



PUBLIC NOTICE

US Army Corps
of Engineers
New York District
Jacob K. Javits Federal Building
New York, N.Y. 10278-0090
ATTN: Regulatory Branch

In replying refer to:

Public Notice Number: NAN-2013-00259-EHA
Issue Date: November 14, 2013
Expiration Date: December 16, 2013

To Whom It May Concern:

The New York District, Corps of Engineers has received a mitigation bank prospectus to establish the Saw Mill Creek Mitigation Bank. This notice is to inform interested parties of the proposed activities and solicit comments.

AUTHORITY: Issuance of a public notice regarding a proposed mitigation bank prospectus is required pursuant to the "Compensatory Mitigation for Losses of Aquatic Resources; Final Rule," (Rule) as published in April 10, 2008, Federal Register, Vol. 73, No. 70, Pages 19594-19705 (33 Code of Federal Regulations, Parts 325 and 332). The authorization of the proposed wetland mitigation bank may be reviewed under a separate future permit action pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33U.S.C. 403), and Section 404 of the Clean Water Act (33 U.S.C. 1344).

APPLICANT: New York City Economic Development Corporation
Attn: Katie Axt
110 William Street
New York, New York 10037

ACTIVITY: The prospective mitigation bank sponsor, New York City Economic Development Corporation, is in the process of requesting Department of the Army authorization to establish and maintain a 91.1 acre area that would consist of a tidal emergent marsh, mudflat and open water ecosystem.

All aspects associated with the objectives, establishment, operation, maintenance, and monitoring of the proposed bank are discussed in the "Saw Mill Creek Pilot Wetland Mitigation Bank Prospectus dated October 2013. To view the Prospectus please visit the Public Notices section of the New York District's Regulatory Branch page online at www.nan.usace.army.mil/PublicNotices and select the public notice labeled NAN-2013-00259-EHA.

The proposed mitigation bank may be one of a number of practicable options available to applicants to compensate for unavoidable impacts to aquatic resources associated with Department of the Army permits issued under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403), and Section 404 of the Clean Water Act (33 U.S.C. 1344).

The mitigation bank prospectus will be reviewed by the New York District of the U.S. Army Corps of Engineers in consultation with a group of federal and state agency representatives known as the Interagency Review Team (IRT). The New York District of the U.S. Army Corps of Engineers is the chair of the IRT. The New York State Department of Environmental Conservation is the co-chair of the IRT.

The proposed mitigation bank sponsor is in the process of preparing mitigation bank design plans for the site which will be submitted to the U.S. Army Corps of Engineers for consideration as part of a Department of the Army permit application pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403), and Section 404 of the Clean Water Act (33 U.S.C. 1344).

**CENAN-OP-RE
PUBLIC NOTICE NO. NAN-2013-00259-EHA**

WATERWAY: Saw Mill Creek, tributary to Arthur Kill

LOCATION: Borough of Staten Island, Richmond County, New York

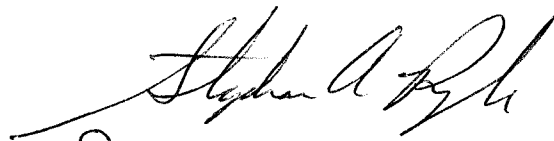
FEDERAL EVALUATION OF THE PROPOSAL: The Corps of Engineers is soliciting comments from the public; federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate this proposed mitigation bank. The New York District Corps of Engineers in evaluating this proposal will consider any comments received. Comments will be used to assess the potential for the proposed mitigation bank to provide appropriate compensatory mitigation for activities authorized by Department of the Army permits.

ALL COMMENTS REGARDING THE PROSPECTUS MUST BE PREPARED IN WRITING AND MAILED TO REACH THIS OFFICE BEFORE THE EXPIRATION DATE OF THIS NOTICE, otherwise, it will be presumed that there are no objections to the activity.

It is requested that you communicate the foregoing information concerning the activity to any persons known by you to be interested and who did not receive a copy of this notice. If you have any questions concerning this application, you may contact this office at (917) 790-8523 and ask for Naomi Handell.

In order for us to better serve you, please complete our Customer Service Survey located at <http://per2.nwp.usace.army.mil/survey.html>

For more information on New York District Corps of Engineers programs, visit our website at <http://www.nan.usace.army.mil>



Jodi
Jodi M. McDonald
Chief, Regulatory Branch

The Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHES) Initiative

**Saw Mill Creek Pilot Wetland Mitigation Bank
Staten Island, New York**

PROSPECTUS

Submitted to:

**The Interagency Review Team (IRT)
U.S. Army Corps of Engineers, Chair
New York, New York
Application Number NAN-2013-00259-EHA**



Submitted by:

**New York City Economic Development Corporation
New York, New York**



Prepared by:

**Louis Berger & Assoc, PC
New York, New York
In association with
Mogensen Mitigation, Inc.**



October 2013

SAW MILL CREEK PILOT WETLAND MITIGATION BANK PROSPECTUS

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INTRODUCTION

The New York City Economic Development Corporation (NYCEDC) has engaged in an initiative with the City and State of New York to protect and enhance the City's coastal resources while fostering sustainable waterfront development. As part of the Mitigation and Restoration Strategies for Habitat and Ecological Sustainability (MARSHES) initiative, NYCEDC is pursuing the first Mitigation Banking Instrument (MBI) in New York City as a means to facilitate both the long term improvement and protection of critical coastal resources, and providing a predictable, efficient and environmentally responsible process to serve the mitigation needs of permit applicants in the geographical service area. The proposed project is referred to as the Saw Mill Creek Pilot Wetland Mitigation Bank (the Bank).

On behalf of NYCEDC, Louis Berger & Assoc., PC (Louis Berger), prepared this Prospectus for the Bank in accordance with the *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources*; (Federal Register, Vol. 73, No. 70, April 10, 2008). This Prospectus is submitted to the U.S. Army Corps of Engineers – New York District (Corps), Chair of the Interagency Review Team (IRT), to formally initiate the planning and agency review process for the Bank. Information provided in this Prospectus will serve as the basis for developing the MBI. The MBI will contain the Site Development Plan and will include, without limitation, location maps, summary of existing conditions and reference sites, hydrologic analysis, design criteria and success, and plans for construction, operation, monitoring and maintenance of the Bank.

If undertaken, the proposed Bank will be located on Staten Island in Richmond County, New York as shown on the U.S. Geologic Survey (USGS) topographic map of Arthur Kill, NY 7.5-minute quadrangle (Exhibit A, Bank Location Map). The Bank will be established within a portion of a 91.1-acre site that is bisected by Chelsea Road (oriented north to south) into a western section and an eastern section. The 37.4-acre western section is bounded by railroad tracks to the west, a Williams-Transco underground natural gas pipeline valve house access road to the north, Chelsea Road and privately-owned parcels to the east and by Saw Mill Creek to the south. The 53.7-acre eastern section is bounded by Chelsea Road and privately-owned parcels to the west, Edward Curry Avenue and associated right-of-way to the north, tidal marsh followed by Route 440 to the east, and Chelsea Road and an off-ramp from Route 440 to the south. The proposed bank site is located at Latitude 40.61006 and Longitude -74.18869 within the NYSDEC Atlantic Ocean/Long Island Sound Watershed and the 8-digit Hydrologic Unit Code (HUC08) Sandy Hook-Staten Island subbasin (02030104).

