sensitivity and Disturbance Record

New Creek Watershed

The New Creek Watershed has had few historic period archaeological resources recorded within its boundaries, the exception being the resources associated with New Dorp located within Miller Field. However, much of the watershed has never been systematically surveyed for historic period archaeological resources and so survival of as of yet undiscovered sites is unknown. Historic period archaeological sites are most likely to be found in proximity to early roadways, such as New Dorp Road and Richmond Road, and in areas where historic maps show development. It is less likely that historic period archaeological resources would be found in areas that were not settled during the historic era. The possibility that any such sites have survived is dependent on the level of disturbance to the potential resources. Disturbance across the New Creek Watershed obviously varies according to the level of development and earthmoving that has occurred at any given spot, and would need to be assessed on an individual basis according to site-specific conditions.

BMPs and Outfalls

Historic maps indicate that none of the 19 proposed BMPs or the proposed outfalls within the New Creek Watershed have had any historic period development within or immediately adjacent to their boundaries. HPI concludes that the proposed BMPs and proposed outfalls contain no historic period archaeological sensitivity.

VI. RECOMMENDATIONS

Based on these conclusions, HPI recommends that a program of Phase IB archaeological testing be conducted on the proposed site of BMP NC-4 and the portion of the proposed site of BMP NC-6 designated as having a high archaeological sensitivity for precontact resources, as shown in Figure 11, if these areas will experience subsurface impacts as part of proposed BMP construction. All archaeological testing should be conducted according to applicable archaeological standards (New York Archaeological Council 1994, NYSOPRHP 2005; LPC 2002; CEQR 2010). Professional archaeologists, with an understanding of and experience in urban archaeological excavation techniques, would be required to be part of the archaeological team. No further archaeological investigations are recommended for the remaining 17 proposed BMPs or the proposed outfall sites.

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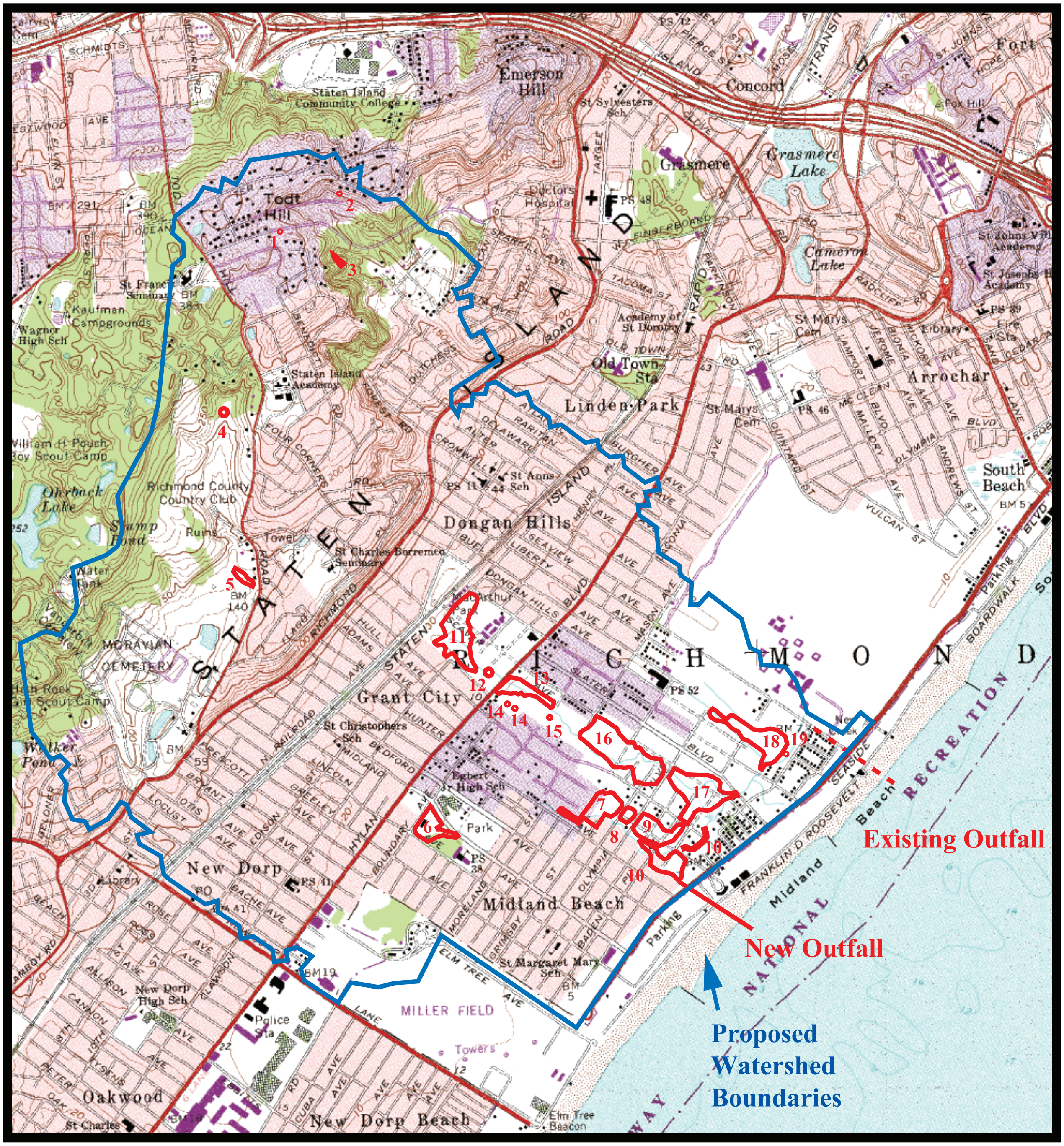
Figure 1: New Creek Watershed and BMP Locations.



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
New Creek Watershed
Phase IA Archaeological Documentary Study

Figure 2: New Creek Watershed and BMP Locations on *The Narrows, N.Y.-N.J.* 7.5 Minute Topographic Quadrangle (U.S.G.S. 1981).

0 1000 2000 3000 4000 5000 FEET

N

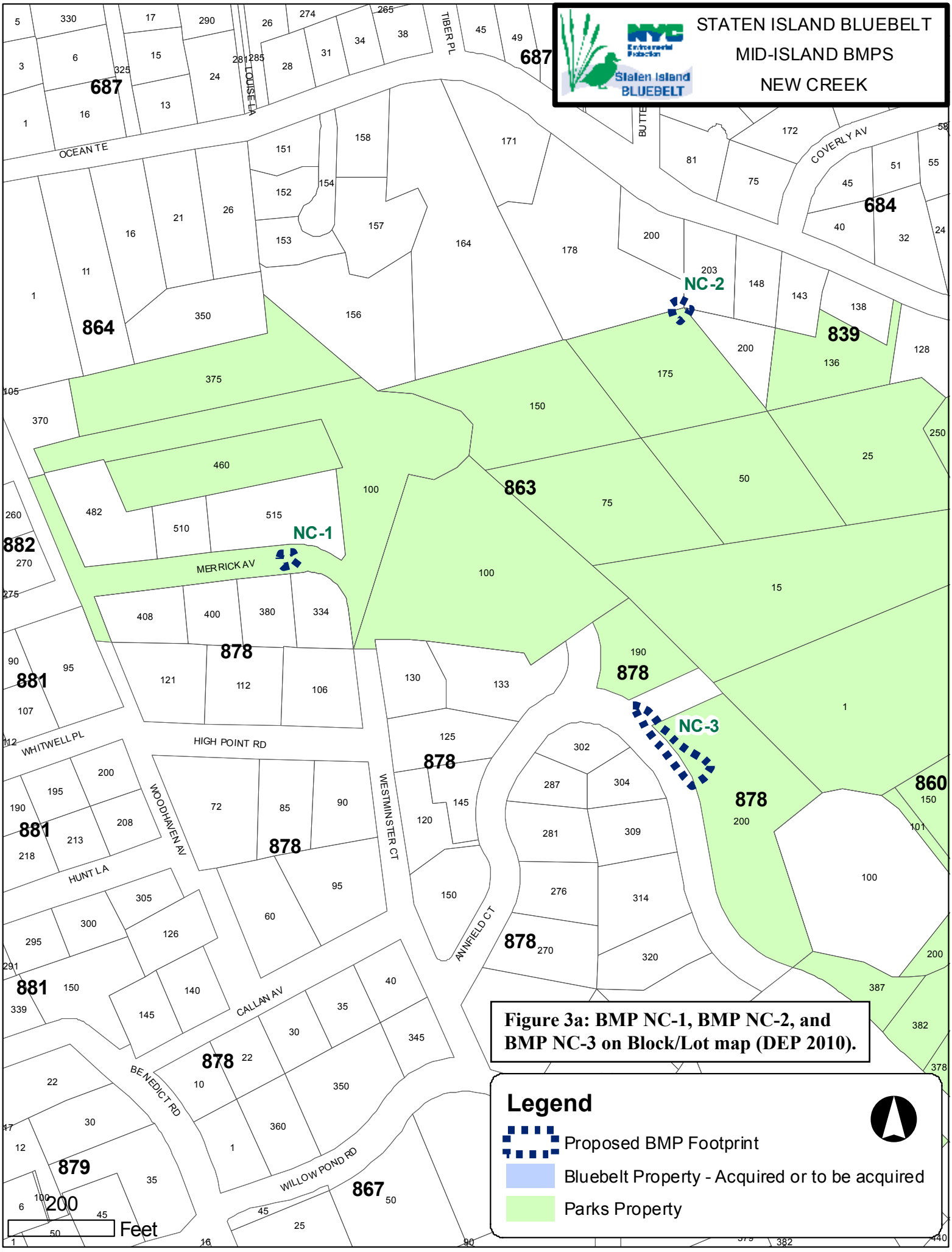
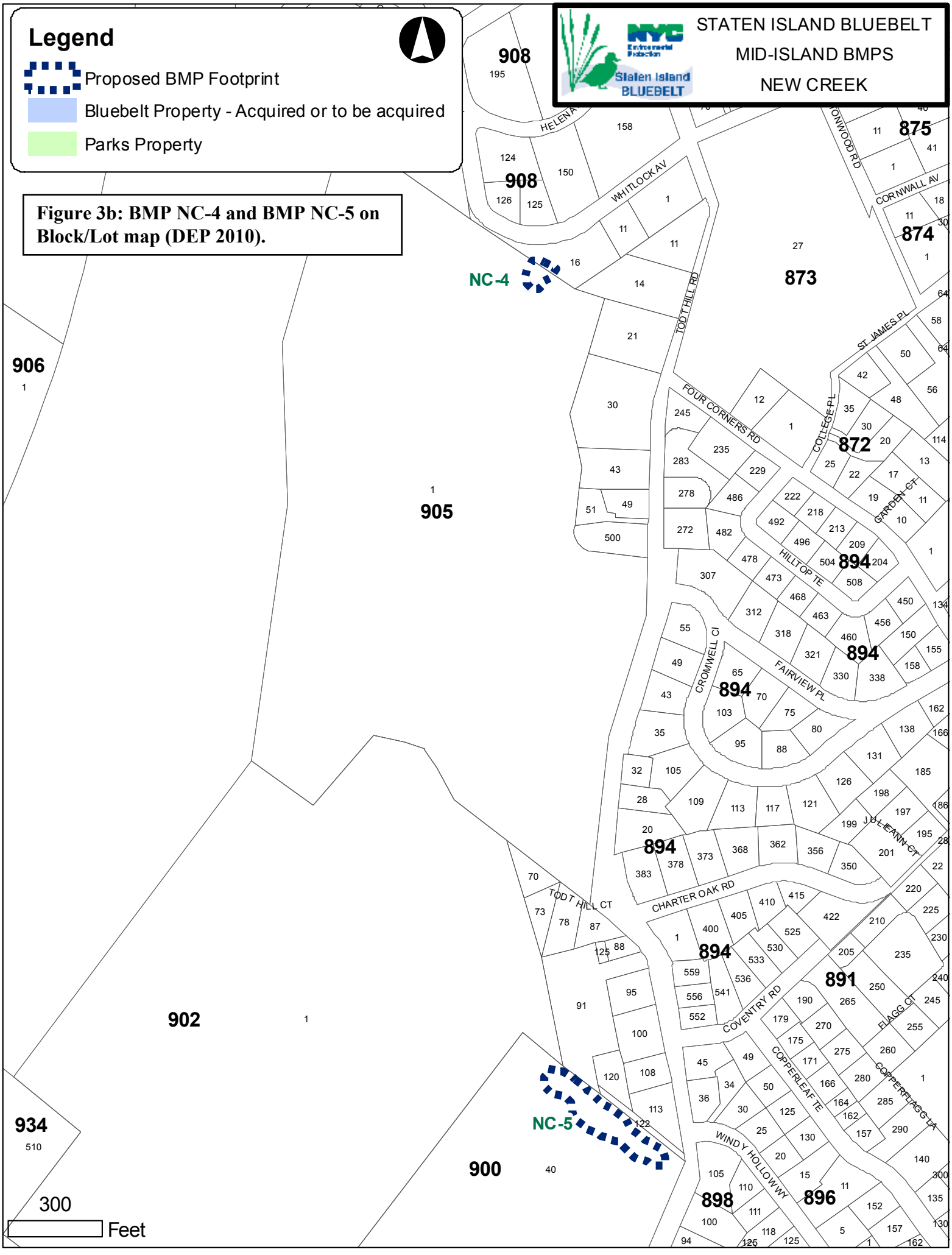


Figure 3a: BMP NC-1, BMP NC-2, and BMP NC-3 on Block/Lot map (DEP 2010).


Legend
Proposed BMP Footprint
Bluebelt Property - Acquired or to be acquired
Parks Property
STATEN ISLAND BLUEBELT
MID-ISLAND BMPS
NEW CREEK
Figure 3b: BMP NC-4 and BMP NC-5 on Block/Lot map (DEP 2010).
NC-4
NC-5
908
195
908
124
126
125
150
158
HELENA
WHITLOCK AV
16
14
11
1
906
1
905
1
902
1
934
510
900
40
21
30
43
51
49
500
TOD T HILL RD
TODT HILL CT
70
73
78
87
125
88
91
95
100
120
108
113
122
873
27
875
11
41
1
CONWOOD RD
CORNWALL AV
18
11
874
1
64
58
ST JAMES PL
50
64
42
56
48
12
1
245
235
283
229
278
486
272
482
FOUR CORNERS RD
COLLEGE PL
35
30
872
20
114
25
22
17
13
19
11
10
GARDEN CT
1
222
218
492
213
496
209
504
894
204
508
HILLTOP TE
307
478
473
468
312
463
318
321
460
456
450
134
150
155
158
330
338
894
55
49
43
35
CROMWELL CI
65
894
70
103
75
80
95
88
FAIRVIEW PL
162
138
166
131
185
32
105
126
28
109
113
117
121
198
197
186
199
JULIEANN CT
195
20
894
378
373
368
362
356
350
201
22
383
CHARTER OAK RD
220
410
415
405
422
225
210
1
400
525
230
894
530
205
235
559
533
891
240
536
250
556
541
COVENTRY RD
190
265
245
552
179
270
FLAGG CT
255
175
275
260
171
COPPERLEAF TE
COPPERFLAGG LN
1
45
49
280
166
34
50
285
36
30
125
164
162
25
130
157
290
WINDY HOLLOW WY
20
140
15
11
105
110
898
896
300
152
135
100
111
118
125
5
157
130
94
125
1
162
300
Feet

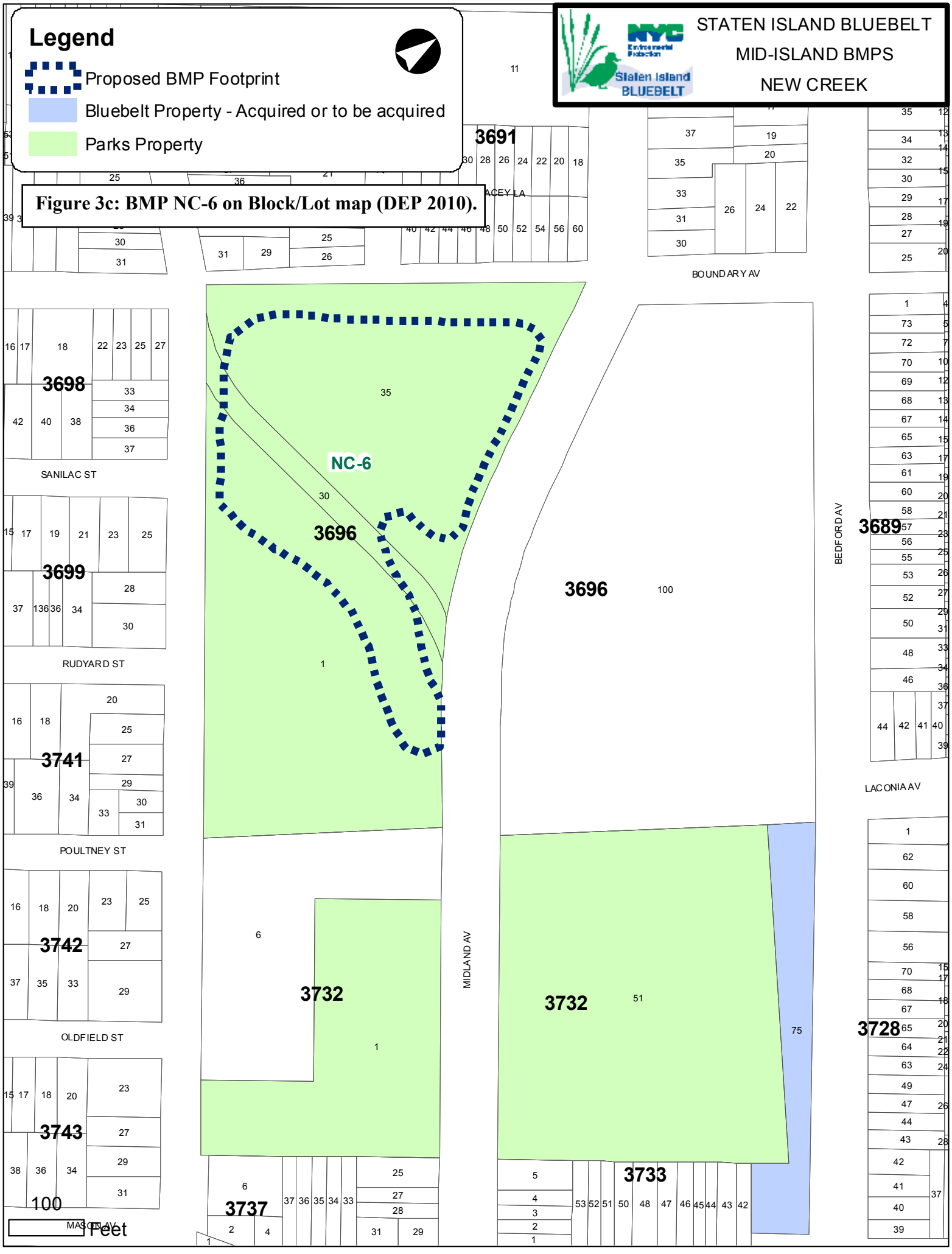


Figure 3c: BMP NC-6 on Block/Lot map (DEP 2010).