NYCEDC is a New York not-for-profit corporation that performs a variety of economic development, urban planning and other services for the City of New York pursuant to an agreement with the City. As a part of these services, NYCEDC is acting as the Sponsor of the Bank described in this Prospectus.

I. OBJECTIVES OF THE PROPOSED BANK

The main objective of the Bank is to provide compensatory mitigation for unavoidable impacts to waters of the U.S., including wetlands, which result from activities authorized under Sections 404 and 401 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, New York State ECL Article 15, Title 5 (Protection of Waters/Stream Disturbance), New York State ECL Article 25 (Tidal Wetlands); New York Department of State Coastal Consistency Concurrence; New York State Environmental Quality Review Act (SEQRA); New York City Department of City Planning (NYCDP) Uniform Land Use Review Procedure (ULURP); NYCDP Local Waterfront Revitalization Plan Compliance; and/or City Environmental Quality Review (CEQR) provided such activities have met all applicable requirements and are authorized by the appropriate authorities.

In furtherance of this main objective, the Sponsor seeks to provide economically efficient, environmentally sustainable, and flexible off-site compensatory mitigation opportunities for public agencies and private property owners seeking to develop in accordance with all relevant Federal, State and local regulations. The Bank would

be established to compensate for wetland and other aquatic resource losses anticipated by such authorized development within the Bank Service Area. The goals of the Bank are the restoration and enhancement of tidal wetlands and streams to provide a positive contribution to water quality, fish and wildlife habitat, flood attenuation, and erosion control.

II. ESTABLISHMENT AND OPERATION OF THE PROPOSED BANK

A. ESTABLISHMENT OF THE BANK

As the Bank Sponsor, the NYCEDC on behalf of the City of New York will restore, enhance, and maintain a portion of 91.1 acres of emergent wetlands, scrub-shrub wetlands, forested wetlands, open water channels/pannes, mudflat habitat, and uplands in accordance with the provisions of a MBI (to be developed) and regulatory permits (to be obtained). It is anticipated that the Bank will be established in two Phases, with Phase 1 of the Bank established first and Phase 2 established later. The Ecological Suitability and Baseline Conditions Report, presented in Exhibit B, describes the existing conditions of the degraded Bank site and the Conceptual Design Report, presented in Exhibit C, describes and depicts the plan to improve the ecological functions and services of the site.

The Bank Sponsor will improve wetland functions and services (water quality, flood storage, and wildlife habitat), including re-establishing and improving hydrologic flow to the marsh plain, creating a meandering channel/emergent marsh complex, and replacing monotypic stands of *Phragmites australis* with a diversity of native wetland plants with improved wildlife value. The primary wetland system will be a tidal emergent marsh, mudflat, open water ecosystem comprised of *Spartina* spp. dominated plant communities. These wetlands will provide habitat for a wide variety of wetland-dependent and terrestrial wildlife species.

Upon executing the MBI, the Sponsor will perform (or caused to be performed) all necessary work, in accordance with the provisions of the MBI and federal and state permits, to restore, enhance, and maintain emergent marsh and other aquatic habitats, freshwater forested wetland habitat, and upland habitat until it is demonstrated to the satisfaction of the Corps and NYSDEC, in consultation with the IRT, that the Bank complies with all requirements, or until all credits are sold, whichever is later. The exact acreages of these habitat types will be determined once the site survey and design are completed by the Sponsor and approved by the IRT. The Bank credits will become available in accordance with the credit generation schedule specified in the MBI.

The Sponsor will obtain (or cause its Contractors to obtain) all appropriate environmental documentation, permits or other authorizations needed to establish, operate and maintain the Bank. This Prospectus does not fulfill or substitute for such authorization.

The Sponsor will provide customary and appropriate financial assurances, as established by the Corps and NYSDEC in consultation with the IRT, to ensure a high level of confidence that the Bank will be successfully completed and maintained in perpetuity. The details of these financial assurances will be provided in the MBI.

B. OPERATION OF THE BANK

After establishment of the Bank, the Sponsor will operate the Bank in accordance with the monitoring and maintenance plan and bank closure provisions of the MBI and regulatory permits to be approved by the Corps and the NYSDEC in consultation with the IRT. The Bank will be closed at the end of its operational life, which is 5 years from the date of the completion of the grading and planting tasks, successful completion of all performance standards as documented by approved monitoring reports, or the date when all credits have been sold, whichever comes later. After that, the Bank will be maintained by the City of New York (the property owner) acting through its Department of Parks and Recreation in accordance with the Long-Term Management provisions of the MBI. The Bank will be protected in perpetuity by restrictive covenants (such as a restrictive declaration executed by the City of New York and recorded against the land which contains relevant restrictive covenants) or by other appropriate methods to protect the Bank in perpetuity.

Compensatory mitigation credits will be available for purchase by public agencies and private property owners with permitted wetland impacts. A credit is defined as a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic functions at the site. The measure of aquatic functions is based on the resources restored or enhanced as agreed to by the Bank Sponsor and the Corps and NYSDEC, in coordination with the IRT.

Projects proposed for utilization of credits purchased from the Bank will be submitted to the Corps and/or NYSDEC for consideration, in consultation with the IRT where appropriate, in conjunction with the permitting for such projects. The utilization of mitigation credits from the Bank to compensate for project impacts will be determined on a site and project specific basis by the Corps and/or NYSDEC in consultation with the IRT where appropriate. In the MBI, the Corps and NYSDEC will reserve the right to require a higher compensation ratio depending on the project.

The MBI will provide that the Sponsor is responsible for assuring the success of the Bank establishment activities and goals described in Exhibit C. The success of the Bank will be measured by performance standards approved by the Corps and NYSDEC in consultation with the IRT, as set forth in the Corps and NYSDEC permits and the MBI. The standards will define the conditions under which the Bank would be judged successful and provide monitoring and maintenance requirements to identify and correct any deficiencies. The Bank will be considered successful if the Sponsor demonstrates to the Corps and NYSDEC that the appropriate areas have been restored and/or enhanced and the goals of the Bank have been met. The MBI will provide that after successful completion of each planning, construction and monitoring task, the Sponsor will notify the Corps and NYSDEC in writing. The Corps and NYSDEC, in consultation with the IRT, will confirm whether or not the tasks are successfully completed for purposes of releasing credits.

C. ESTABLISHMENT AND USE OF CREDITS

The exact number of credits to be generated by the Bank will be determined once the site survey, design, and functional assessments are completed by the Sponsor and approved by the IRT and will be provided in the MBI. The credits will be sold by the Sponsor to public agencies, private property owners, and any other permittees in the Service Area provided such entities have met all applicable regulatory requirements, including avoidance and minimization, and the use of credits has been authorized by the appropriate agencies.

The MBI will provide that Bank credits will not be released for debiting until specific milestones associated with the Bank's protection and establishment are achieved. Use of credits will be established by the Corps and NYSDEC in consultation with the IRT.