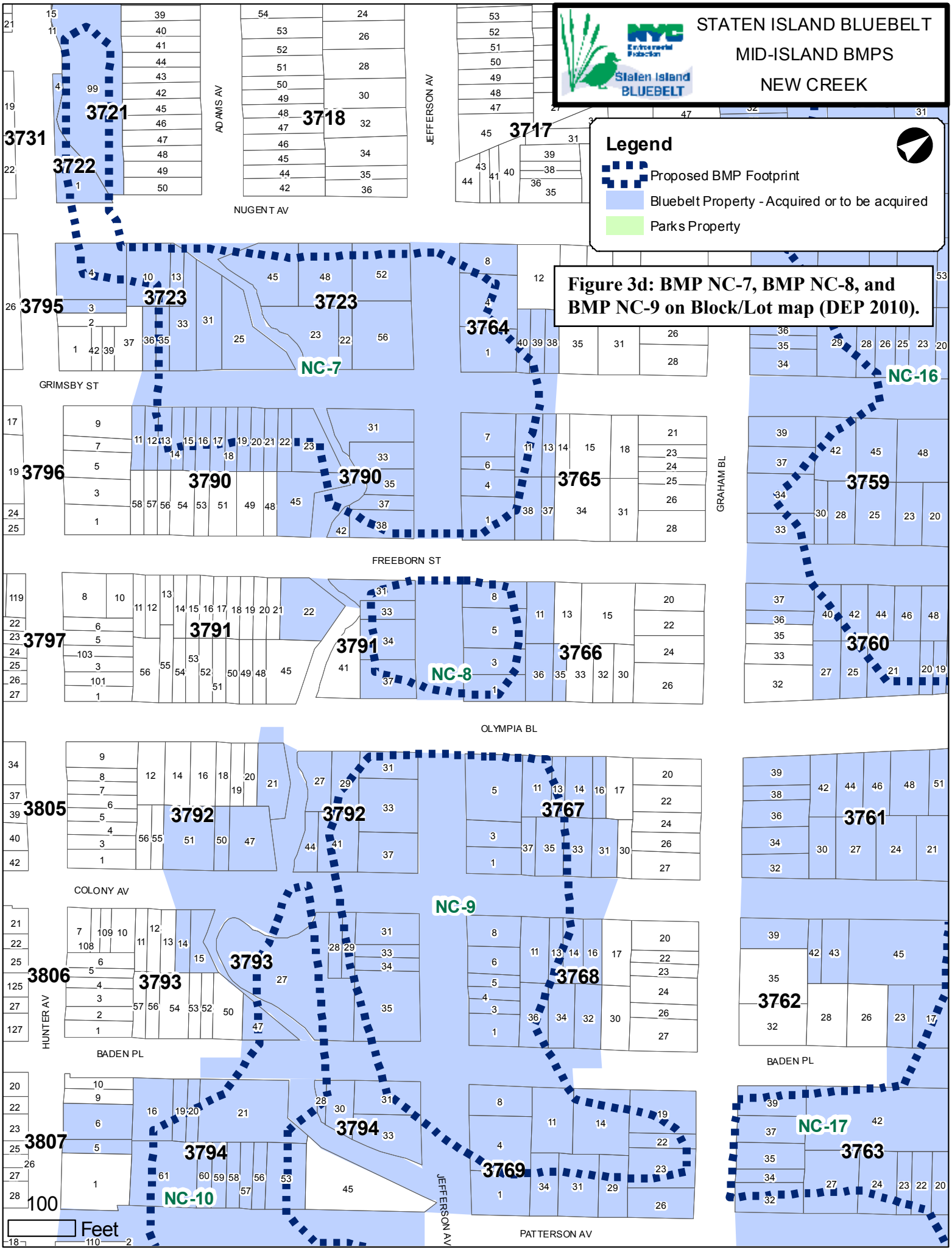
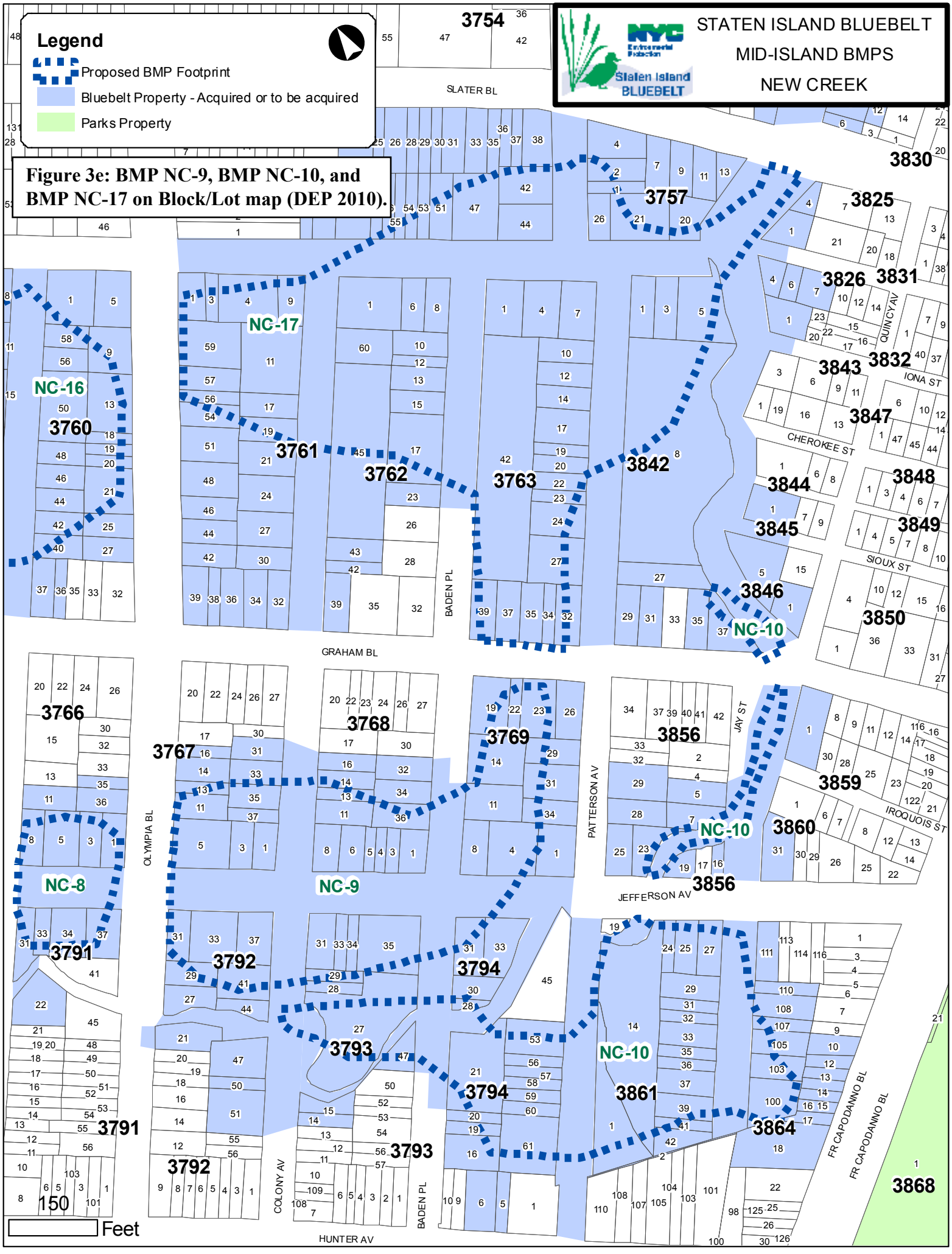
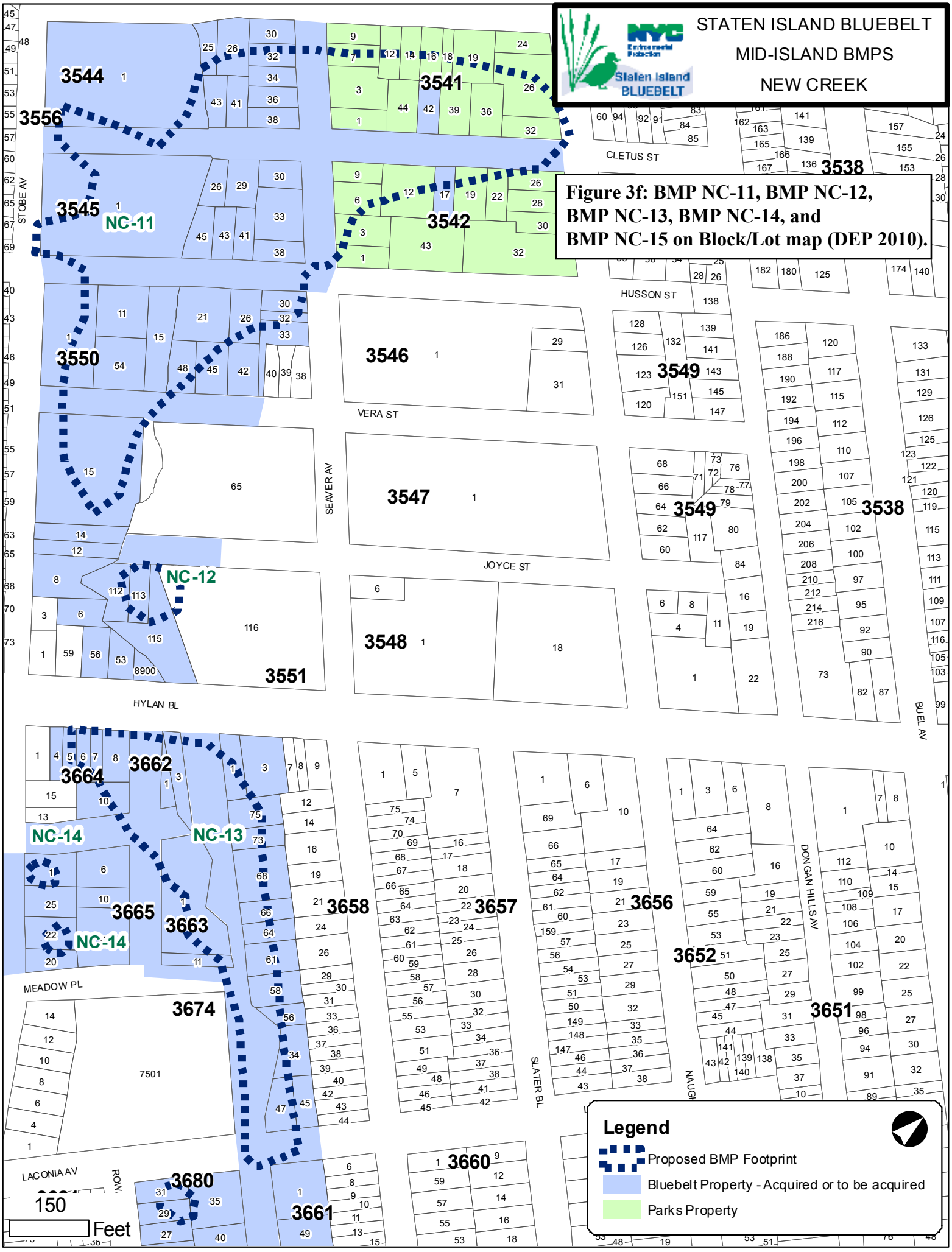
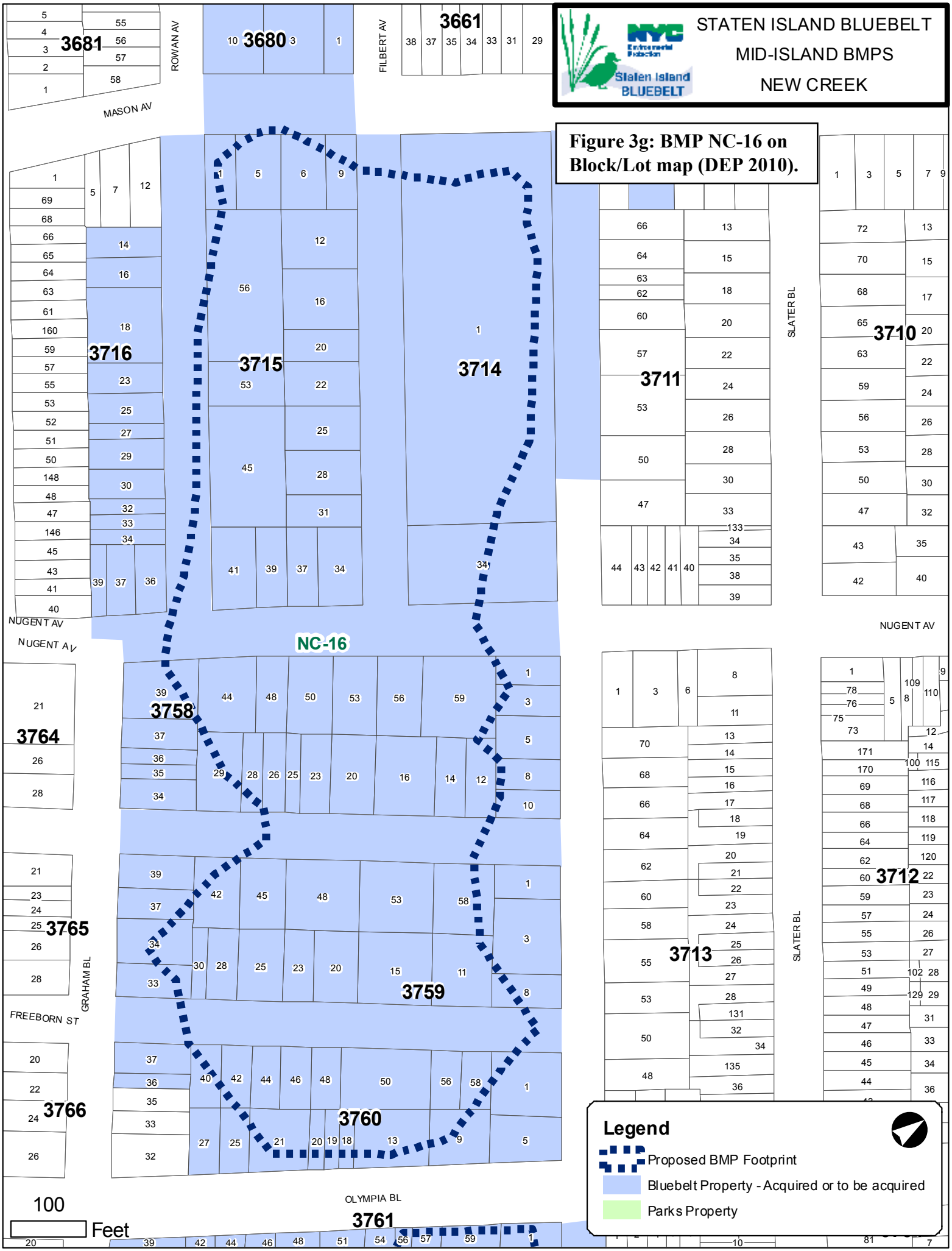


Figure 3d: BMP NC-7, BMP NC-8, and BMP NC-9 on Block/Lot map (DEP 2010).


Legend
Proposed BMP Footprint
Bluebelt Property - Acquired or to be acquired
Parks Property
STATEN ISLAND BLUEBELT
MID-ISLAND BMPS
NEW CREEK
Figure 3e: BMP NC-9, BMP NC-10, and BMP NC-17 on Block/Lot map (DEP 2010).
NC-16
NC-17
NC-8
NC-9
NC-10
3760
3761
3762
3763
3842
3757
3754
3830
3825
3826
3831
3832
3843
3847
3844
3845
3848
3849
3850
3846
3766
3767
3768
3769
3856
3859
3860
3791
3792
3793
3794
3861
3864
3868
SLATER BL
GRAHAM BL
BADEN PL
QUINCY AV
IONA ST
CHEROKEE ST
SIOUX ST
IROQUOIS ST
JAY ST
PATTERSON AV
JEFFERSON AV
OLYMPIA BL
COLONY AV
HUNTER AV
FR CAPODANNO BL
150
Feet


STATEN ISLAND BLUEBELT
MID-ISLAND BMPS
NEW CREEK
Figure 3f: BMP NC-11, BMP NC-12, BMP NC-13, BMP NC-14, and BMP NC-15 on Block/Lot map (DEP 2010).
NC-11
NC-12
NC-13
NC-14
NC-14
3544
3556
3545
3541
3542
3538
3546
3549
3550
3547
3548
3551
3662
3664
3665
3663
3658
3657
3656
3652
3651
3674
3680
3661
3660
CLETUS ST
HUSSON ST
VERA ST
SEAVER AV
JOYCE ST
HYLAN BL
STOBE AV
BUEL AV
DONGAN HILLS AV
SLATER BL
MEADOW PL
LACONIA AV
7501
Legend
Proposed BMP Footprint
Bluebelt Property - Acquired or to be acquired
Parks Property
150
Feet


STATEN ISLAND BLUEBELT
MID-ISLAND BMPS
NEW CREEK
Figure 3g: BMP NC-16 on Block/Lot map (DEP 2010).
NC-16
3681
3680
3661
3716
3715
3714
3711
3710
3758
3764
3759
3765
3713
3712
3766
3760
3761
ROWAN AV
FILBERT AV
MASON AV
NUGENT AV
SLATER BL
GRAHAM BL
FREEBORN ST
OLYMPIA BL
Legend
Proposed BMP Footprint
Bluebelt Property - Acquired or to be acquired
Parks Property
100
Feet

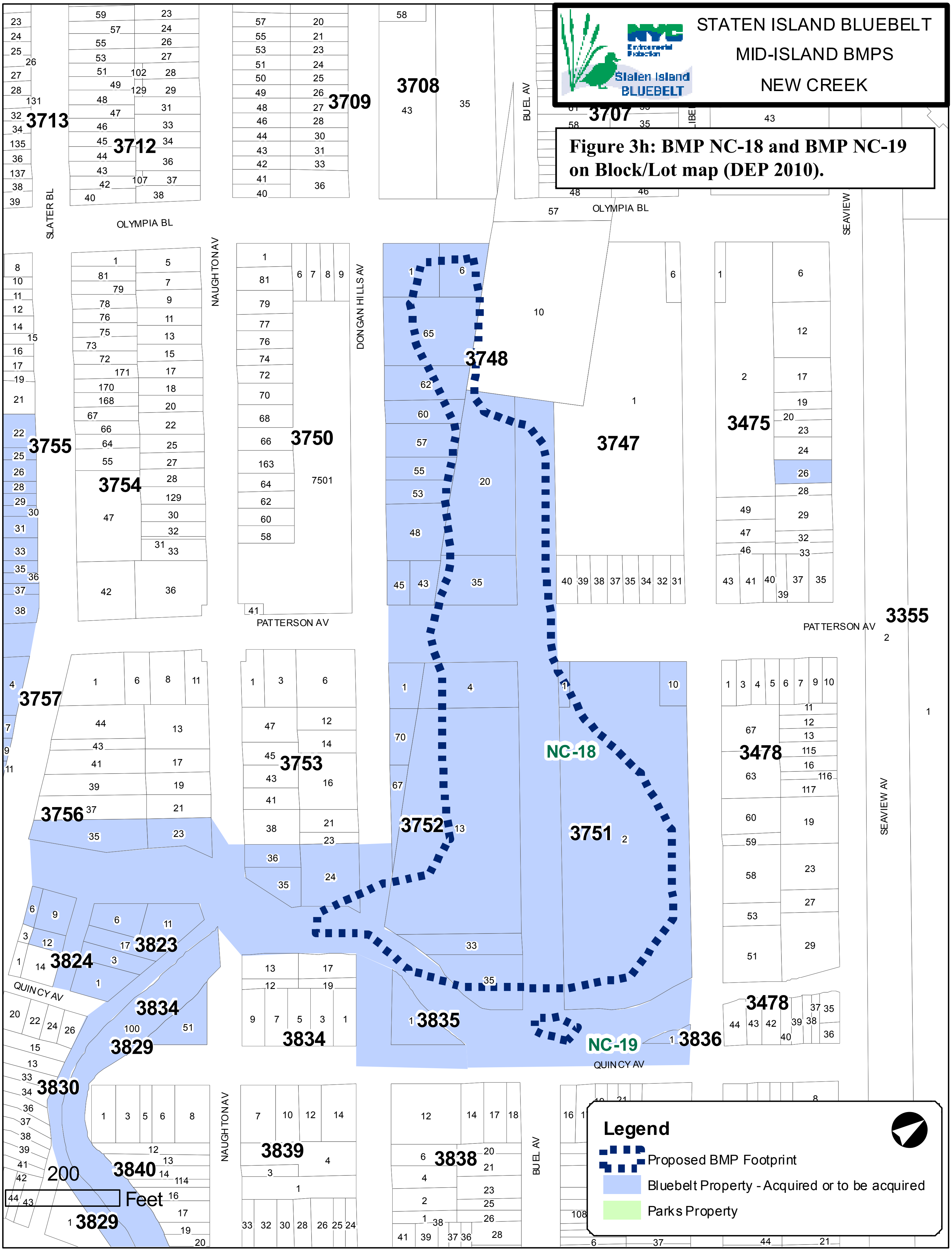

STATEN ISLAND BLUEBELT
MID-ISLAND BMPS
NEW CREEK
Staten Island BLUEBELT
OLYMPIA BL
SLATER BL
NAUGHTON AV
DONGAN HILLS AV
BUEL AV
SEAVIEW
SEAVIEW AV
PATTERSON AV
QUINCY AV
3713
3712
3709
3708
3707
3755
3754
3750
3748
3747
3475
3355
3757
3753
3752
3751
3478
3756
3824
3823
3834
3829
3835
3836
3830
3840
3839
3838
NC-18
NC-19
Legend
Proposed BMP Footprint
Bluebelt Property - Acquired or to be acquired
Parks Property
200
Feet

Figure 3h: BMP NC-18 and BMP NC-19 on Block/Lot map (DEP 2010).