D. ASSESSMENT METHODOLOGY

The credits will be determined by the Corps and/or NYSDEC, in consultation with the IRT, and informed through the use of a functional assessment methodology that the Corps and NYSDEC, in consultation with the IRT, determine to be appropriate and will be provided in the MBI. The anticipated methodology is derived from the Uniform Mitigation Assessment Method (UMAM) which was developed by the University of Florida H.T. Odum Center for Wetlands and the Florida Department of Environmental Protection (FDEP, 2004). UMAM tracks wetland functional gains from mitigation projects and banks. This assessment methodology provides a standardized framework to assess wetland functions for baseline and post-mitigation conditions for assessment areas using a qualitative description and quantitative scoring. It has been adopted and modified for use in other Corps Districts and State programs and is proposed for use on the Bank, with some modifications to tailor it to the NYC region and its habitats.

The available credits will reflect the difference between before and after Bank establishment site conditions as informed by the approved functional assessment methodology and approved by the Corps and NYSDEC, in consultation with the IRT.

E. SUCCESS CRITERIA

The Sponsor will be responsible for assuring the success of the Bank establishment activities and goals described in Exhibit C. The success of the Bank will be measured by performance standards approved by the Corps and NYSDEC, in consultation with the IRT, as set forth in the Corps and NYSDEC permits and the MBI. The standards to be defined in the MBI will establish the conditions under which the Bank will be evaluated successful and provide monitoring and maintenance requirements. As will be provided in the MBI, the Bank will be considered successful if the Sponsor demonstrates to the Corps and NYSDEC that the appropriate areas have been restored or enhanced and the goals of the Bank have been met. After successful completion of each planning, construction and monitoring task, the Sponsor will notify the Corps and NYSDEC in writing. In addition to the written notice, the Sponsor will submit photographs of the completed project task along with a photo location map. The Corps and NYSDEC, in consultation with the IRT, will confirm whether or not the tasks are successfully completed for purposes of releasing credits.

F. CONDITIONS ON DEBITING

The MBI will provide that prior to the sale and transfer of any credits by the Sponsor, the following requirements will be met: (1) the MBI and mitigation plans will be approved by the Corps and NYSDEC, in consultation with the IRT; (2) customary and appropriate financial assurances satisfactory to the Corps and NYSDEC will be obtained; (3) all applicable regulatory permits and approvals will be secured by the Sponsor; (4) the Bank will be protected in perpetuity by a restrictive covenant (such as a restrictive declaration executed by the City of New York and recorded against the land) or by other appropriate methods to protect the Bank in perpetuity and, (5) the MBI will be signed by the Sponsor, Corps and NYSDEC and any members of the IRT who choose to sign the MBI.

III. SERVICE AREA

The Bank primarily would be established to provide off-site compensatory mitigation for authorized unavoidable impacts to waters of the United States and/or State waters, including wetlands, occurring within the portions of the Lower Hudson River Basin, also known as Hydrologic Unit Code 06 (HUC06) 020301, that are within the New York City Municipal limits (Primary Service Area). This Primary Service Area includes portions of the following HUC08 subbasins: Lower Hudson River and Sandy Hook-Staten Island and excludes the HUC12 subwatershed region: Raritan Bay-Lower Bay Deep. As depicted on the excerpt of the USGS Hydrologic Unit Map in Exhibit D, the Primary Service Area includes the Boroughs of Staten Island and Manhattan and portions of the Boroughs of the Bronx, Brooklyn and Queens.

The Bank secondarily would be established to provide off-site compensatory mitigation for authorized unavoidable impacts to waters of the United States and/or State waters, including wetlands, occurring within the portions of Long Island Basin, also known as Hydrologic Unit Code 06 (HUC06) 020302, that are within the New York City Municipal limits (Secondary Service Area). This Secondary Service Area includes portions of the following HUC08 subbasins: Bronx River, Long Island Sound, Northern Long Island and Southern Long Island and includes the HUC12 subwatershed region: Raritan Bay-Lower Bay Deep. As depicted on the excerpt of the USGS Hydrologic Unit Map in Exhibit D, the Secondary Service Area includes portions of the Boroughs of the Bronx, Brooklyn and Queens. The MBI will restrict the use of this Secondary Service Area to authorized projects that meet the following requirements:

1. No practical on-site mitigation alternatives are available that meet all of the mitigation need;
2. No practical off-site mitigation alternatives are available within the Secondary Service Area that meet all of the mitigation need; and
3. There are no other approved mitigation banks servicing the Secondary Service Area.

Within the Primary Service Area, the Bank will be the preference for providing mitigation for authorized impacts. Within the Secondary Service Area, decisions authorizing use of credits from the Bank will be made by the Corps and/or NYSDEC on a case-by-case basis in accordance with applicable permit requirements.

IV. NEED FOR AND TECHNICAL FEASIBILITY OF BANK

A. NEED FOR BANK

At the current time, there are no wetland mitigation bank credits available within New York City. Yet, there is a strong need for compensatory wetland mitigation by public agencies and private property owners. Based on a detailed review of available data, there appears to be a sufficient need for wetland mitigation credits from projects within the Primary Service Area and Secondary Service Area to make the Bank economically viable.

B. TECHNICAL FEASIBILITY OF BANK

As described in Exhibit C, it is technically feasible and environmentally desirable to restore the proposed Bank site. A review of historic aerials and topographic maps indicates that most of the site was originally tidal marsh, but the topography of the area has been significantly altered over the past century by filling and ditching. Chelsea Road appears on the 1857 map as running along the eastern side of a strip of land approximately 300 to 400 feet wide, north of Saw Mill Creek. Some mosquito control ditches are evident in eastern and western parcels in the 1924 aerial photo. By the 1943 aerial photo, the marsh had been ditched to its current extent. Mosquito ditches are very straight, narrow channels that were dug to drain the upper reaches of salt marshes, as it was formerly thought that ditching marshes would control mosquito breeding. The ditching often negatively impacted the hydrology and habitat of tidal marshes.

In the project area east of Chelsea Road, the marsh formerly extended beyond the area now occupied by Edward Curry Avenue. An island surrounded by salt marsh appears on the 1857 map and is visible in the 1924 aerial photo. This area was filled by 1943 and Edward Curry Avenue now crosses this area. Two large berms were constructed in this area south of Edward Curry Avenue between the 1966 and 1970 aerial photos, possibly to begin filling for development. This effort appears to have been abandoned, as only portions of the areas within the berms have been filled. The fill associated with construction of Route 440 is seen in the 1970 aerial photo. A human-made channel has been excavated to connect the wetlands east of Route 440 with wetlands in the eastern parcel. This channel flows through a large box culvert beneath Route 440. Some fill appears immediately south of Saw Mill Creek, along the east side of Chelsea Road in the 1943 and 1954 aerial photos. By the 1966 aerial photo, a much larger area has been filled, and by 1970, the portion of this area within the project boundary has been filled to its current extent.

In the project area west of Chelsea Road, railroad tracks were built on fill along the western parcel edge by 1957. There are no culverts under the railroad embankment along the project area boundary. The railroad tracks cross a bridge over Saw Mill Creek and over a tidal creek about 1,200 feet north of the northwest corner of the project boundary. The developed lots along the western side of Chelsea Road appear to remain confined to the original upland footprint until the 1960s. Available aerial imagery indicates that these lots were progressively filled westward into the marsh.