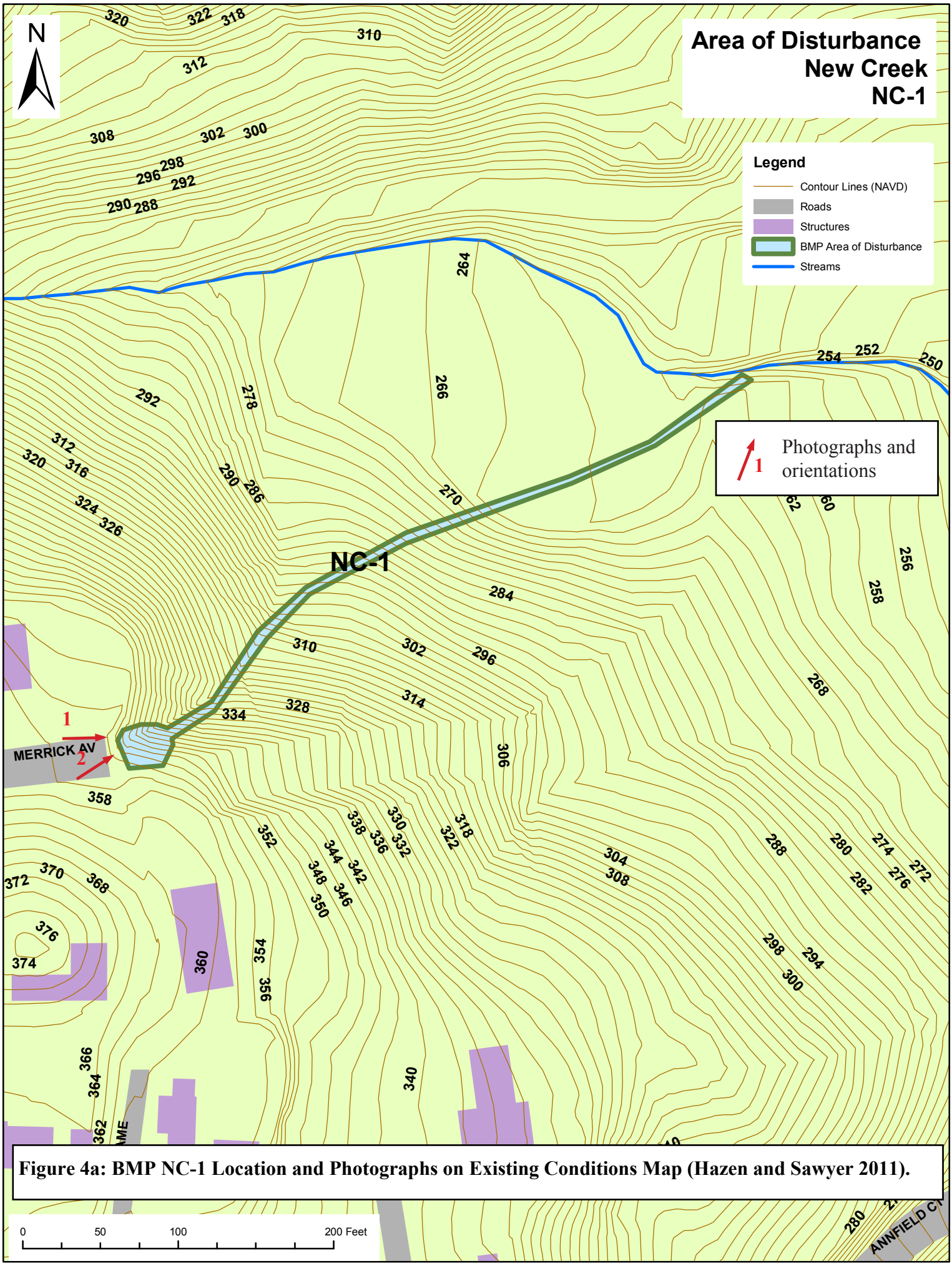


Figure 4a: BMP NC-1 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

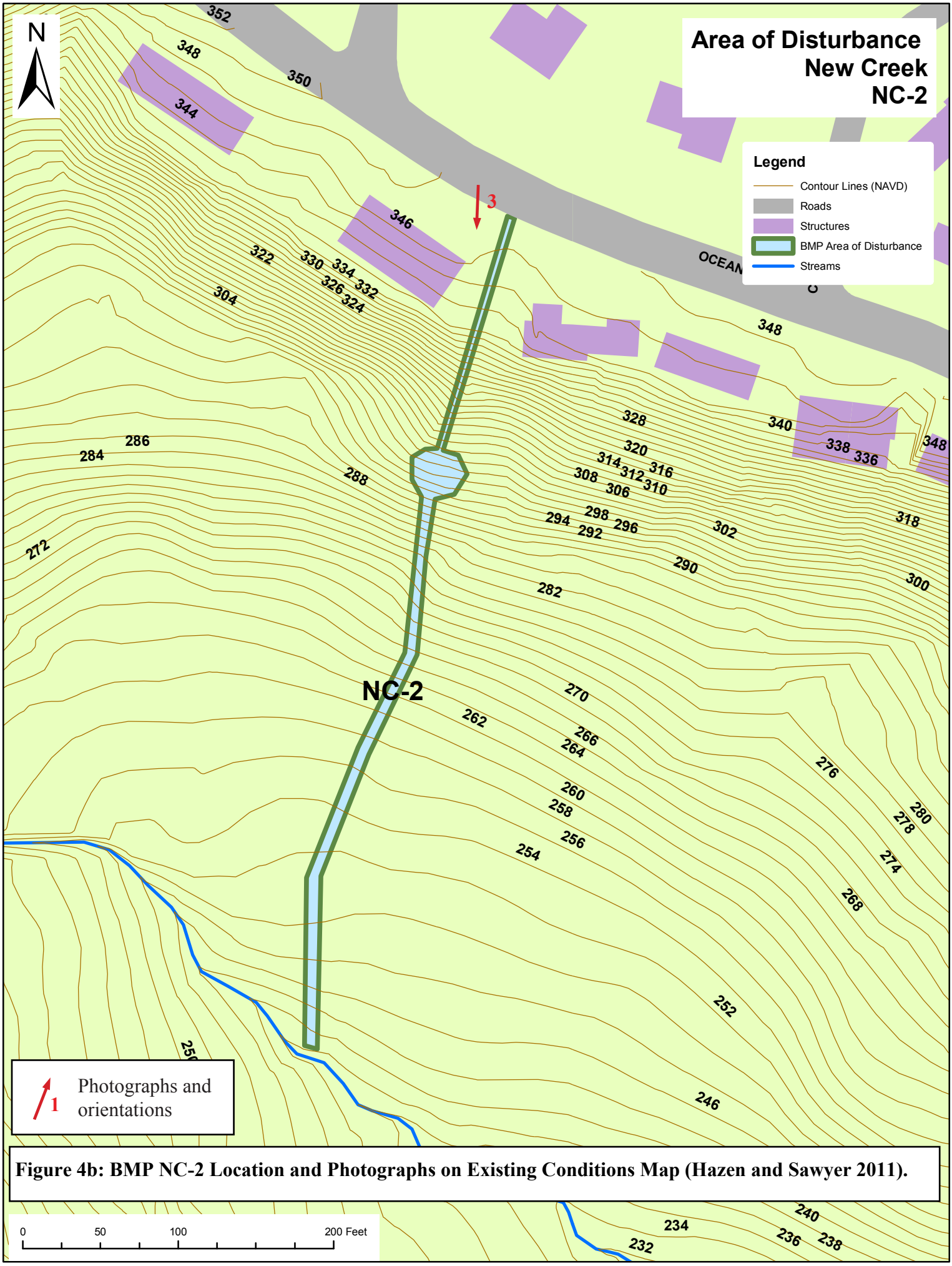


Figure 4b: BMP NC-2 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

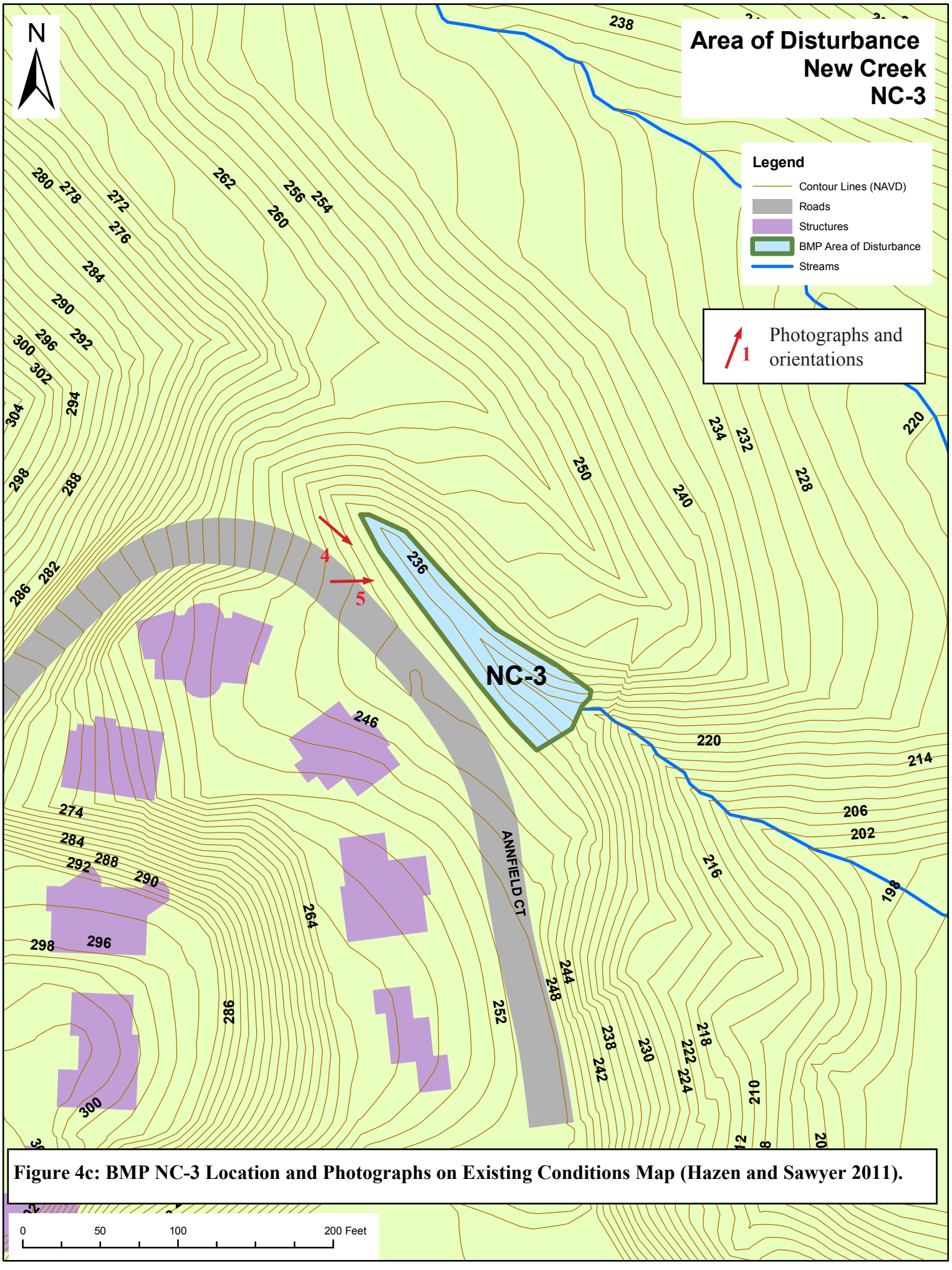


Figure 4c: BMP NC-3 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

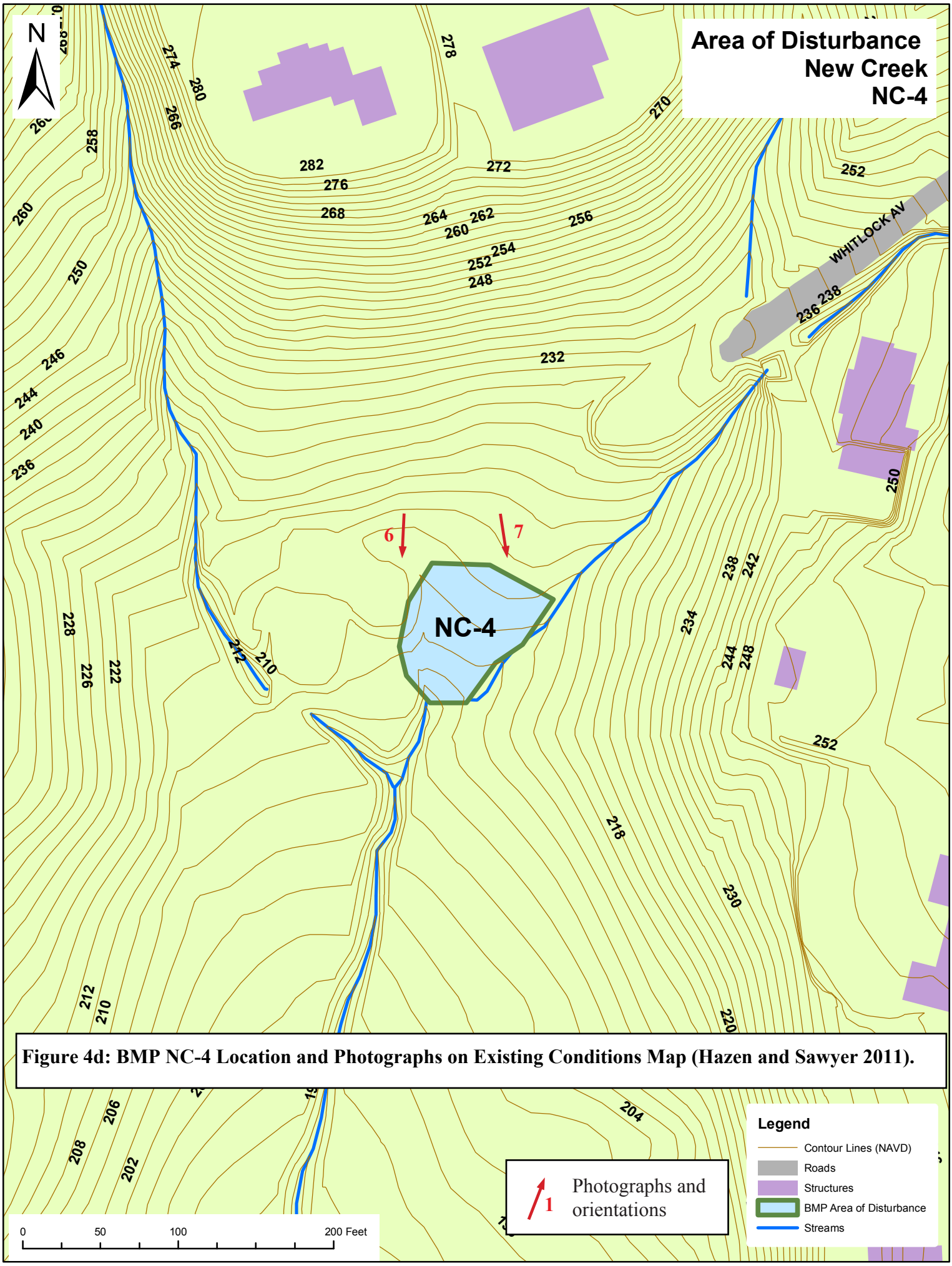


Figure 4d: BMP NC-4 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

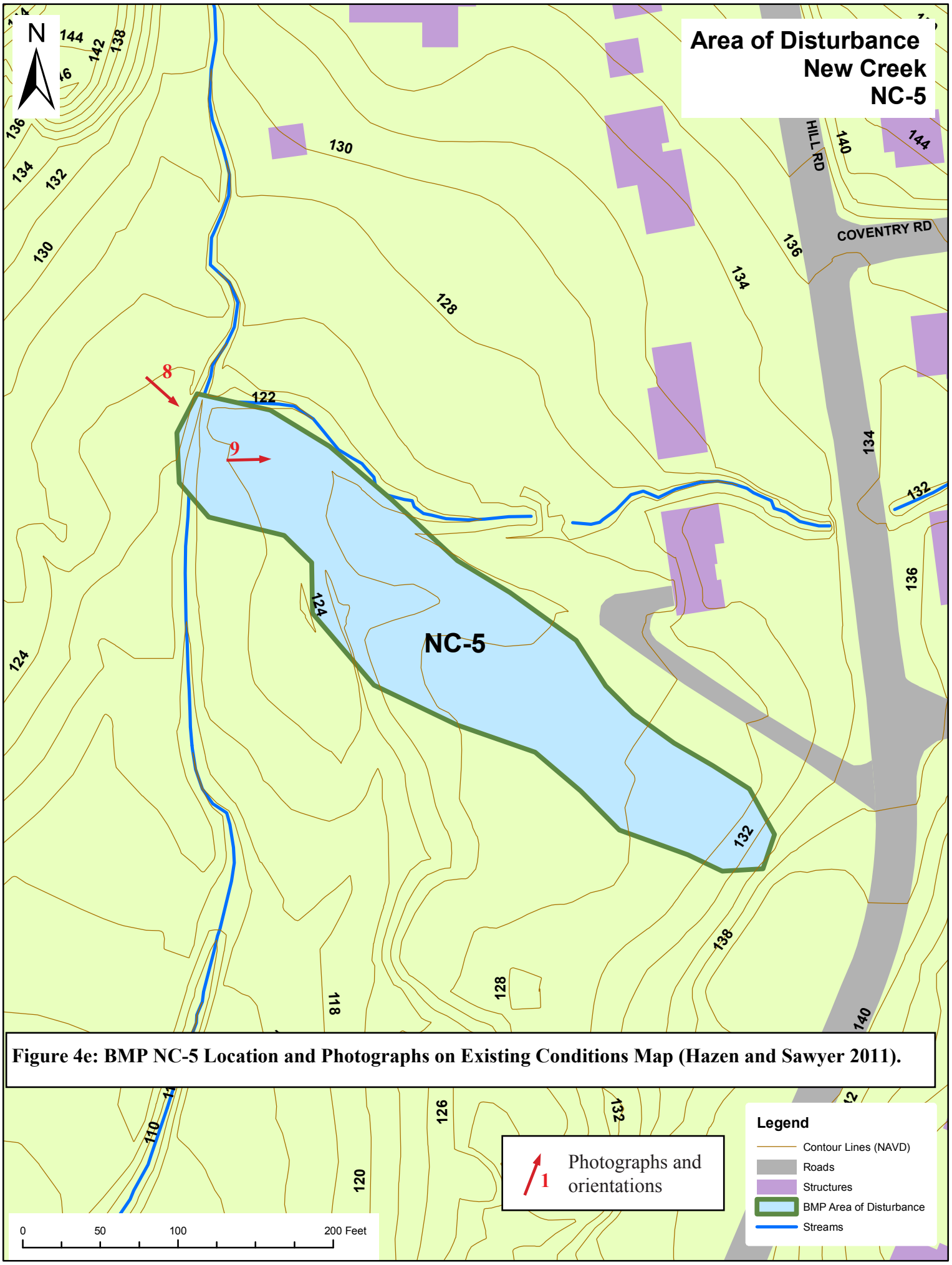


Figure 4e: BMP NC-5 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

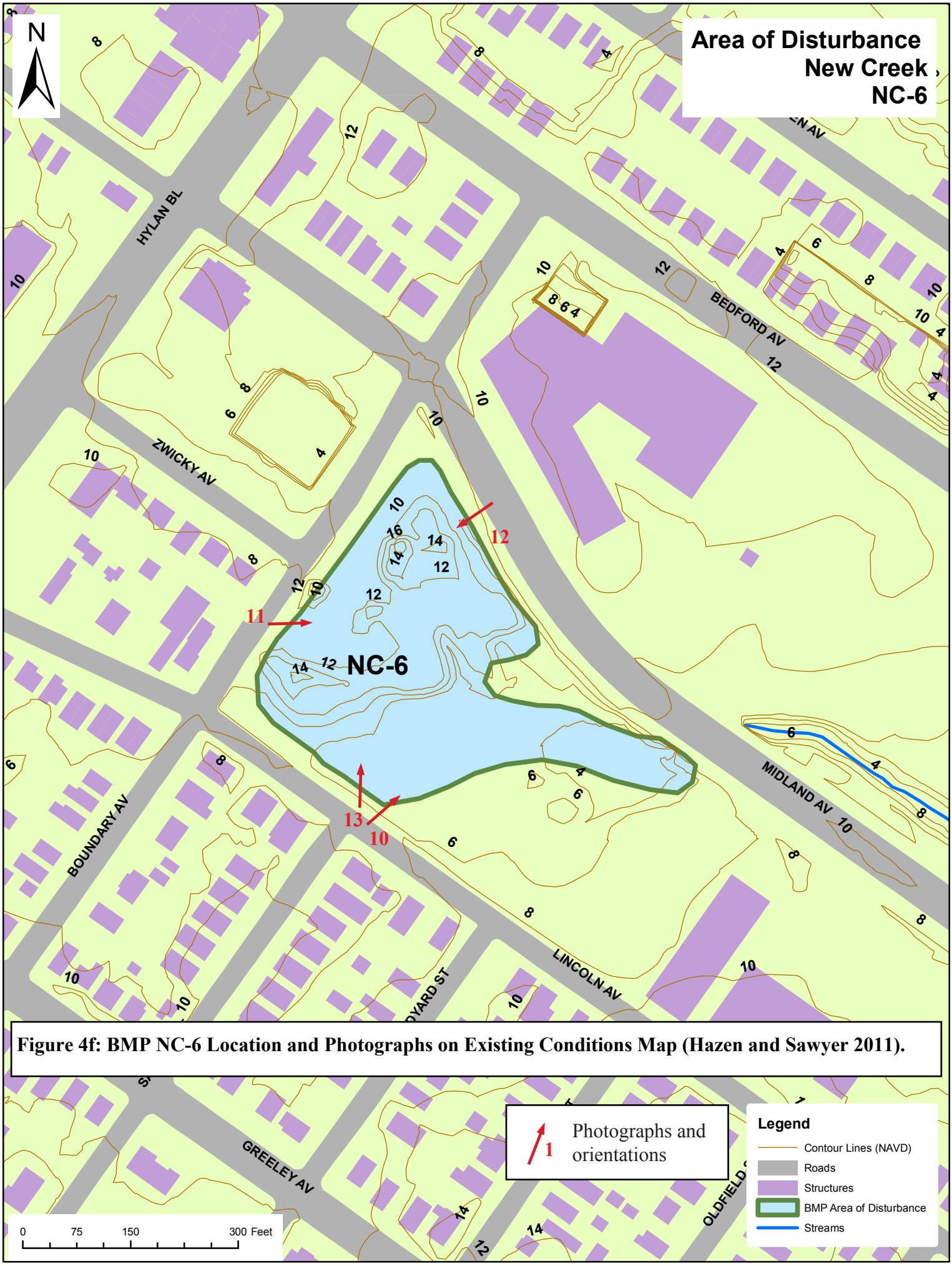


Figure 4f: BMP NC-6 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

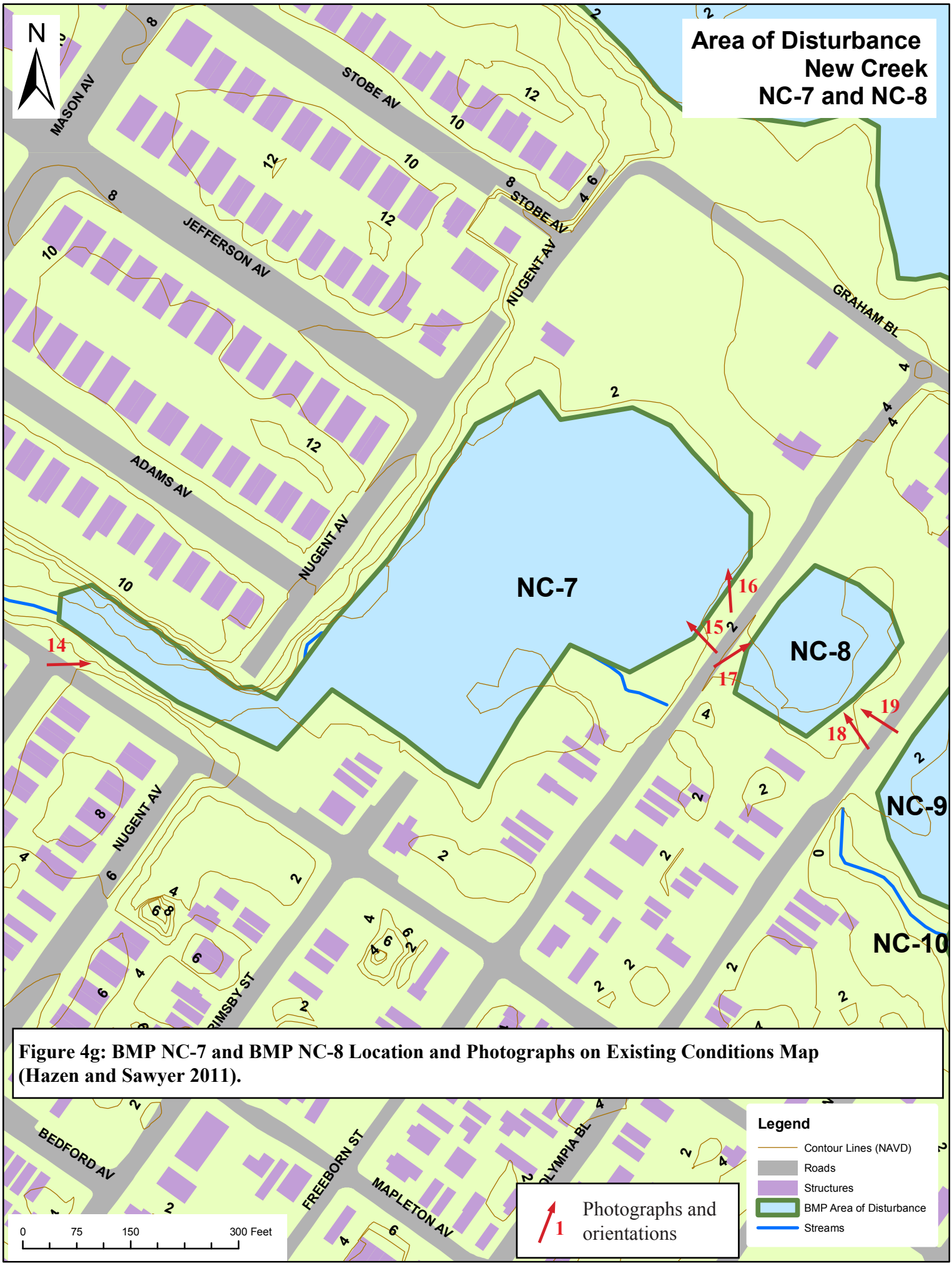


Figure 4g: BMP NC-7 and BMP NC-8 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

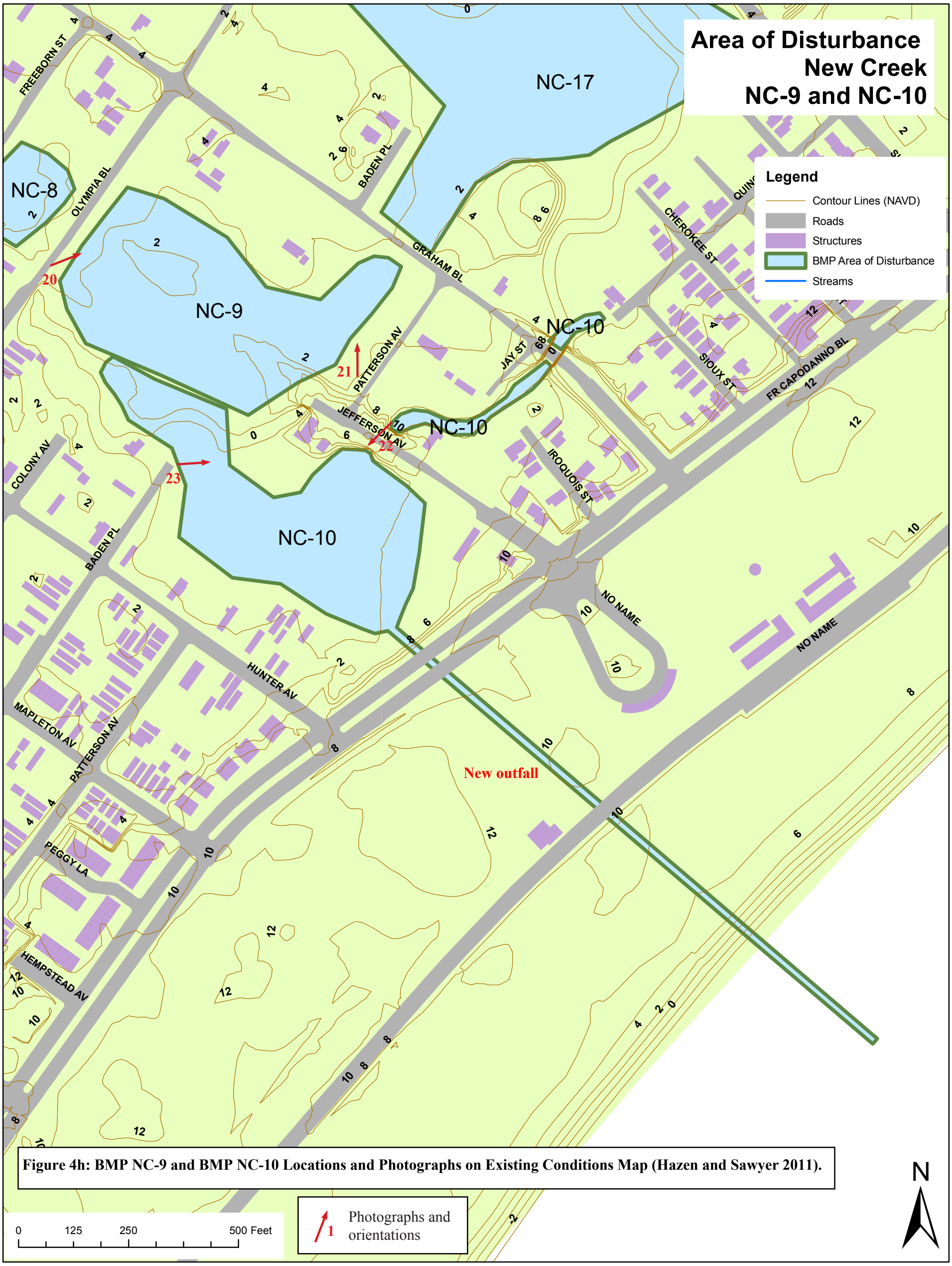


Figure 4h: BMP NC-9 and BMP NC-10 Locations and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

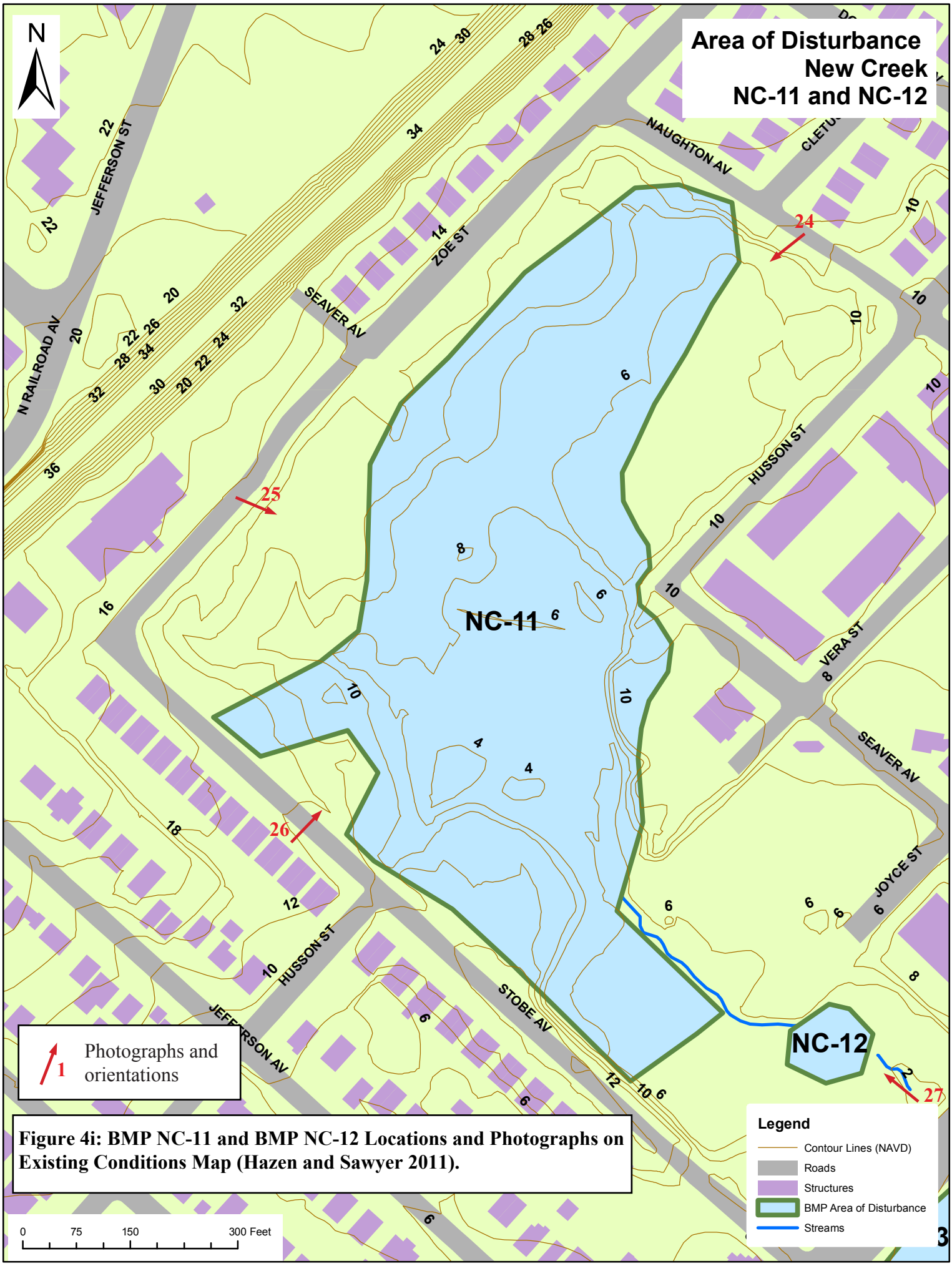


Figure 4i: BMP NC-11 and BMP NC-12 Locations and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

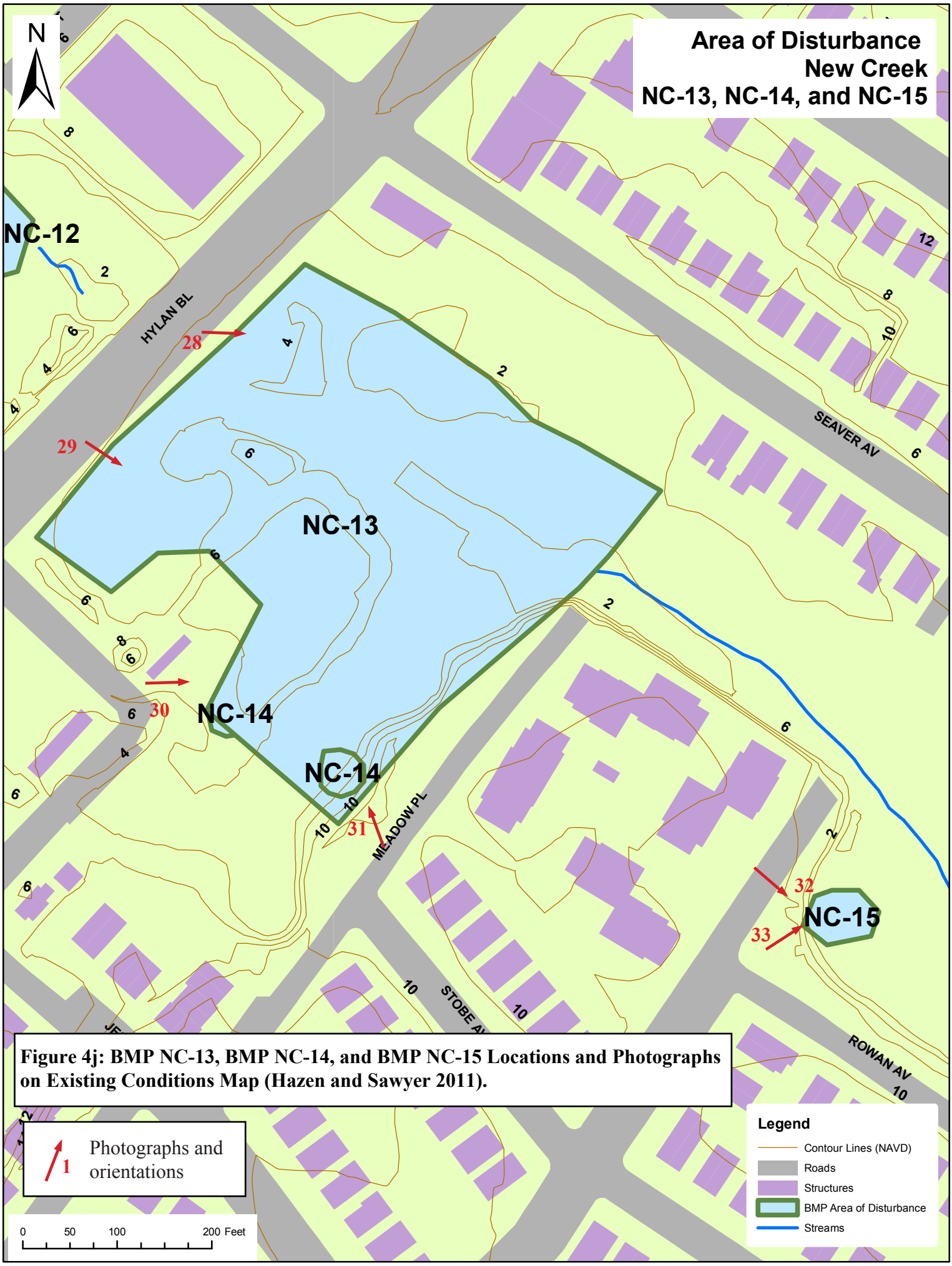


Figure 4j: BMP NC-13, BMP NC-14, and BMP NC-15 Locations and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