Saw Mill Creek, a tidally influenced tributary of Pralls Creek, and several tributaries and drainage ditches are located within the project area. The confluence of Saw Mill Creek and Pralls Creek is located approximately 600 feet west of the project area. Pralls Creek is a tributary of the Arthur Kill. The project area is connected to the Staten Island Sound through a series of smaller tidal channels. Part of the site experiences daily tidal inundation. Tidal fluctuations are being monitored as part of the design studies for the project.

As tidal waters still flow to portions of the project area and support thriving salt marsh habitat in portions of the site, it is technically feasible to remove upland fill, restore the site to elevations conducive to more natural tidal inundation and plant diverse native salt marsh species.

V. OWNERSHIP AND LONG TERM MANAGEMENT OF THE MITIGATION BANK

A. OWNERSHIP

The NYCEDC on behalf of the City of New York has the right to establish a wetland mitigation bank on the

subject property (see Exhibit A, Bank Location Map) and to act as the Sponsor. The Sponsor has developed a conceptual plan to enhance and restore wetland habitat and a small portion of upland habitat on a portion of this property. Title to the property is held by New York City and will remain in New York City's name after the Bank is established. The project area is comprised of 20 parcels as summarized in Table 1 and consists mainly of undeveloped tidal marsh and upland areas with some areas of fill and development from adjoining parcels. The parcels are owned by the City of New York and managed by either the NYC Department of Parks and Recreation, NYC Transit (through a Master Leaser) or NYCEDC, on behalf of the Department of Small Business Services. The exact acreage of these parcels, as well as the location of any existing easements, is currently being surveyed by a NY state-licensed surveyor.

Table 1. Project Area Parcel Summary

Block	Lots
1780	1, 69, 210, 260 and 300
	275
1790	100
1815	74, 75, 85, 204, 220, 235, 251, 300 and 325
	125
	135, 150 and 375

Owner Contact Information: City of New York, City Hall, 250 Broadway, New York, NY 10007; Phone: 212-788-3000; Fax: (212) 618-8898; e-mail: KAxt@nycedc.com

Sponsor Contact Information: New York City Economic Development Corporation, Attn: Katie Axt; 110 William Street, New York, NY 10037; Phone: 212-312-3730; Fax: 212- 618-8898; e-mail: KAxt@nycedc.com

B. MAINTENANCE PROVISIONS

The Bank will be designed to create a natural aquatic system that does not include any man-made structures. Some active management and maintenance is anticipated to ensure the viability and sustainability of the Bank. The Sponsor will perform all necessary work to maintain the Bank consistent with the maintenance criteria established in the MBI until closure of the Bank. Upon closure of the Bank, the long term land steward will implement the management requirements established in the long-term management plan. Deviation from the approved maintenance plan is subject to review and written approval by the Corps and NYSDEC following consultation with the IRT.

C. MONITORING PROVISIONS

The Sponsor will perform necessary work to monitor the Bank to demonstrate compliance with the success criteria established in the MBI, and any regulatory permits, for a period of 5 years, until success criteria are met, or until all credits are sold, whichever is later. The monitoring period will begin one full calendar year after the completion of all construction and planting activities (e.g., if the planting is completed in spring 2014, the first monitoring event would occur in spring 2015). The MBI will provide that the Sponsor will provide annual monitoring reports to the Corps and NYSDEC on the long term success of the Bank and to identify any problems requiring corrective action by December 31st of each calendar year.

D. REPORTS

The MBI will provide that the Sponsor will submit to the Corps and NYSDEC, for distribution to the IRT, as-built grading and planting plans of the Bank establishment activities and a post-construction report within 60 days after the date of completion of grading and planting activities. The as-built drawings and report will include all aspects of the final grading elevations and planting arrangements of the Bank. In addition, the Sponsor will submit to the Corps and NYSDEC, for distribution to the IRT, eight copies of each annual report on the status of the Bank establishment activities, prepared during the growing season, no later than December 31st of each of the five years following initiation of the tidal wetland planting activities, in accordance with

the permits. Two copies of each report will be provided directly to NYSDEC.

E. ACCOUNTING PROCEDURE

The MBI will provide that the Sponsor will submit a Ledger statement to the Corps and NYSDEC each time credits are debited or additional credits are approved for release. If requested, the Corps may distribute the statement to other members of the IRT or the public. The Sponsor will submit an annual ledger to the Corps and NYSDEC for distribution to all members of the IRT, showing all transactions at the Bank for the previous year. All ledger submittals will include Corps and NYSDEC permit numbers.

F. CONTINGENCY PLANS/CORRECTIVE ACTIONS

The MBI will provide that should any report submitted by the Sponsor to the Corps and NYSDEC note conditions requiring corrective action, the Sponsor will determine the cause of the condition, in consultation with the Corps and NYSDEC and the IRT. Prior to commencing corrective actions, the Sponsor will submit a detailed proposal for such a corrective action to the Corps, NYSDEC, and IRT for review and approval within 60 days of a determination by the Corps and NYSDEC, in consultation with the IRT, that corrective measures are warranted. Once approved by the Corps and NYSDEC, in consultation with the IRT, the Sponsor will undertake such corrective action and will, upon completion, submit to the Corps and NYSDEC a summary of the work performed. Should corrective actions not be implemented as determined by the Corps and NYSDEC, the release of credits may be withheld and/or credit sales may be suspended until the corrective action is implemented.

G. LONG-TERM MANAGEMENT

The MBI will provide that the Sponsor will conduct maintenance and monitoring of the Bank for its operational life. The Bank will be closed at the end of its operational life, which is 5 years from the date of the completion of the grading and planting tasks, successful completion of all performance standards, or the date when all credits are sold by the Sponsor, whichever comes later. The MBI will include a long-term management plan that describes the long term management activities to be conducted by the long-term land steward, in this case the landowner (the City of New York, acting through its Department of Parks and Recreation), and the maintenance surety for the management activities. The Bank will be protected in perpetuity by a restrictive covenant (such as a restrictive declaration executed by the City of New York and recorded against the land) or by other appropriate methods to protect the Bank in perpetuity.

VI. SPONSOR QUALIFICATIONS

The Bank Sponsor has previously been involved in wetland restoration projects in New York City, such as the Randall's Island Urban Salt Marsh and Freshwater Wetland Restoration Project, the former Pennsylvania and Fountain landfills; Jamaica Bay Marsh Island Restoration Projects (Elders Marsh and Yellow Bar Hassock), Ecology Park in Paerdegat Basin, Pugsley Creek Park, and Soundview Park. While the Sponsor has not established a Bank previously, the City of New York, through NYCEDC, has retained consultant services from Louis Berger and Mogensen Mitigation, Inc. (MMI) on this project. Both Louis Berger and MMI have successfully established mitigation banks and efficiently transferred credits to satisfy permit-related mitigation requirements.