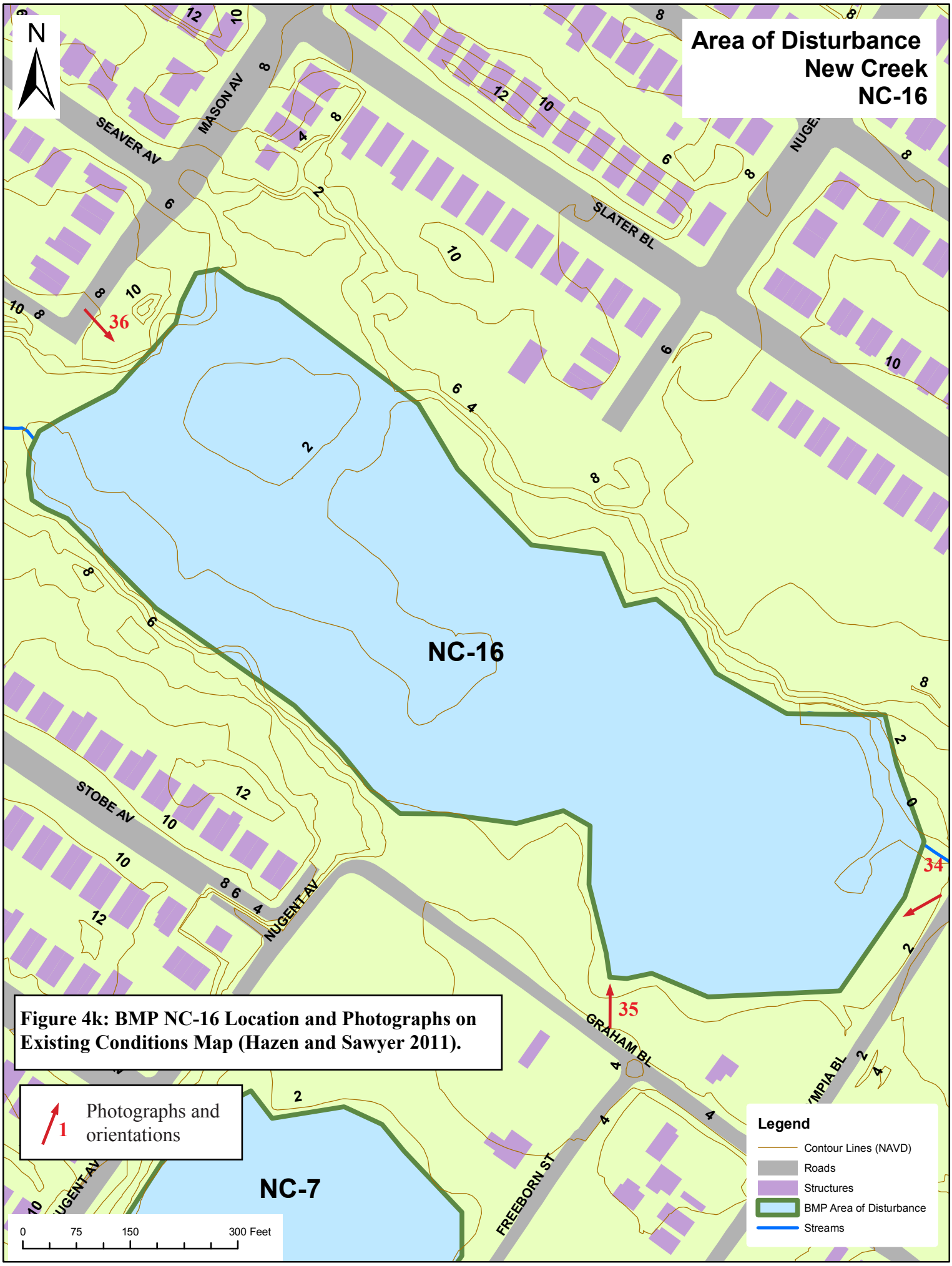


Figure 4k: BMP NC-16 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

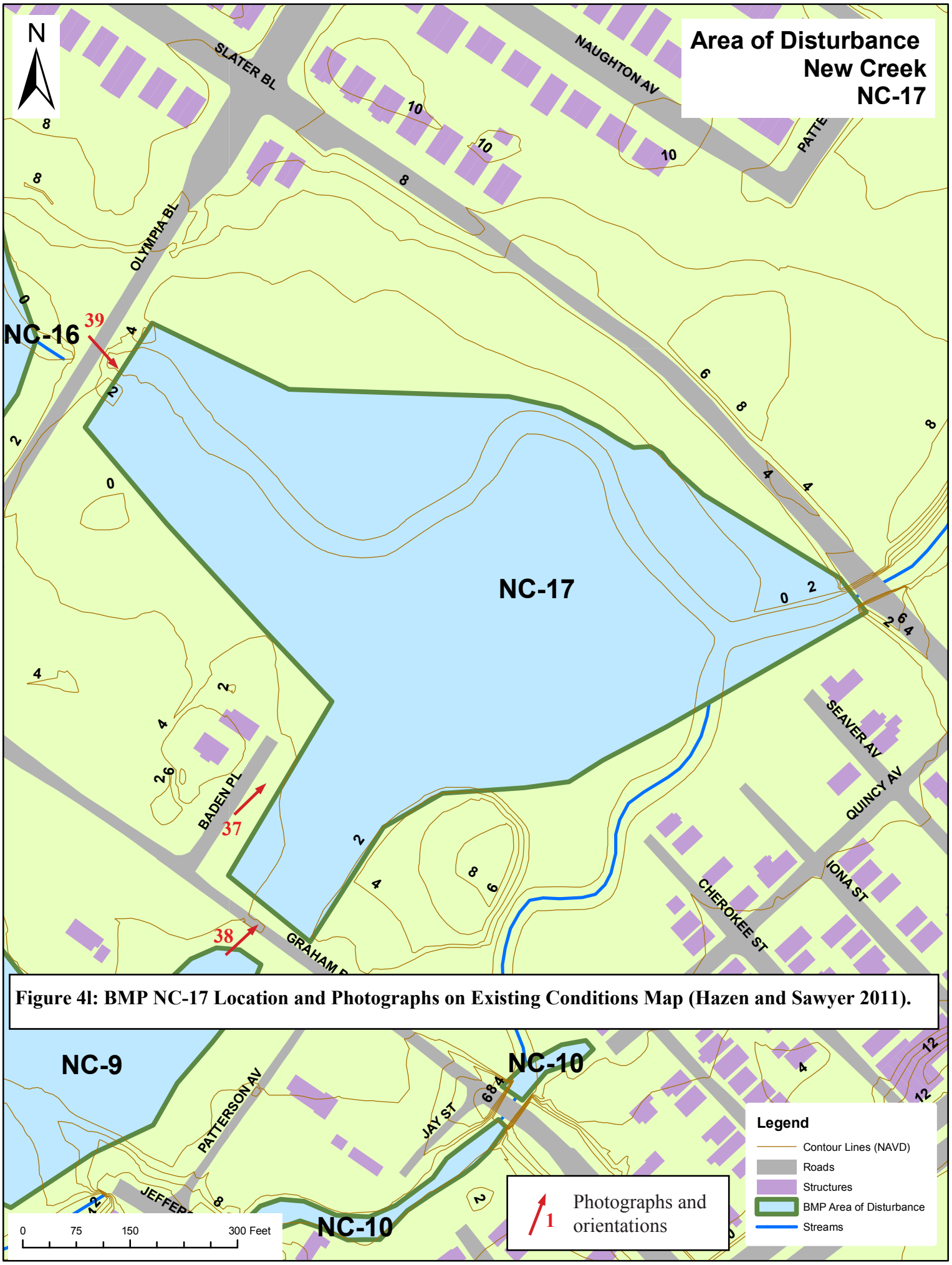


Figure 4l: BMP NC-17 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

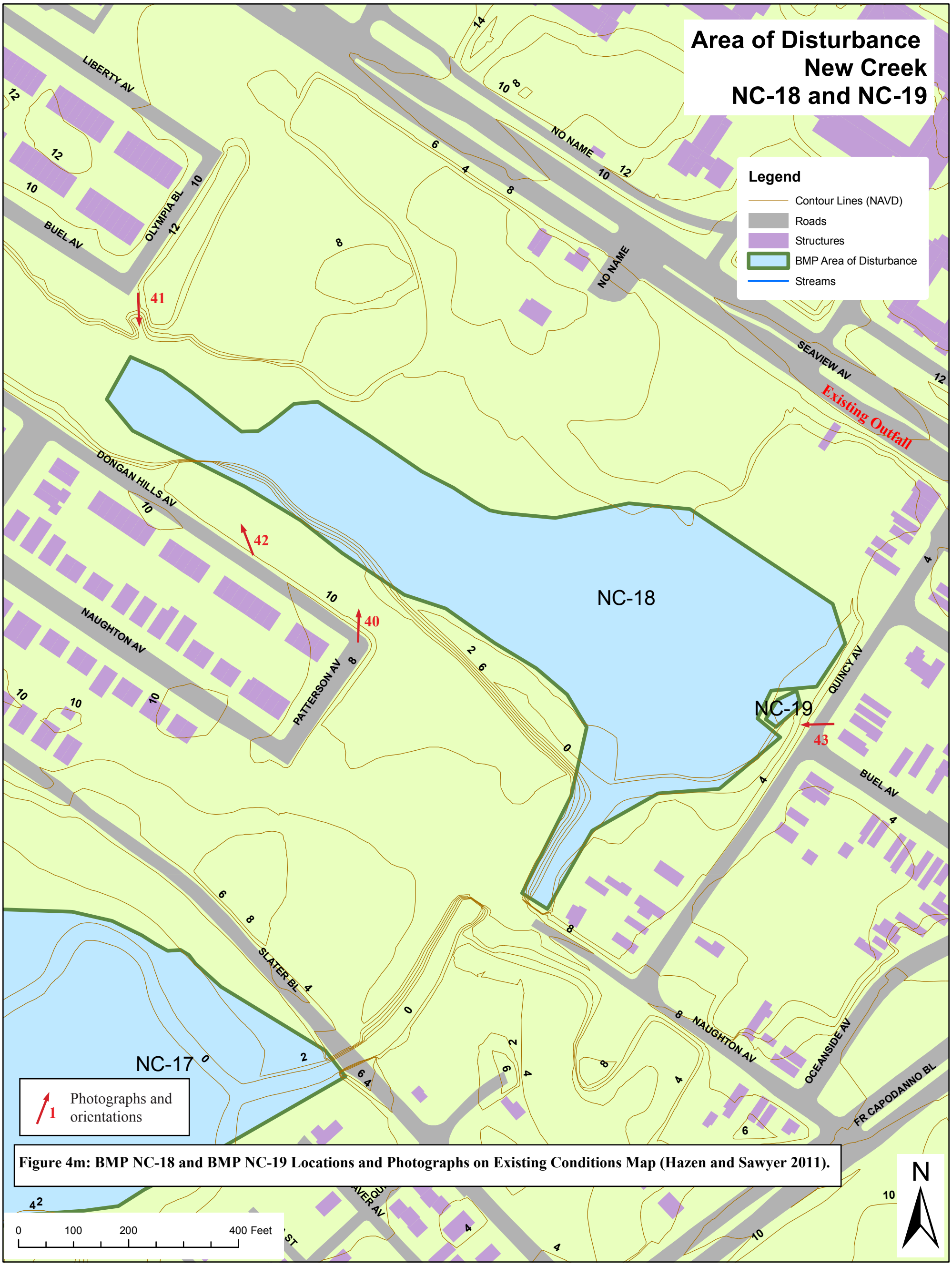


Figure 4m: BMP NC-18 and BMP NC-19 Locations and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

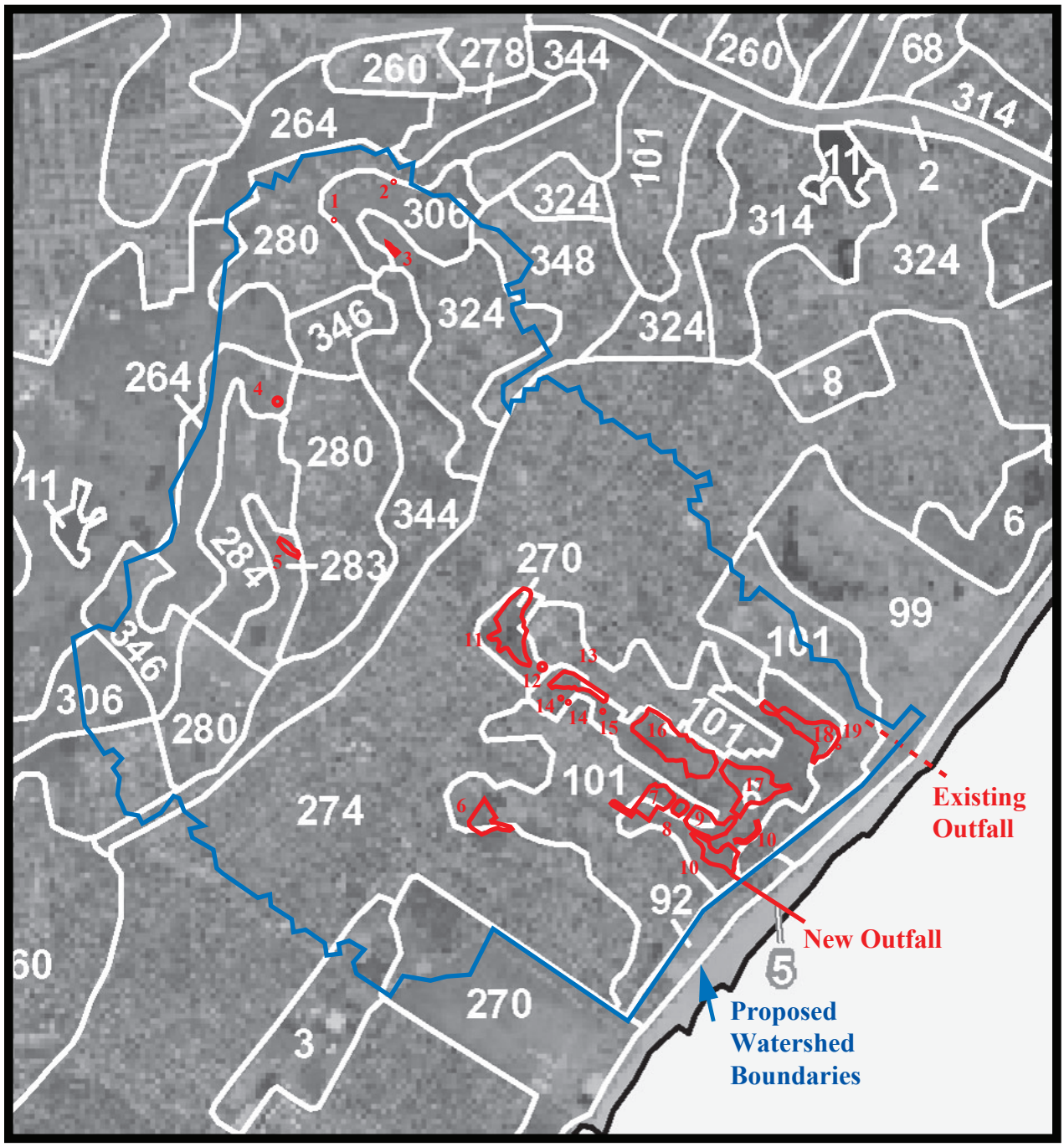


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Figure 5: BMP Locations on *New York City Reconnaissance Soil Survey* (U.S.D.A. 2006).

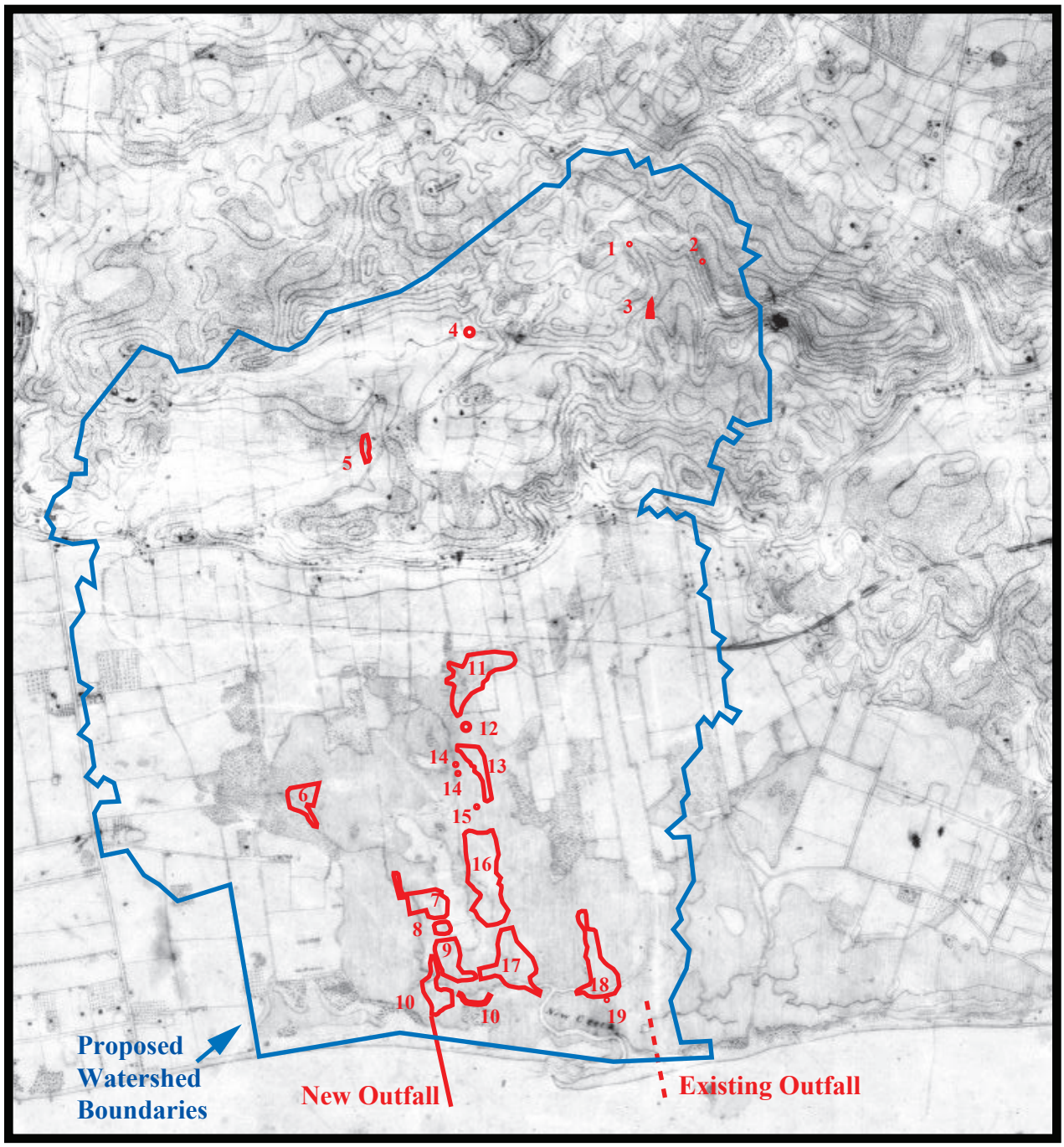

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Figure 6: New Creek Watershed and BMP Locations on *Staten Island From New Brighton to Great Kills* (U.S.C.S. 1856).