Richard Mogensen of MMI formerly worked for Marsh Resources, Inc., (MRI) and managed wetland designers, construction contractors and landscape contractors (including Louis Berger) to establish Phases 1 and 2 of the MRI Meadowlands Mitigation Bank. Mr. Mogensen and Louis Berger developed the first MBI to be implemented in the Hackensack Meadowlands District. This involved continuous coordination and meetings with the members of the IRT, also known as the Meadowlands Interagency Mitigation Advisory Council (MIMAC), including the Corps, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Marine Fisheries Service, New Jersey Department of Environmental Protection, and N.J. Meadowlands Commission. To meet the goals of a tidal marsh restoration project located in an area of challenging environmental conditions, Louis Berger developed and implemented a design/build program and

served as prime contractor to MRI for the first bank approved by the Corps-New York District through execution of a federal banking instrument. This 206-acre restored salt marsh provided a wetland mitigation alternative for approved development projects permitted in the Meadowlands and the surrounding watershed and provides a thriving restored habitat.

Prior to MRI Bank construction, the site was a degraded, *Phragmites australis* monoculture underlain with dredge spoils and peat, and was isolated from tidal inundation due to topographic elevation and a lack of tidal creeks. Mitigation credit was generated by lowering site elevations to restore tidal flow, enhancing and creating a meandering tidal channel network and island habitat complex, and reestablishing desired native plant species within a variety of natural habitats.

Mr. Mogensen and Louis Berger also worked together to establish the Richard P. Kane Wetland Mitigation Bank in the Hackensack Meadowlands in 2010. The Louis Berger Team secured regulatory approvals of the restoration design for an approximately 230-acre site from the IRT also known as the MIMAC, comprising six federal and state agencies. Louis Berger designed the Kane Bank to re-establish natural tidal hydrology and improve hydrologic flow to the marsh plain through a channel/emergent marsh complex, and to replace monotypic stands of invasive *Phragmites australis* with a diversity of native wetland plants with improved wildlife value. The Kane Bank is providing mitigation credits for authorized wetland impacts by four New Jersey public transportation agencies.

VII. ECOLOGICAL SUITABILITY AND WATER RIGHTS

A. ECOLOGICAL SUITABILITY AND BASELINE CONDITIONS

Information collected thus far documenting the baseline conditions for the Bank site, including physical, chemical and biological characteristics, are presented in [Exhibit B](#). All information collected to date indicates that the site is ecologically suited to be established as a wetland mitigation bank.

B. WATER RIGHTS

Sufficient water rights exist to support the long-term sustainability of the Bank. The tidal wetlands will be supported by tidal waters primarily from Saw Mill Creek. The freshwater forested wetlands will be primarily supported by groundwater, which is abundant. Details on the proposed hydrology of the Bank are provided in [Exhibit C](#).

VIII. EXHIBITS

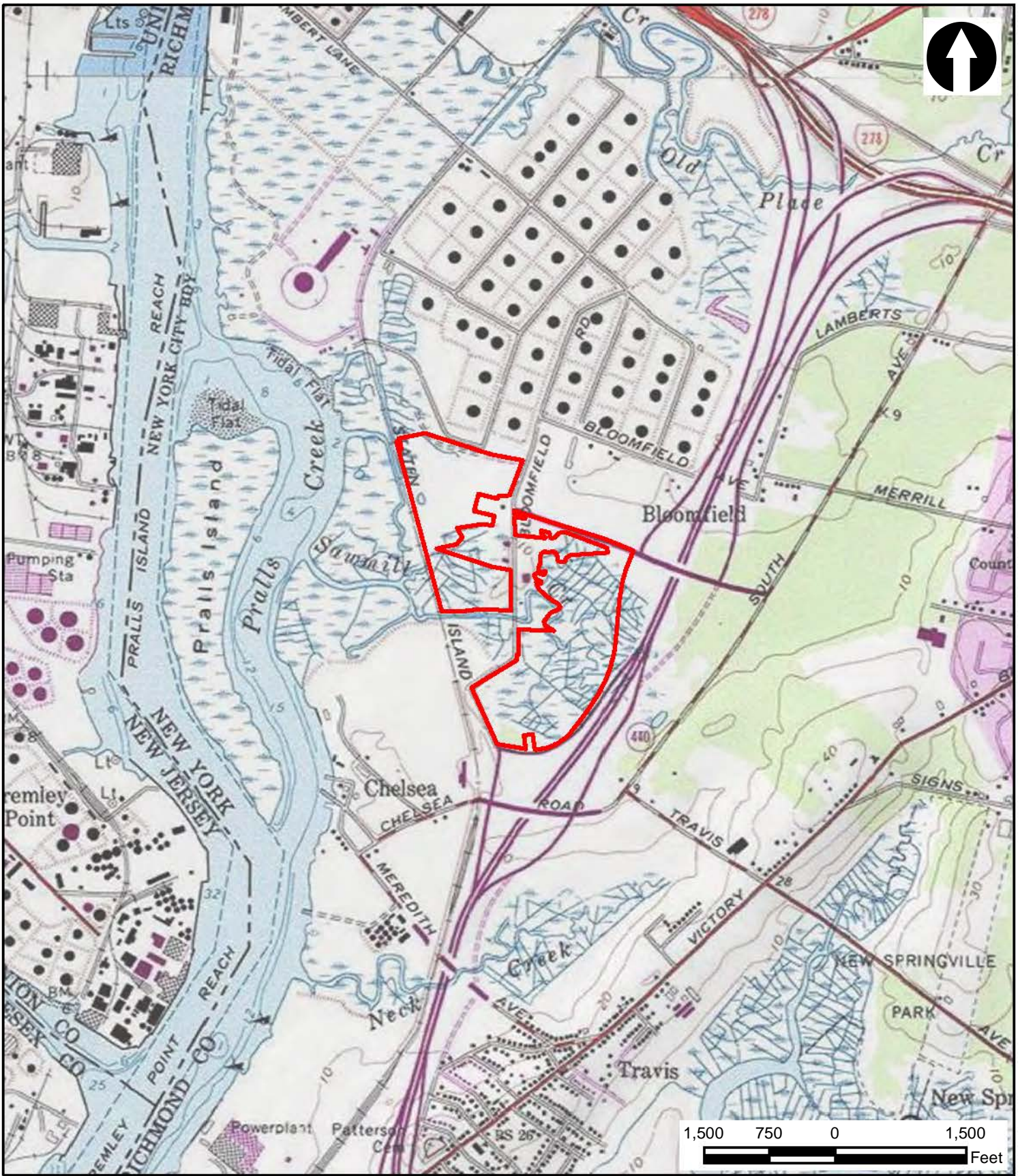
The following Exhibits are incorporated as appendices to this Prospectus.

Exhibit A Bank Location Map

Exhibit B Ecological Suitability and Baseline Conditions Report

Exhibit C Conceptual Design Plan



Exhibit D Service Area Map



Source: Copyright:© 2013 National Geographic Society, i-cubed

Legend

General Project Area

 New York City Economic Development Corporation	
Saw Mill Creek Wetland Mitigation Bank Staten Island, New York Bank Location Map	
 Louis Berger & Assoc, PC	August 2013 Exhibit A

SAW MILL CREEK PILOT WETLAND MITIGATION BANK

PROSPECTUS - EXHIBIT B

ECOLOGICAL SUITABILITY AND BASELINE CONDITIONS

The purpose of the Saw Mill Creek Wetland Mitigation Bank (the Bank) is to pilot a Wetland Mitigation Bank in New York City. The proposed site provides a significant tidal wetland restoration opportunity in New York City. It is anticipated that the pilot bank will provide the following wetland functions and services:

- Improved water quality,
- Improved sediment quality,
- Increased plant diversity, and
- Increased fish and wildlife species abundance and diversity.

1.0 PHYSICAL CHARACTERISTICS

1.1 Geology and Geomorphology

Duke Geological Laboratory, Trips on the Rocks, Guide 04: Staten Island and Vicinity, NY and NJ (Merguirian and Sanders, 2010) indicates the surficial geologic deposits beneath the organic material within the project area consist of glacial and Quaternary deposits of fine to coarse sand. These surficial deposits are underlain by the Newark Supergroup, a sequence of sedimentary rocks consisting of brownish and reddish shales and sandstones. Depth to bedrock in the vicinity of the project area is estimated to be approximately 30 to 50 feet below ground surface (bgs).

Much of the project area was originally tidal salt marsh, but the topography of the area has been significantly altered over the past century by filling and ditching. Chelsea Road appears on the 1857 map (based upon 1837 USGS Survey) as running along the eastern side of a strip of land approximately 300 to 400 feet wide, north of Saw Mill Creek. The road continues south, over a bridge and through bridged or filled marsh for about 500 feet to uplands located south of Saw Mill Creek. Some mosquito control ditches are evident in eastern and western parcels in the 1924 aerial photo. By the 1943 photo the marsh had been ditched to its current extent. Mosquito ditches are very straight, narrow channels that were dug to drain the upper reaches of salt marshes, as it was formerly thought that ditching marshes would control mosquito breeding.

Project Area East of Chelsea Road

The marsh formerly extended beyond the area now occupied by Edward Curry Avenue. An island surrounded by salt marsh appears on the 1857 map and is visible in the 1924 aerial photo. This area was filled by 1943 and Edward Curry Avenue now crosses this area. Two large berms were constructed in this area between the 1966 and 1970 aerial photos, possibly to begin filling for development. This effort appears to have been abandoned, as only portions of the areas within the berms have been filled. The fill associated with construction of Route 440 is seen in the 1970 aerial photo. A human-made channel has been excavated to connect the wetlands east of Route 440 with wetlands in the eastern parcel. This channel flows through a large box culvert underneath Route 440 and its connecting ramps with Chelsea Road. Some fill appears immediately south of Saw Mill Creek, along the east side of Chelsea Road in the 1943 and 1954 aerial photos. By the 1966 aerial photo, a much larger area has been filled, and by 1970, the portion of this area within the project boundary has been filled to its current extent.

Project Area West of Chelsea Road

The forested area immediately north of Saw Mill Creek and east of Chelsea Road is portrayed as land on the 1857 and 1894 maps, though site inspection indicates that filling and dumping have also occurred there. By 1957, railroad tracks had been built on fill along the western parcel edge. There are no culverts under the

railroad embankment along the project area boundary. The railroad tracks cross a bridge over Saw Mill Creek and over a tidal creek about 1,200 feet north of the northwest corner of the project boundary. The developed lots along the western side of Chelsea Road appear to remain confined to the original upland footprint until the 1960s. Available aerial imagery indicates that these lots were progressively filled westward into the marsh.

1.2 Hydrology and Hydraulics

Saw Mill Creek, a tidally influenced tributary of Pralls Creek, and several tributaries and drainage ditches are located within the project area. The confluence of Saw Mill Creek and Pralls Creek is located approximately 600 feet west of the project area. Pralls Creek is a tributary of the Arthur Kill. The project area is connected to the Staten Island Sound through a series of smaller tidal channels. Part of the site experiences daily tidal inundation. Tidal fluctuations are being monitored as part of the design studies for the project. Groundwater within the project area is expected to be present within the glacial and overlying organic material. At high tide, the low-lying marsh is saturated. At low tide, groundwater is estimated to be present at less than 6 feet bgs. Groundwater flow is anticipated to be to the west towards Pralls Creek. According to the environmental database report (EDR, 2013a), the project area is located within the Federal Emergency Management Agency (FEMA) 100-year flood zone, but outside of the 500-year flood zone.

In May, 2013, Louis Berger installed four levelloggers and one barologger on-site to measure site specific tidal fluctuations and atmospheric pressure within the project area. Data collection is ongoing. In addition to the tide data monitoring, Louis Berger obtained the surveyed the tide gauge elevations and transformed the tide stages measured by the levelloggers into vertical elevation datum. This allows for a direct comparison of the monitored tide elevation to the site topography that has been surveyed and referenced to NAVD88 in feet.

1.3 Soils

The U.S Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), New York City Reconnaissance Soil Survey (2005) indicates that soils within the project area consist of four soil mapping units: Ipswich-Pawcatuck-Matunuck mucky peats (mapping unit 6); Laguardia-Ebbets-Pavement & Buildings, wet substratum complex, 0 to 8 percent slopes (mapping unit 7); Pavement & Buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (mapping unit 101); and Windsor-Windsor, loamy substratum-Deerfield loamy sands, 0 to 8 percent slopes (mapping unit 238). Soil mapping units are described below.

Ipswich-Pawcatuck-Matunuck mucky peats (6): The majority of surficial soils throughout the project area consist of Ipswich-Pawcatuck-Matunuck mucky peat. These soils form in low-lying areas of tidal marsh that are inundated by salt water twice each day at high tide. These soils are a mixture of very poorly drained soils which vary in thickness of organic material over sand.

Laguardia-Ebbets-Pavement & buildings, wet substratum complex, 0 to 8 percent slopes (7): Surficial soils within the northern portion of the eastern project area consist of the Laguardia-Ebbets-Pavement & buildings, wet substratum complex. These soils form on nearly level to gently sloping areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water. This unit contains a mixture of anthropogenic soils which vary in coarse fragment content. At least 15 percent of the land surface is covered by impervious pavement and buildings.

Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (101): Surficial soils within the eastern-central portion of the western project area consist of the Pavement & buildings, wet substratum-Laguardia-Ebbets complex. These soils are formed in nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water. This unit contains a mixture of anthropogenic soils which vary in coarse fragment content. Up to 80 percent of the land surface is covered by impervious pavement and buildings.

Windsor-Windsor, loamy substratum-Deerfield loamy sands, 0 to 8 percent slopes (238): Surficial soils in

the southern-most portion of the eastern project area consist of Windsor-Windsor, loamy substratum-Deerfield loamy sands. These soils are formed in nearly level to gently sloping areas of sandy outwash plains and dunes that are relatively undisturbed and mostly wooded. This unit contains a mixture of excessively drained and moderately well drained sandy outwash soils.

2.0 CHEMICAL CHARACTERISTICS

2.1 Water Salinity

The project area is surrounded by roadways and developed properties that result in stormwater discharges to the Saw Mill Creek wetland complex. Louis Berger conducted surface water salinity monitoring in areas of known or suspected freshwater surface water inputs into the Saw Mill Creek system within the project area and at the four tide gauge locations. Monitoring was performed during ebb tide when freshwater inputs would be most apparent. Surface water salinity measurements were being taken at monitoring stations on a weekly basis for at least one month by refractometer. The eastern parcel has several apparent freshwater input sources. A storm drain along Edward Curry Avenue discharges stormwater directly into the system. Also, a channel passing through a large box culvert under Route 440 connects the brackish marsh between Route 440 and South Avenue within the project area.