0 1000 2000 3000 4000 5000 FEET

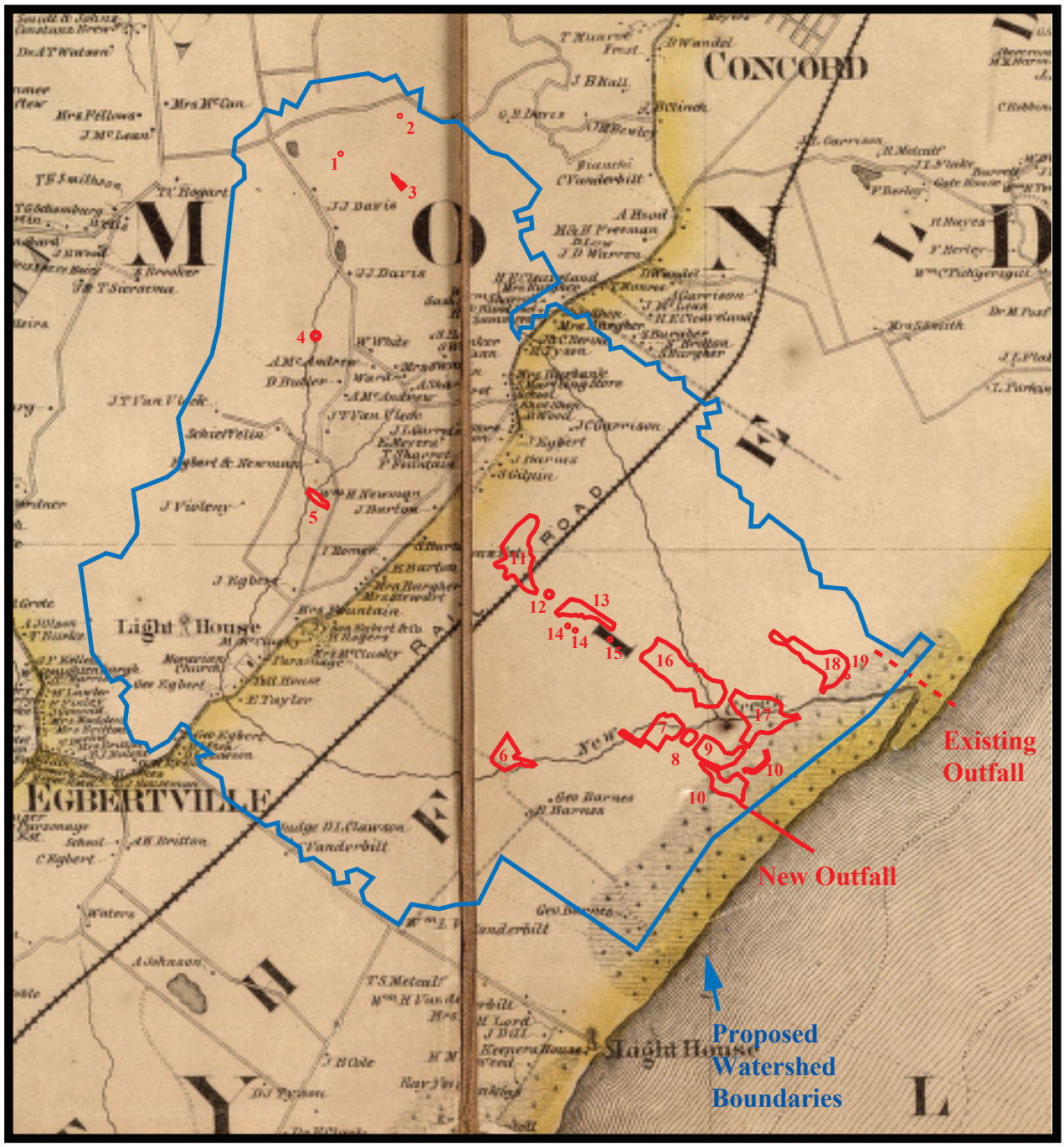

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Figure 7: New Creek Watershed and BMP Locations on *Map of the City Of New-York and Its Environs from Actual Surveys* (Walling 1860). [Note that railroad tracks are mapped too far to the southeast].

0 1000 2000 3000 4000 5000 FEET

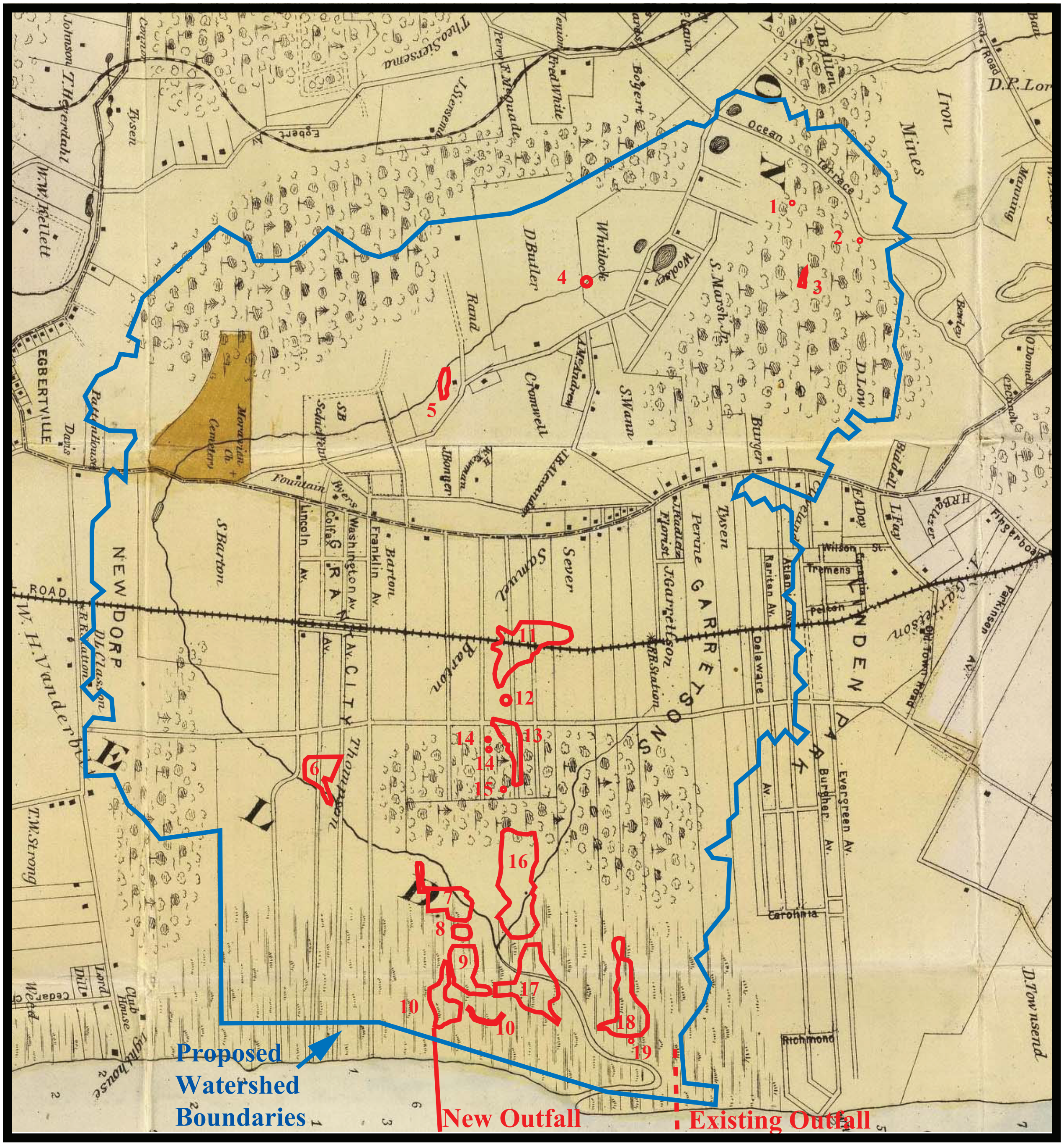

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Figure 8: New Creek Watershed and BMP Locations on *Map of Staten Island, Richmond County, New York* (Dripps 1872). [Note that railroad tracks are mapped too far to the southeast].

0 1000 2000 3000 4000 5000 FEET

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Figure 9: New Creek Watershed and BMP Locations on *Atlas of the Metropolitan District and adjacent country...* (Bien and Vermeule 1891).

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Figure 10a: BMP NC-1, BMP NC-2 and BMP NC-3 on *Borough of Richmond Topographical Survey*, Sheets 31, 32, 39, and 40 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

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Figure 10b: BMP NC-4 on *Borough of Richmond Topographical Survey*, Sheet 39 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

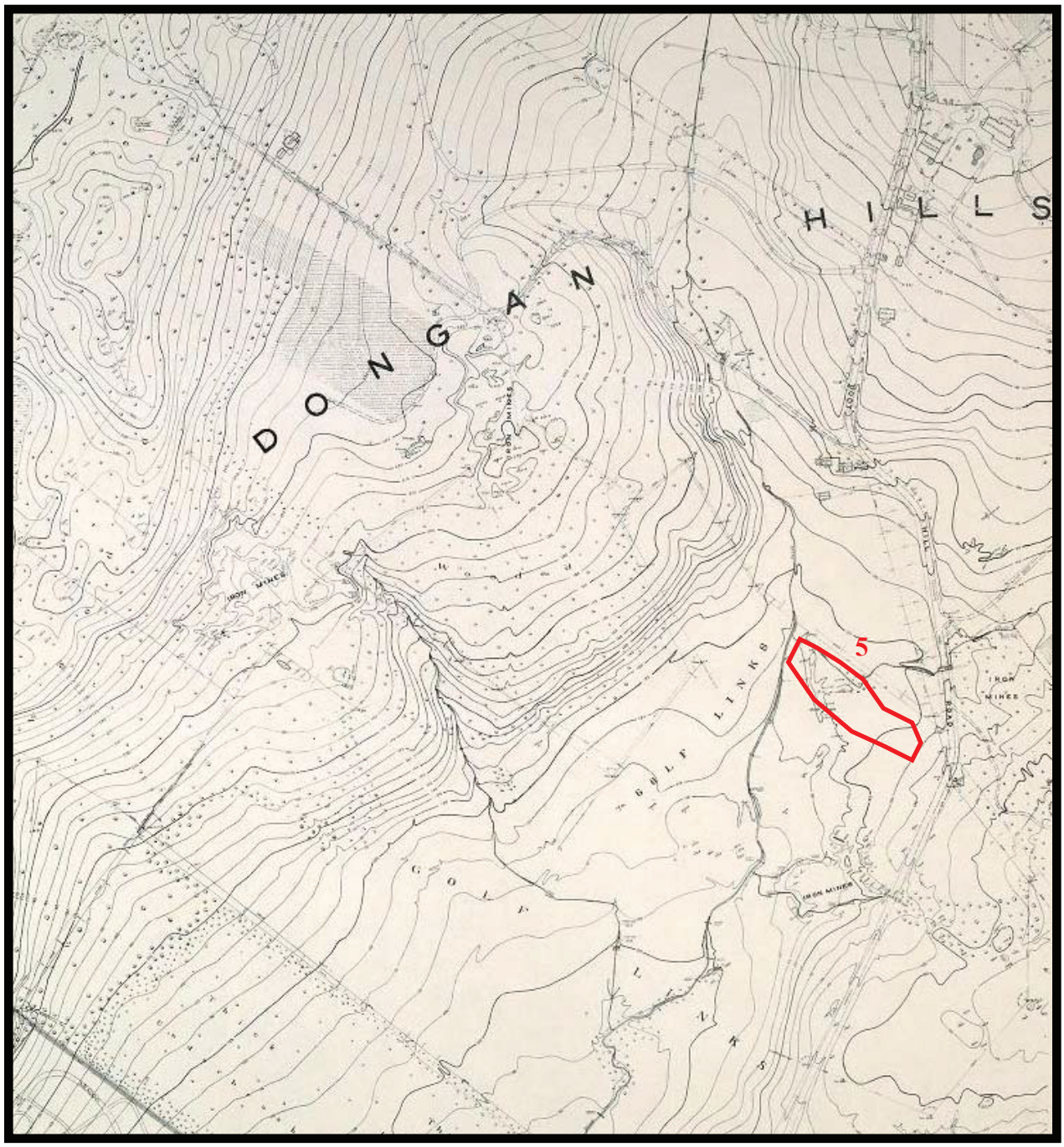

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Figure 10c: BMP NC-5 on *Borough of Richmond Topographical Survey*, Sheet 47 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

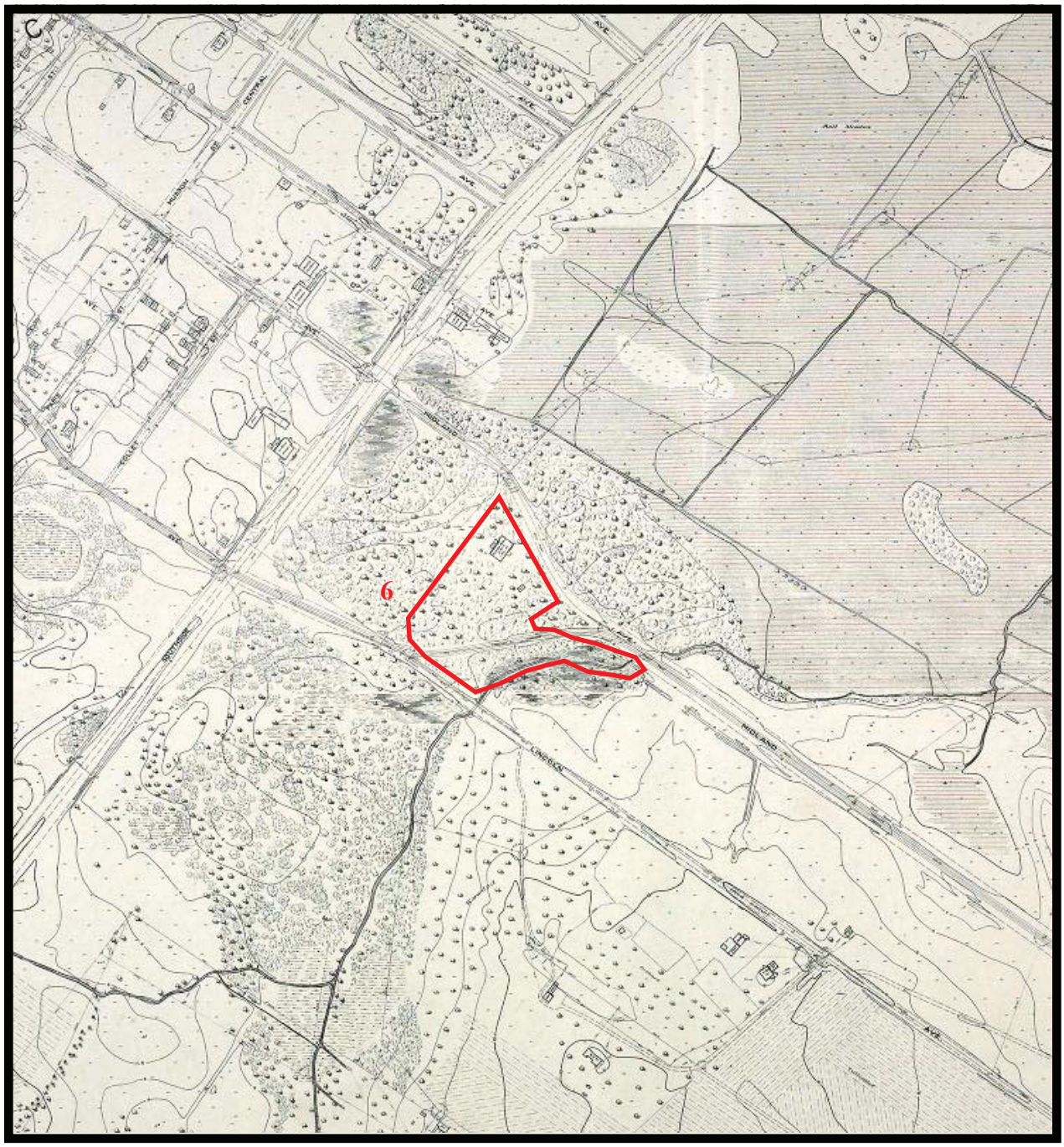

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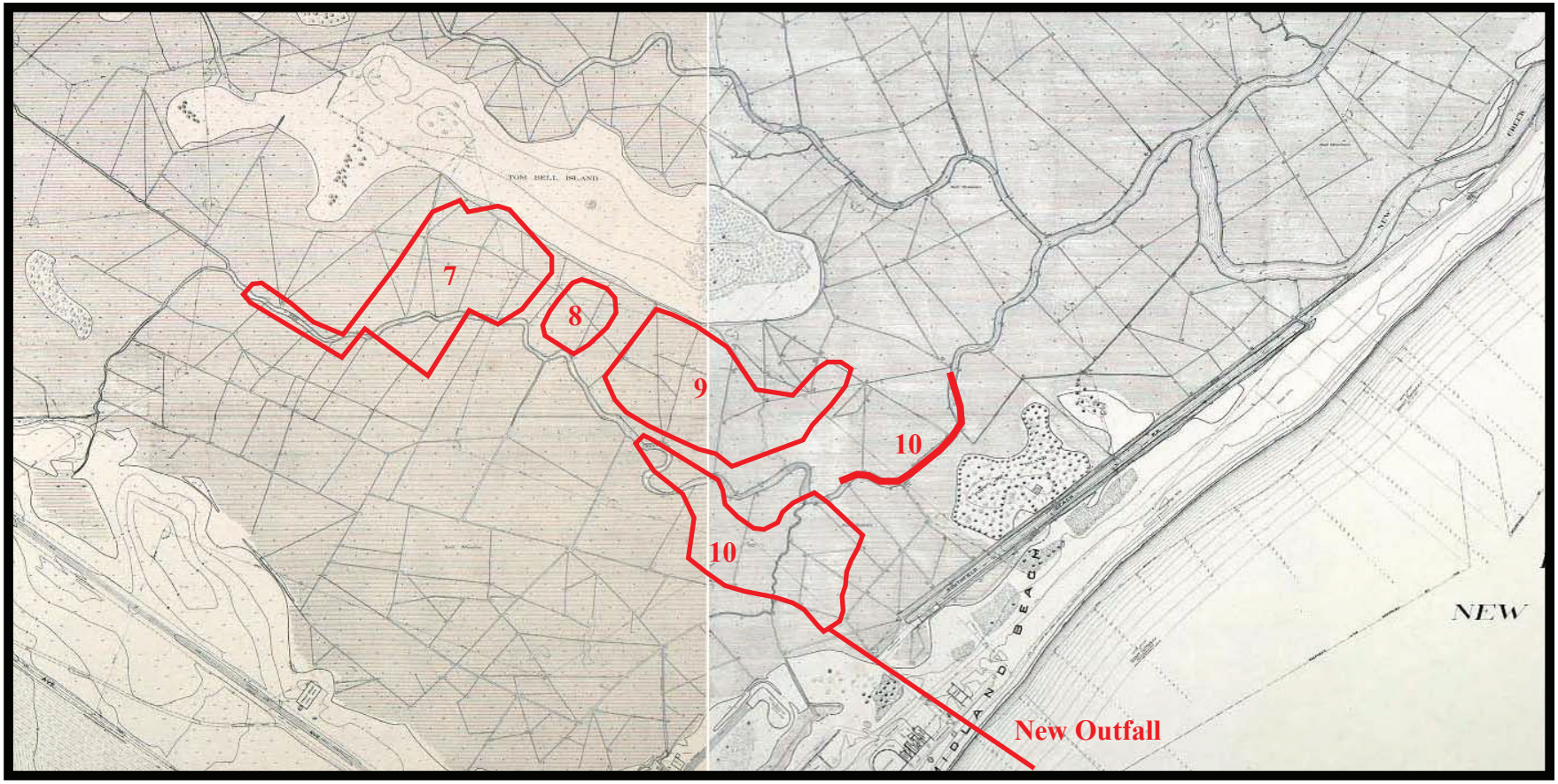
Figure 10d: BMP NC-6 on *Borough of Richmond Topographical Survey*, Sheet 56 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET



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HP

Figure 10e: BMP NC-7, BMP NC-8, BMP NC-9, and BMP NC-10 on *Borough of Richmond Topographical Survey*, Sheets 56 and 57 (Borough of Richmond 1911).

0 500 1000 1500 2000 2500 FEET

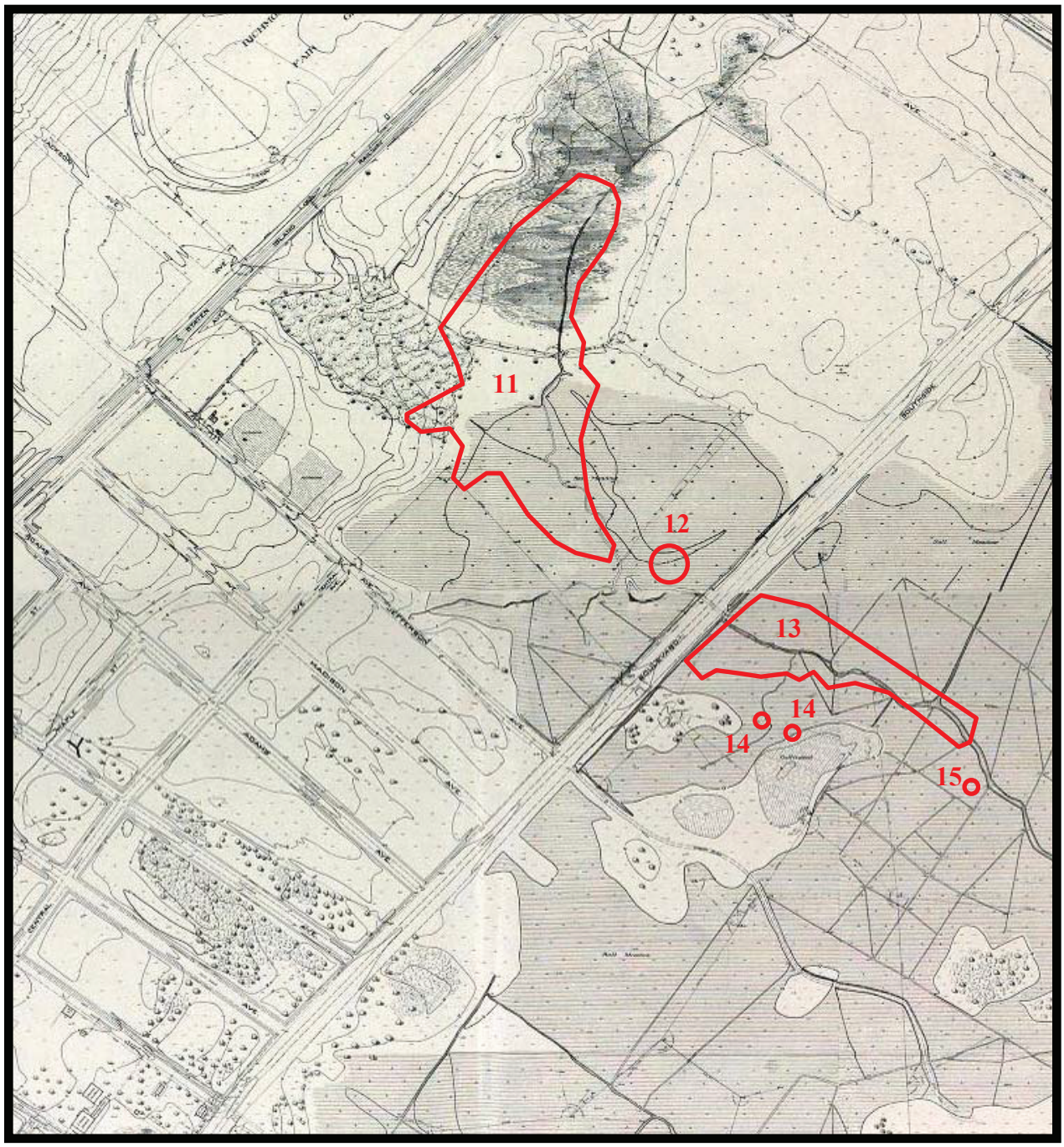

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Figure 10f: BMP NC-11, BMP NC-12, BMP-NC 13, BMP NC-14, and BMP NC-15 on *Borough of Richmond Topographical Survey*, Sheets 48 and 56 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

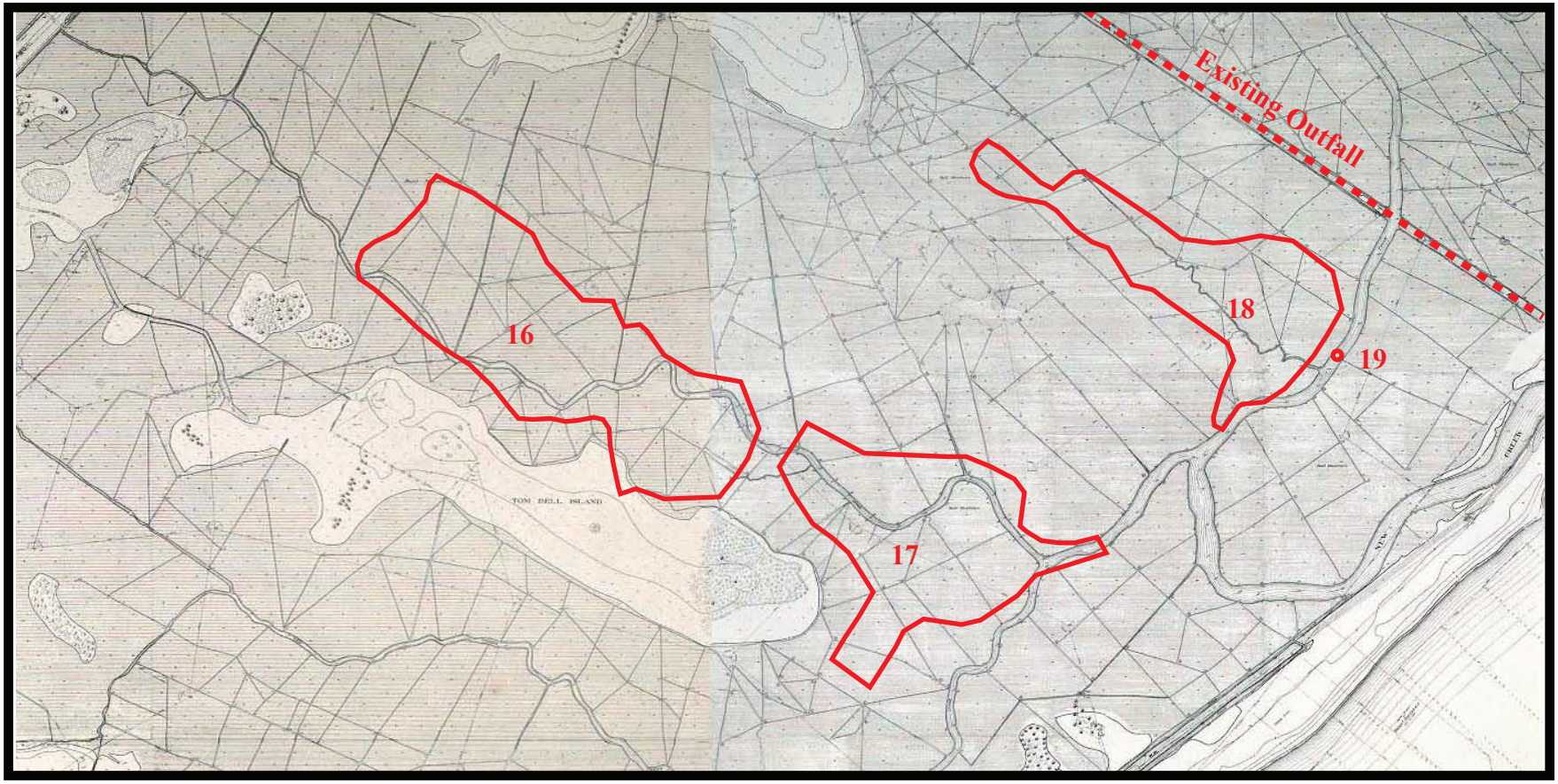

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Figure 10g: BMP NC-16, BMP NC-17, BMP NC-18, and BMP NC-19 on *Borough of Richmond Topographical Survey*, Sheets 56 and 57 (Borough of Richmond 1911).

0 500 1000 1500 2000 2500 FEET

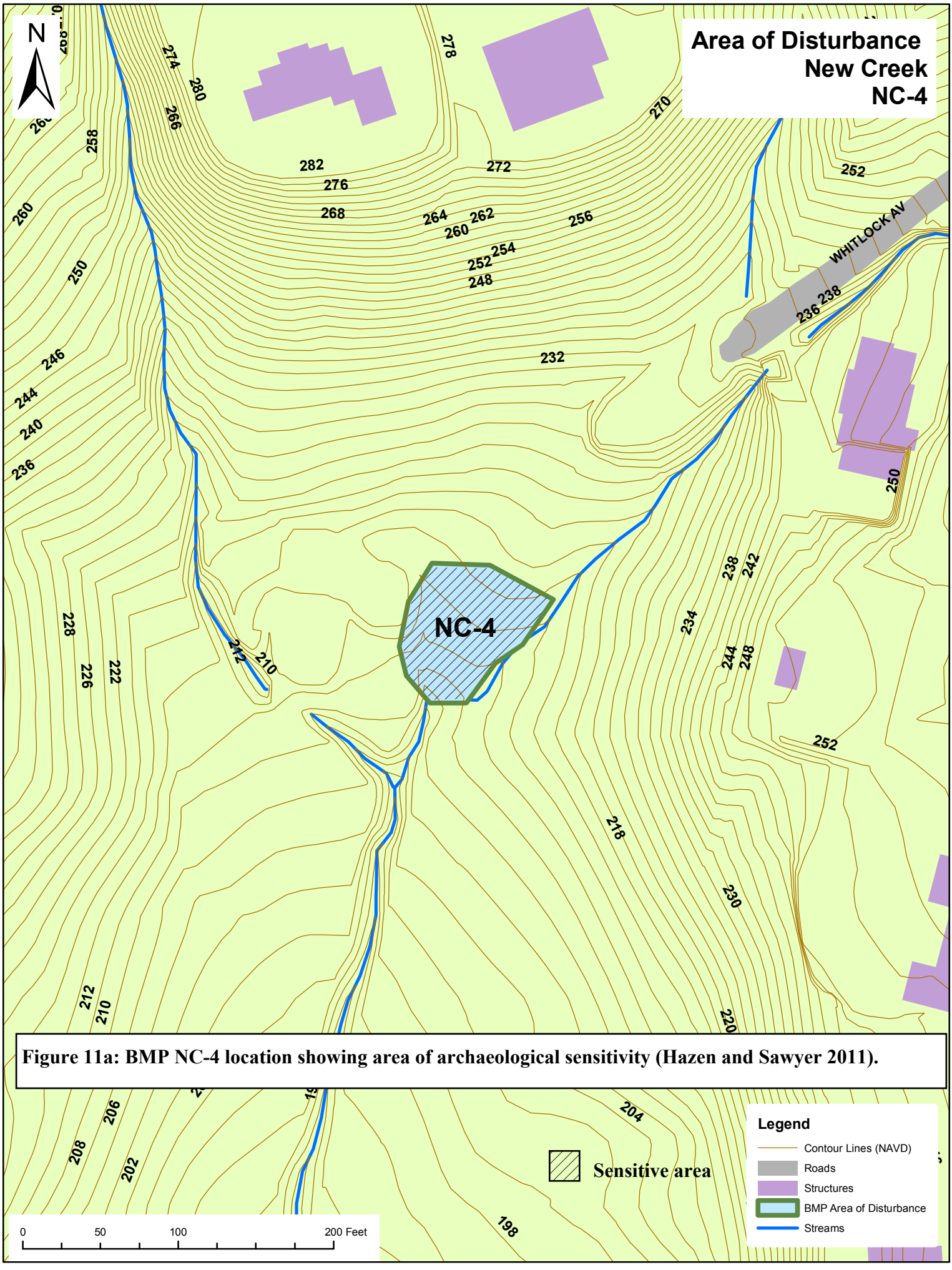


Figure 11a: BMP NC-4 location showing area of archaeological sensitivity (Hazen and Sawyer 2011).

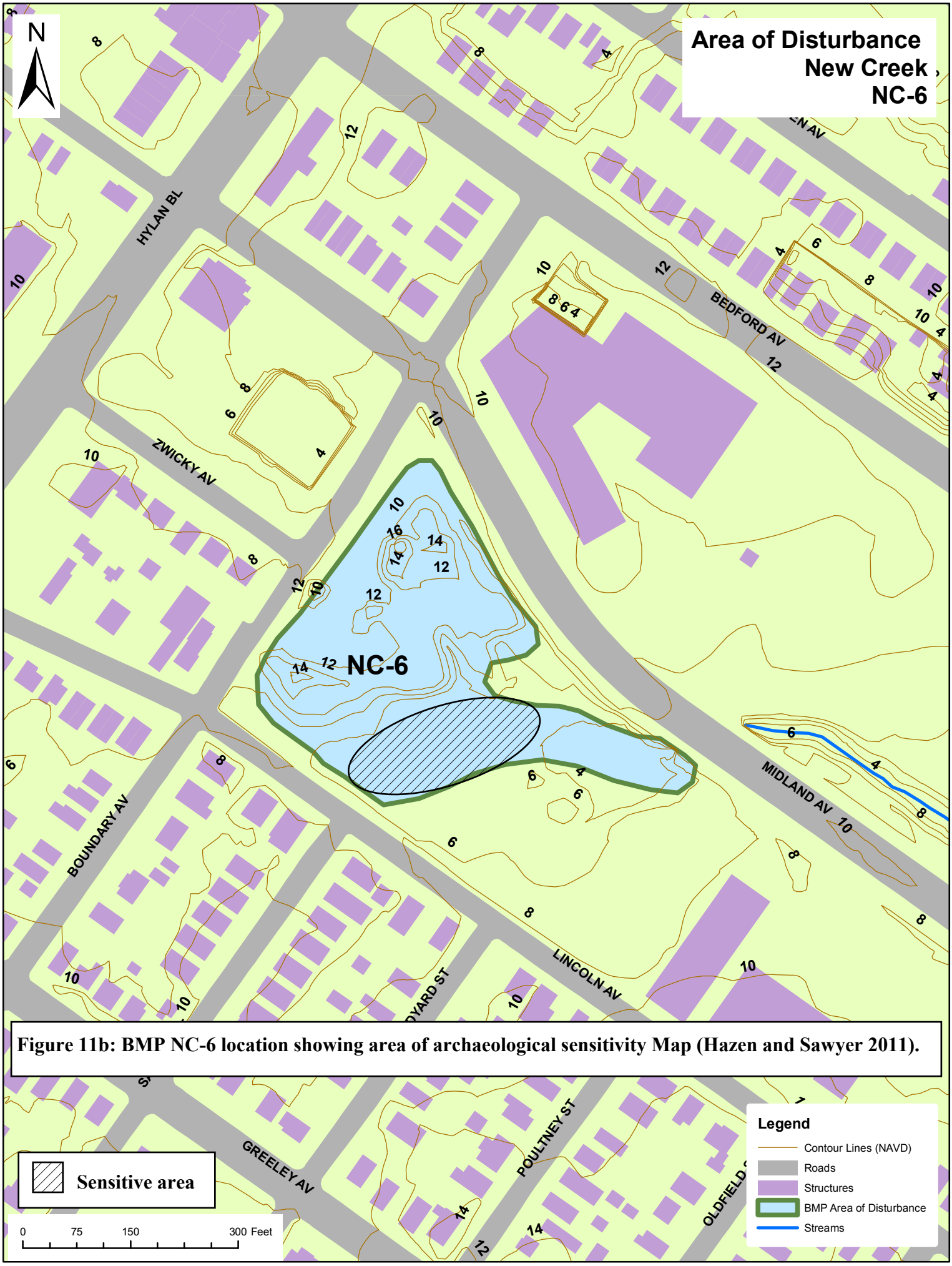


Figure 11b: BMP NC-6 location showing area of archaeological sensitivity Map (Hazen and Sawyer 2011).

Photograph 1: NC-1, end of Merrick Avenue, view to the east.


Photograph 2: NC-1, downslope, view to the northeast (note rock deposit, slope and concrete cover for drainage).

Photograph 3: NC-2, drainage channel which leads behind 440 Ocean Terrace, view to the south.

Photograph 4: NC-3, from Annfield Court, view to the southeast.

Photograph 5: NC-3, from Annfield Court, view to the east (note terrace in background).

Photograph 6: NC-4, from golf course tee, view to the south.

Photograph 7: NC-4, from woods at end of Whitlock Avenue, view to the southeast.

Photograph 8: NC-5, confluence of streams with bridge, view to the southeast.

Photograph 9: NC-5, from golf course cart path, view to the east.

Photograph 10: NC-6, stream bed from Lincoln Avenue, view to the northeast.

Photograph 11: NC-6, mounding from Boundary Avenue, view to the east.

Photograph 12: NC-6, mounding from Midland Avenue, view to the southwest.

Photograph 13: NC-6, area adjacent to stream from Lincoln Avenue, view to the north.

Photograph 14: NC-7, the stream from Hunter Avenue, view to the east.

Photograph 15: NC-7, from Freeborn Street, view to the northwest.

Photograph 16: NC-7, from Freeborn Street, view to the north.

Photograph 17: NC-8, from Freeborn Street, view to the northeast.

Photograph 18: NC-8, from Olympia Boulevard, view to the northwest.

Photograph 19: NC-8, from Olympia Boulevard.

Photograph 20: NC-9, from Olympia Boulevard, view to the northeast.

Photograph 21: NC-9, from Patterson Avenue, view to the north.

Photograph 22: NC-10, from Jefferson Avenue, view to the southwest.

Photograph 23: NC-10, from Baden Place, view to the east.

Photograph 24: NC-11, from Naughton Avenue, view to the southwest (note area beyond siltation fence).

Photograph 25: NC-11, from Zoe Street, view to the southeast.

Photograph 26: NC-11, from Stobe Avenue, view to the northeast.

Photograph 27: NC-12, from Hylan Boulevard, view to the northwest.

Photograph 28: NC-13, from Hylan Boulevard, view to the east.

Photograph 29: NC-13, from Hylan Boulevard, view to the southeast.

Photograph 30: NC-14, corner of Stobe Avenue and Boundary Avenue, view to the east.

Photograph 31: NC-14, Meadow Place, view to the northwest (note unnatural bank and concrete/asphalt).

Photograph 32: NC-15, wetlands depression, view to the southeast.

Photograph 33: NC-15, wetlands depression bank, view to the northeast (note debris).

Photograph 34: NC-16, from Olympia Boulevard, view to the southwest.

Photograph 35: NC-16, from Graham Boulevard, view to the north.

Photograph 36: NC-16, from Mason Avenue, view to the southeast.

Photograph 37: NC-17, from Baden Place, view to the northeast.

Photograph 38: NC-17, from Graham Boulevard, view to the northeast.

Photograph 39: NC-17, from Olympia Boulevard, view to the southeast.