Additionally, Louis Berger monitored the salinity of groundwater in areas dominated by common reed (*Phragmites australis*) to determine any effect of fresh groundwater in these areas. Groundwater salinity monitoring was performed on a weekly basis, concurrent with surface water salinity monitoring. Groundwater salinity monitoring wells consist of two (2) inch diameter screened PVC pipe, advanced to a depth of approximately four (4) feet bgs. Wells were sealed to a depth of two (2) feet below the soil surface and were purged of water prior to sampling in order to measure return groundwater salinity. Two groundwater salinity monitoring wells are located in the eastern parcel (GW east and GW south) and one location in the northern portion of the western parcel (GW north). The early June salinity measurements followed heavy rain events, in addition to periods of heavy rain prior to and during sampling.

In the eastern parcel, surface water was observed in an area of skunk cabbage (*Symplocarpus foetidus*) growing at the edge of the red maple - sweetgum swamp in the southern portion of the eastern parcel (SW South) had a salinity of 4 parts per thousand (ppt) on May 15 and May 24, and a salinity of 1 ppt on June 7 and June 24. Water in the discharge pipe receiving drainage from Edward Curry Avenue had a salinity of about 1 ppt on May 15 and May 24, but measured 0 ppt on June 7, and 4 ppt on June 24. Ebb tide salinity at tide gauge 1 was 10 ppt on May 15, May 24, and June 24, and measured 2 ppt on June 7. Ebb tide salinity at tide gauge 2 ranged from 2 to 19 ppt. Water coming out from the Route 440 culvert on the ebb tide had a salinity of 11 ppt on May 15, 6 ppt on May 24, 10 ppt on June 24, but measured 0 ppt on June 10. Groundwater salinity at GW east measured 11 ppt on May 24, 4 ppt on June 10, and 8 ppt on June 24. Groundwater salinity at GW south measured 6 ppt on May 24, 11 ppt on June 10, and 3 ppt on June 24.

In the western parcel, ebb tide salinity at tide gauge 3 ranged from 6 to 18 ppt. Ebb tide salinity within Saw Mill Creek at tide gauge 4 ranged from 4 to 20 ppt. Salinity at SW north ranged from 10 to 16 ppt. Groundwater salinity at GW north was 11 ppt on all dates sampled.

2.2 Sediment Quality

In May 2013, a Phase I Environmental Site Assessment (ESA) for the project area was conducted. The 91.1-acre project area consists almost entirely of undeveloped tidal marsh and upland areas with some areas of fill and development from adjoining parcels. Based on the data obtained during the inspection, interviews, historical resources review and regulatory agency records review, the ESA recommends action and/or additional investigation of the Recognized Environmental Conditions (RECs) identified at the Project Area.

Based on the results of the Phase I ESA, Louis Berger prepared a Site Screening Work Plan for the Bank. The purpose of this work plan is to proceed with field activities to investigate and identify the extent, depth and physical characteristics of the RECs associated with the Project Areas identified during the Phase I ESA. This work plan includes a site background, physical setting, and discussion of the proposed work plan activities, Quality Assurance/Quality Control and Health and Safety Protocols. All field activities and laboratory analysis of all media for chemical contaminants will be executed in accordance with the approved work plan.

3.0 BIOLOGICAL CHARACTERISTICS

3.1 Baseline Plant Surveys

Plant resources at the site were assessed and a list of vegetation observed while completing various field studies was compiled. This existing data will be used to document the nature of existing biological resources at the site and to establish baseline conditions.

3.2 Bio-Benchmark Surveys

Biological benchmarks (bio-benchmarks) are typically used as reference points, in conjunction with tidal data, to determine optimal elevation ranges for the establishment of plants in tidal wetlands. The long-term success of a restored or created marsh relies primarily on establishing, with a high degree of accuracy, the correct elevations for the different plant communities. To determine target elevation ranges, detailed observations of functioning habitats are made and survey data are collected. These observations illustrate the elevations and tidal regimes under which individual species thrive or struggle, and reveal the elevations at which undesirable, non-native species begin to out-compete target native species. The bio-benchmarks are then compared with tidal analysis results to determine optimal elevations for plant establishment within tidal marsh habitats. A bio-benchmark survey was conducted to determine elevations of key vegetative zones within the project area. On May 24, 2013, bio-benchmarks were established at 25 locations within the project area and a nearby reference marsh adjacent to the western project boundary. All bio-benchmark locations and elevations were surveyed by licensed surveyor in June 2013.

Precise vertical elevations were coupled with observations of key vegetative, soil and hydrological characteristics to investigate (1) the lowest elevation at which *Spartina alterniflora* was observed; (2) the elevations for strong and vigorous *Spartina alterniflora*; (3) the elevations for strong and vigorous growth of native high marsh species (*Spartina patens*, *Distichlis spicata*, *Juncus gerardii*, and *Iva frutescens*); and (4) the lower elevation of common reed colonization.

3.3 Wetlands and Waters of the U.S.

A wetland delineation was performed to determine the jurisdictional boundaries of all wetlands and open waters within the project area. Wetlands were delineated in May 2013 by Louis Berger in accordance with the procedures outlined in the U.S. Army Corps of Engineers (USACE) *Wetlands Delineation Manual* (Environmental Laboratory, 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (USACE, 2012).

As an initial guide to the extent and nature of the project area wetlands, existing federal and state documents and resources were reviewed, including the USGS topographic map (Exhibit A), *Reconnaissance Soil Survey of New York City* (2005), NY State Department of Environmental Conservation (NYSDEC) Tidal and Freshwater Wetland Maps, and U.S. Fish Wildlife Service (USFWS) National Wetlands Inventory (NWI) Maps. In addition, aerial photographs and existing project area topographic mapping were also reviewed.

The Routine On-Site Inspection Methodology, as set forth in the manual, was employed. Wetlands are defined in the 1987 manual and 2012 supplement as: “Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support,

a prevalence of vegetation typically adapted to life in saturated soil conditions". The wetland delineation was performed at a time of year when the upper 18 inches of the soil was not frozen and there was sufficient vegetative cover to utilize the three-parameter approach.

The boundaries of these wetlands and/or open waters were marked in the field by sequentially numbered flags and located to sub meter accuracy using a Trimble ProXT Global Positioning System (GPS) unit. A licensed land surveyor subsequently located each wetland flag using a Leica GS15 GPS Rover. The horizontal accuracy of the Rover is 0.1' +/- . Two wetland complexes, Wetland A and Wetland B, were delineated as shown on Figure B-1. Ten (10) different classes of wetlands/watercourses were identified within the project area, based upon *The Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin *et al.* 1979).

Wetland A: Wetland flags A1 to A200 delineate the wetlands and open waters located on the west side of Chelsea Road.

Wetland B: Wetland flags B1 to B152 delineate the wetlands and open waters located on the east side of Chelsea Road. Additionally, areas of upland (i.e. remnant berms) were delineated within Wetland B where non-wetland conditions were noted. These upland areas are noted as areas C, D, E, F, G, H, I, J, and K. Delineated wetlands are under the jurisdiction of the U.S. Army Corps of Engineers and the NYSDEC.