Photograph 40: NC-18, from Dongan Hills Avenue, view to the northwest.

Photograph 41: NC-18, from Buel Avenue and Olympia Boulevard, view to the south.

Photograph 42: NC-18, from Dongan Hills Avenue, view to the north.


Photograph 43: NC-19, view to the west (note unnatural mounding against bank/roadbed).

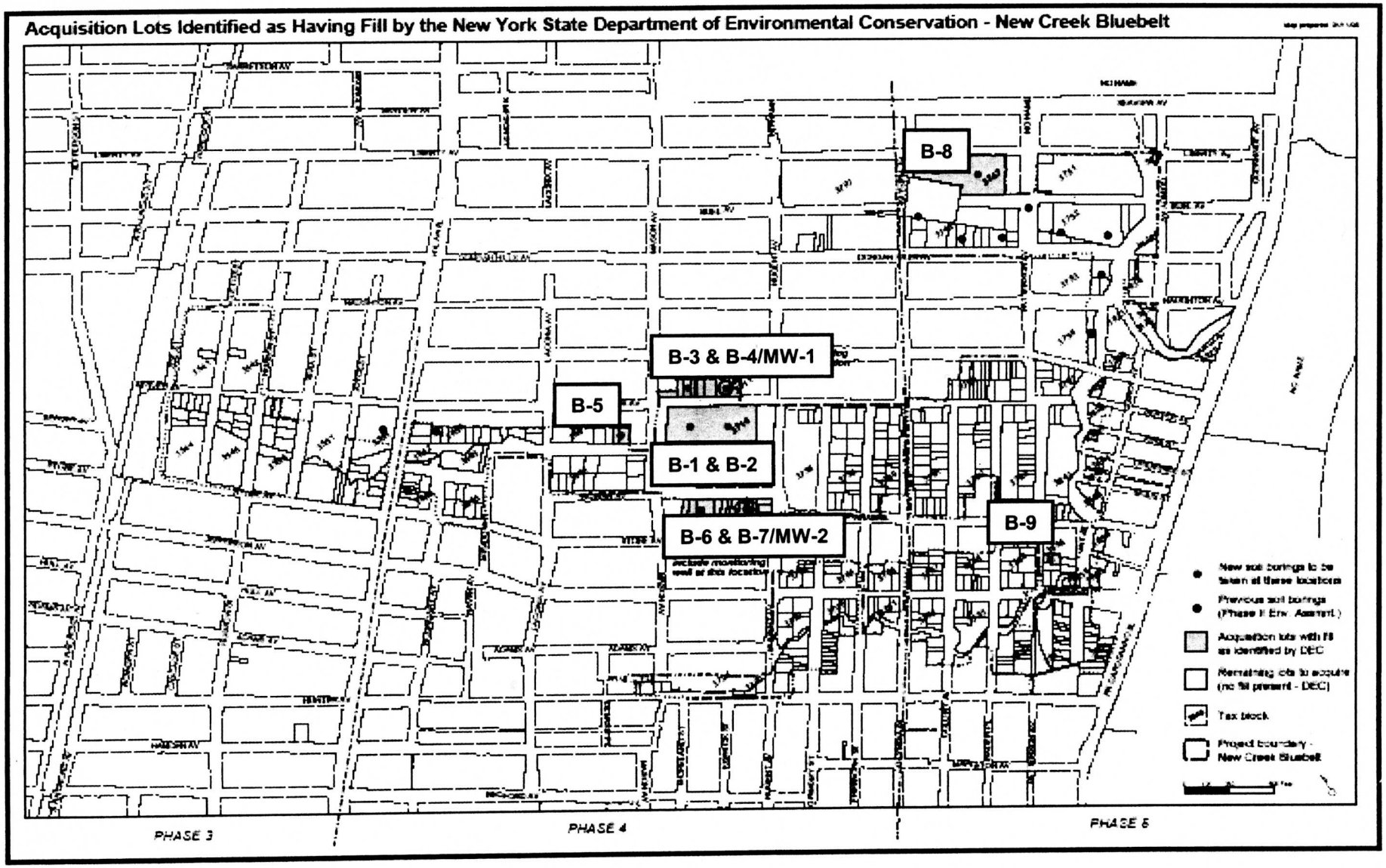
Appendix A: Block and Lot Data

BMP	Block	Lots
NC-1	864	100
NC-2	863	175
NC-3	878	200
NC-4	905	1
NC-4	908	16
NC-5	900	40
NC-6	3696	1, 30, 35
NC-7	3721	99
NC-7	3722	1, 4
NC-7	3723	3, 4, 10, 13, 22, 23, 25, 31, 33, 35, 36, 45, 48, 52, 56
NC-7	3764	1, 4, 8, 38,, 39, 40
NC-7	3765	1, 4, 6, 7, 11, 13, 37, 38
NC-7	3790	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 31, 33, 35, 37, 38, 42, 45
NC-8	3766	1, 3, 5, 8, 11, 36
NC-8	3791	22, 31, 33, 34, 37
NC-9	3767	1, 3, 5, 11, 13, 14, 31, 33, 35, 37
NC-9	3768	1, 3, 4, 5, 6, 8, 11, 13, 14, 32, 34, 36
NC-9	3769	1, 4, 8, 11, 14, 19, 22, 23, 26, 29, 31, 34
NC-9	3792	27, 29, 31, 33, 37, 41, 44
NC-9	3793	29, 31, 33, 34, 35
NC-9	3794	31, 33
NC-10	3792	47
NC-10	3793	27, 28, 47
NC-10	3794	5, 6, 16, 19, 20, 21, 28, 30, 53, 56, 57, 58, 59, 60, 61
NC-10	3842	27, 35, 37
NC-10	3846	1, 5
NC-10	3856	5, 7, 16, 19, 23, 25, 28
NC-10	3859	1
NC-10	3860	31
NC-10	3861	1, 2, 14, 19, 24, 25, 27, 29, 31, 32, 33, 35, 36, 37, 39, 41, 42
NC-10	3864	12, 13, 14, 15, 16, 17, 18, 100, 103, 105, 107, 108, 110, 111
NC-11	3541	1, 3, 7, 12, 14, 16, 18, 19, 26, 32, 36, 39, 42, 44
NC-11	3542	1, 3, 6, 9, 12, 17, 19, 22, 26
NC-11	3544	1, 25, 26, 30, 32, 34, 36, 38, 41, 43
NC-11	3545	1, 26, 29, 30, 33, 38, 41, 43, 45
NC-11	3550	1, 11, 15, 21, 26, 30, 32, 33, 42, 45, 48, 54
NC-11	3551	15
NC-12	3551	6, 8, 12, 14, 112, 113, 115, 116
NC-13	3658	1, 3, 34, 45, 47, 56, 58, 61, 64, 66, 68, 73, 75
NC-13	3661	1
NC-13	3662	1, 3
NC-13	3663	1, 11
NC-13	3664	4, 5, 6, 7, 8, 10
NC-13	3665	1, 6, 12, 20, 22, 25
NC-13	3680	24, 27, 29, 31, 35, 40
NC-16	3714	1, 34
NC-16	3715	1, 5, 6, 9, 12, 16, 20, 22, 25, 28, 31, 34, 37, 39, 41, 45, 53, 56
NC-16	3716	32, 33, 34, 36, 37
NC-16	3758	1, 3, 5, 8, 10, 12, 14, 16, 20, 23, 25, 26, 28, 29, 34, 35, 36, 37, 39, 44, 48, 50, 53, 56, 59
NC-16	3759	1, 3, 8, 11, 15, 20, 23, 25, 28, 30, 33, 34, 37, 39, 42, 45, 48, 53, 58

BMP	Block	Lots
NC-16	3760	1, 5, 9, 13, 18, 19, 20, 21, 25, 27, 36, 40, 42, 44, 46, 48, 50, 56, 58
NC-17	3755	30, 31, 33, 35, 36, 37, 38, 42, 44, 47, 51, 53, 54, 55, 56, 57, 58, 61
NC-17	3757	1, 2, 4, 11, 13, 20, 21, 26
NC-17	3761	1, 3, 4, 9, 11, 17, 19, 21, 51, 54, 56, 57, 59
NC-17	3762	1, 6, 8, 10, 12, 13, 15, 17, 23, 45, 60
NC-17	3763	1, 4, 7, 10, 12, 14, 17, 19, 20, 22, 23, 24, 27, 32, 34, 35, 37, 39, 42
NC-17	3825	1, 4
NC-17	3826	4
NC-17	3842	1, 3, 5, 8
NC-18	3748	1, 6, 10, 20, 35, 43, 48, 53, 55, 57, 60, 62, 65
NC-18	3751	1, 2
NC-18	3752	1, 4, 13, 33, 35, 67
NC-18	3753	24, 35
NC-18	3835	1

APPENDIX B: SOIL BORINGS

Figure 2 - Location of Soil Borings/Monitor Wells – New Creek Bluebelt



Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt/DDC	JOB NO: 200658.35	BORING NO: B1
LOCATION: About 100 feet East of Mason Ave, South of Seaver Ave. Staten Island, NY	ELEVATION:	DEPTH: 4'
	DATE BEGUN: 2/16/05	DATE FINISHED: 2/16/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: B. Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 2" ø
WEATHER: Overcast, 45°F	DEPTH TO WATER: ± 2.0'	DATE: 2/16/05
COMPLETED AS WELL? No	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	1.8	3-5	Brown F-M Sand and Silt, little Brick and Concrete Fill, trace C-Sand, Gravel and Ash moist (Fill)	0.0	Collect Soil Sample B1-S1 From 1.5-2.0' @ 1150
				8-8		0.0	
	S2	2-4	0.4	3-3		0.0	
				2-4	Brown-Red F-M Sand and Silt, large piece of Gravel in Tip, wet (Fill)	0.0	± 2'
5					Terminate Boring at 4 feet		
10							
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt/DDC	JOB NO: 200658.0035	BORING NO: B2
LOCATION: South of Unbuilt Seaver Ave, Approx 80 Feet South of B4/MW-1 Staten Island, NY	ELEVATION:	DEPTH: 6'
	DATE BEGUN: 2/17/05	DATE FINISHED: 2/17/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 6"
WEATHER: Overcast, Cool 35°F	DEPTH TO WATER: ±4'	DATE: 2/17/05
COMPLETED AS WELL? No	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	0.9	8-6	Brown Silt and F-M Sand, trace Brick and Concrete, Ash, Moist (Fill)	0.0	
				4-5		0.0	
	S2	2-4	0.8	14-23	Brown Silt and F-M Sand, Little Concrete, trace Brick and Ash, Moist (Fill)	0.0	Collect Soil Sample B2-S2 from 3.5-4.0' @1230
				6-4		0.0	
5	S3	4-6	0.9	3-2	Brown F-M Sand, Little Silt, Wood, trace Concrete, Wet (Fill)	0.0	
				2-3		0.0	
					Terminate Boring at 6 Feet		
10							
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt/DDC	JOB NO: 200658.0035	BORING NO: B3
LOCATION: 30 Feet East of Mason Ave - Just North of Unbuilt Seaver Ave near Pumping Station, SI, NY	ELEVATION:	DEPTH: 4'
	DATE BEGUN: 2/16/05	DATE FINISHED: 2/16/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 2 1/4
WEATHER: Overcast 45°F	DEPTH TO WATER: 2'	DATE: 2/16/05
COMPLETED AS WELL? No	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	1.3	3-3	Brown F M Sand, Some Silt, Organics, trace Ash, Brick and Concrete, moist (Fill)	0.0	
				3-3		0.0	
	S2	2-4	0.3	2-2		0.0	▼ ± 2'
				2-2	Brown F-Sand and Silt, little M-Sand and Ash, wet (Fill)	0.0	Collect Soil Sample B3-S1 From 1.5-2.0' @ 1120
5					Terminate Boring at 9 Feet		
10							
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt / DDC	JOB NO: 200658.0035	BORING NO: B4 / MW-1
LOCATION: North of unbuilt Seaver Ave, West of Nugent Ave - Bet. 5th + 6th House fronting Slater Ave SI, NY	ELEVATION:	DEPTH: 10'
	DATE BEGUN: 2/16/05	DATE FINISHED: 2/17/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 6" ø
WEATHER: Overcast - Cool 35-45°F	DEPTH TO WATER: ±5'	DATE: 2/17/05
COMPLETED AS WELL? Yes	WELL PERMIT NO. NA	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	1.1	4-12	Brown F-M SAND and BRICK + MORTAR, LITTLE SILT, damp (FILL).	0.0	
				10-7		0.0	
	S2	2-4	0.7	8-4	RED-ORANGE SILT, LITTLE CLAY AND F SAND, BRICK AND MORTAR, MOIST (FILL)	0.0	
				3-4		0.0	
5	S3	4-6	NR	8-11	NO RECOVERY - BRICK IN TIP of SPOON		
				9-7			
	S4	6-8	1.4	4-3	TOP 0.4' BROWN-RED F-M SAND, LITTLE BRICK, SILT, TR. PORCELAIN, MOIST (FILL)	0.0	
				2-1	BOTTOM 1.0' PEAT	0.0	
	S5	8-10	NR	3-2	NO RECOVERY - WEATHERED ROCK IN TIP.		
10				3-2			
					TERMINATE BORING AT 10 FEET		
					SET 2" ø PVC MONITORING WELL		
15							
20							

Collect Soil Sample B4 S4 From 6.5-7.0' @ 1350

▼ 17'

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt / DDC	JOB NO: 200658.0035	BORING NO: B5
LOCATION: Approx 125 West of Mason Ave South of Seaver Ave. Staten Island, NY	ELEVATION:	DEPTH: 8'
	DATE BEGUN: 2/16/05	DATE FINISHED: 2/16/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 6" ø
WEATHER: Mostly Cloudy 44°F	DEPTH TO WATER: ±4'	DATE: 2/16/05
COMPLETED AS WELL? NO	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	1.3	5-13	Red Brown F-M SAND, tr. C-SAND, Gravel, Brick, Concrete and Glass, moist (Fill)	0.0	
				24-26		0.0	
	S2	2-4	1.5	35-37	Brown-Black F-C SAND and ASH, trace Brick, moist to wet (Fill)	0.0	Collect Soil Sample B5-S2 From 3.5-4.0' @ 1030
				24-21		0.0	
	S3	4-6	1.1	16-14		0.0	▼ ±4'
5				9-66	Dark Brown F-M SAND, Brick, Ash and Metal, wet (Fill)	0.0	
	S4	6-8	0.3	12-7		0.0	
				6-3	Dark Gray-Brown F-SAND, some Silt, trace M-SAND and F-Gravel, wet (Fill)	0.0	
					Terminate Boring at 8 Feet		
10							
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt/DOC	JOB NO: 200658.0035	BORING NO: B6
LOCATION: In overgrown lot behind 4th + 5th House on Stobe Ave, East of Mason Ave SI, NY	ELEVATION:	DEPTH: 9'
	DATE BEGUN: 2/18/05	DATE FINISHED: 2/18/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 6" ø
WEATHER: Sunny windy 28°F	DEPTH TO WATER: ±7'	DATE: 2/18/05
COMPLETED AS WELL?	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	1.6	8-16	Brown F-M SAND and SILT, some Brick Concrete and Gravel, dry (Fill)	0.0	
				14-12		0.0	
	S2	2-4	1.5	10-7	Brown F-M SAND and SILT, little Concrete and Asphalt, wood in Tip of Spoon, moist (Fill)	0.0	
				6-35		0.0	
						0.0	
5					Drill out past wood to 5 Feet		
	S3	5-7	1.0	15-16	Brown F-M SAND and SILT, little Concrete and Asphalt, wood in Tip of Spoon, wet (Fill)	0.0	Collect Soil Sample B6-S3 From 6.5-7.0 @ 0945
				50/2"		0.0	▼ 7'
	S4	7-9	1.8	2-2	Brown Peat (Pt)	0.0	
				2-2		0.0	
						0.0	
10					Terminate Boring at 9 Feet	0.0	
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt / DDC	JOB NO: 200658.0035	BORING NO: B7 / MW-2
LOCATION: NNW of Corner of Nugent Ave and Graham Blvd Staten Island, NY	ELEVATION:	DEPTH: 10'
	DATE BEGUN: 2/18/05	DATE FINISHED: 2/18/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kinton	
DRILLING RIG: DK 50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 6 ¼
WEATHER: Sunny, Windy 28°F	DEPTH TO WATER: ±7'	DATE: 2/18/05
COMPLETED AS WELL? Yes	WELL PERMIT NO. NA	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	1.6	15-21	Brown F-M SAND and SILT, some Brick and Concrete, little Asphalt, dry (Fill)	0.0	
				19-14		0.0	
						0.0	
						0.0	
	S2	2-4	1.1	22-16	Gray Brown F-M SAND, some SILT, little C-Sand, Brick and Concrete, moist (Fill)	0.0	
				16-15		0.0	
						0.0	
5	S3	4-6	NR	9-4	No Recovery Brick in tip of Spoon		Collect Soil Sample B7-S4 from 6-6.5' @1025
				4-4			
	S4	6-8	1.2	3-7	Gray Brown F-M SAND, some SILT and Asphalt, little C-Sand and Brick. moist to wet (Fill)	0.0	▼±7'
				11-26		0.0	
						0.0	
10							NOTE: Due to problems with Drill Rig - Drill out to 10 Feet to install Monitor Well
					Terminate Boring at 10 Feet		
					Set 2" ø PVC Monitoring Well		
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt/DDC	JOB NO: 200658.0035	BORING NO: B8
LOCATION: Lot between Liberty, Buel, Olympia and Patterson Aves - 200' from rear of residences on Patterson Ave	ELEVATION:	DEPTH: 6'
	DATE BEGUN: 2/17/05	DATE FINISHED: 2/17/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: DK50	DRILLER: Cruz	
DRILLING METHOD: HSA	DRILL FLUID: —	HOLE SIZE: 6" ø
WEATHER: Partly Cloudy, 37°F	DEPTH TO WATER: ± 4'	DATE: 2/17/05
COMPLETED AS WELL? No.	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	0.6	7-3	Brown F-M SAND and ASH cinders, little silt, plastic, moist (FILL)	0.0	
				2-WH		0.0	
	S2	2-4	0.8	2-1	Gray brown F-SAND, some ash and wood, little silt, moist to wet (FILL)	0.0	Collect Soil Sample BB-S2 from 3.5-4.0' @1325
				WH-1		0.0	▼ ± 4'
	S3	4-6	NR	1-1	No Recovery - Sample Saturated		
5				2-1			
					Terminate Boring at 6 Feet		
10							
15							
20							

Metcalf & Eddy, Inc.

GEOLOGIC LOG

PROJECT: New Creek Bluebelt/DDC	JOB NO: 200658.0035	BORING NO: B9
LOCATION: South of Residence on Patterson Ave Between Graham Blvd and Jefferson Ave. SI, NY	ELEVATION:	DEPTH: 2'
	DATE BEGUN: 2/18/05	DATE FINISHED: 2/18/05
DRILL CONTRACTOR: ADT	GEOLOGIST: Kantor	
DRILLING RIG: —	DRILLER: Cruz	
DRILLING METHOD: Hand Auger	DRILL FLUID: -	HOLE SIZE: 2 1/4
WEATHER: Sunny Breezy 30°F	DEPTH TO WATER: ± 2'	DATE: 2/18/05
COMPLETED AS WELL? No	WELL PERMIT NO.	

DEPTH	SAMPLE NO.	SAMPLE DEPTH	RECOVERY	BLOW COUNTS	SAMPLE DESCRIPTION	HNu/OVA ppm	NOTES:
	S1	0-2	2.0	—	Red Brown F-M SAND and SILT, little Ash Cinder, moist to wet (Fill)	0.0	Collect Soil Sample B9 S1 From 1.5-2.0'
					Terminate Boring at 2 Feet		▼ ±2' @ 1200
5							
10							
15							
20							