SUMMARY OF DELINEATED WETLANDS

Wetland Line	Size (Acres)	Wetland Cover Type ⁽¹⁾	Comments
A	22.10	E1UBL, E2EM1N, E2EM5P, E2EM1Pd, E2EM1P, E2SS1P, E2US3P1	West of Chelsea Road
B	43.30	E1UBL, E2EM1N, E2EM5P, E2EM1Pd, E2EM1P, E2EM5Pd, E2SS1P, PFO1C, PFO1E	East of Chelsea Road

(1) Classification of wetlands based on field examination.

Classification under Cowardin 1979:

E1UBL	Estuarine, Subtidal, Unconsolidated Bottom, Subtidal
E2EM1N	Estuarine, Intertidal, Emergent, Persistent, Regularly flooded
E2EM1Pd	Estuarine, Intertidal, Emergent, Persistent, Irregularly flooded, partially drained/ditched
E2EM1P	Estuarine, Intertidal, Emergent, Persistent, Irregularly flooded
E2EM5P	Estuarine, Intertidal, Emergent, Narrow-leaved Persistent
E2SS1P	Estuarine, Intertidal, Scrub-Shrub, Broad Leaved Deciduous, Irregularly Flooded
E2US3P1	Estuarine, Intertidal, Unconsolidated Shore, Mud, Irregularly Flooded, Hyperhaline
E2EM5Pd	Estuarine, Intertidal, Emergent, Narrow-leaved Persistent, Partially Drained/Ditched
PFO1C	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded
PFO1E	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded/Saturated

Freshwater Wetlands - Freshwater wetlands within the project area exist as fringes and upper reaches beyond the tidal wetlands. A small palustrine forested freshwater wetland (PFO1C) is present between the upper tidal limits and upland area along the exit ramp of Route 440/West Shore Expressway in the southern section of the project area. This wetland is dominated by pin oak (*Quercus palustris*) and red maple (*Acer rubrum*). Other species observed include sweetgum (*Liquidambar styraciflua*), skunk cabbage, sweet pepperbush (*Clethra alnifolia*), poison ivy (*Toxicodendron radicans*), northern arrowwood (*Viburnum recognitum*), and common reed.

Tidal Wetlands - Tidal wetlands occur within the project area in association with Saw Mill Creek and its tributaries, and consist primarily of a mixture of subtidal creeks and intertidal marsh. Industrial/commercial

developments and transportation structures (railroad to the west, Route 440/West Shore Expressway to the east and south, and Edward Curry Avenue to the north) surround the tidal wetlands, with Chelsea Road bisecting the project area.

Saw Mill Creek is a steep-banked tidal creek that enters the project area from west of the rail line at the western project area boundary, flows east under the Chelsea Road bridge, and meanders through the eastern portion of the project area towards Route 440. As per NWI mapping, Saw Mill Creek is classified as Estuarine, Subtidal, Unconsolidated Bottom, Subtidal water regime (E1UBL). Portions of the tidal marsh have been filled in the past for roadways and commercial properties, and the remaining tidal marsh habitat contains linear ditches and remnants of filled areas and related berms. The majority of the ditches are completely exposed at low tide, while the bed of Saw Mill Creek remains inundated. Remnants of former berms were located east of Chelsea Road. Portions of the remnant berms remain high enough in elevation that they have been delineated as upland. However, much of the remnant berms have reverted to disturbed wetlands.

Intertidal marsh constitutes most of the tidal wetlands located in the project area. The majority of the intertidal marsh is irregularly flooded high marsh habitat. Vegetation in the high marsh community includes spike grass (*Distichlis spicata*), saltmeadow cordgrass (*Spartina patens*), smooth cordgrass (*Spartina alterniflora*), black grass (*Juncus gerardii*), and common reed. The low marsh community is dominated by smooth cordgrass along creek edges, in shallow ditches, and where lower elevations allow regular tidal flooding. Intertidal scrub-shrub habitat, consisting primarily of high tide bush (*Iva frutescens*), is scattered throughout the high marsh on both sides of Chelsea Road. Salt pannes are also present in depressions and pools of the high marsh surface. Vegetation associated with the pannes includes the short form of smooth cordgrass and glassworts (*Salicornia* spp.). Common reed, high tide bush, and groundsel tree (*Baccharis halimifolia*) are common within transition areas between wetlands and uplands. Common reed is dominant in the upper reaches of the marsh adjacent to roadways, uplands, and freshwater wetlands, and in some areas forms a dense monoculture.

3.4 Biological Resources Survey

A Biological Resources Survey of the Pilot Project Site and a one acre section of a nearby reference site is being conducted to assist with the restoration design. The survey includes a literature review and on-site assessments to identify and document fish and wildlife species, habitat and natural communities; evaluate the suitability of habitat for special status species; and assess habitat connectivity and wildlife corridors that may be present. The reference site is located north of the Pilot Project Site, north of the Williams-Transco underground natural gas pipeline and east of the railroad tracks. The reference site was selected as it near the Pilot Project Site, is ecologically similar to the Pilot Project site, but is functionally superior to the Pilot Project Site.

The survey will describe the vegetative species composition and habitat types present at the sites, discuss the value of each habitat type in terms of regional and local importance of each habitat type, and determine whether it is considered sensitive by state or federal agencies. A habitat cover type map will be developed for each site. A complete list of plant species identified at each site will be developed, including the habitat in which the plant species was identified, and any special status it may have (i.e. state threatened).

The survey will also assess the habitat connectivity between on and off-site lands at the Pilot Project and reference site. Based on mapping review and field inspections, the survey will describe existing connections, including estimated acreage, habitat types, and the species that are likely to use these connections. If a wildlife corridor is present, the width, length, adjacent land use, and species that are likely to use the corridor will be described. The Biological Resources Survey report will describe baseline site conditions to compare against post-construction monitoring and will assist in the development of performance measures. This data will be included in the MBI.

3.5 Fish and Wildlife Habitat

The primary habitat available to fish and wildlife within the project area consists of estuarine tidal wetland

habitat associated with Saw Mill Creek and its tributaries. Species expected to utilize the estuarine tidal wetland habitats present within the project area listed in Table B-1.

Table B-1. Anticipated Wildlife Utilization in Tidal Wetland Communities

Tidal Wetland Community	Common Name	Scientific Name
High marsh	salt marsh mosquitoes	<i>Aedes</i> spp.
	greenhead flies	<i>Tabanidae</i>
	grasshoppers	Suborder Caelifera
	spiders	Order Araneae
	salt marsh snail	<i>Melampus bidentatus</i>
	clapper rail	<i>Rallus longirostris</i>
	sharp-tailed sparrow	<i>Ammodramus caudacutus</i>
	marsh wren	<i>Cistothorus palustris</i>
	American black duck	<i>Anas rubripes</i>
	Northern harrier	<i>Circus cyaneus</i>
	muskrat	<i>Ondatra zibethicus</i>
Low marsh	clapper rail	<i>Rallus longirostris</i>
	willet	<i>Catoptrophorus semipalmatus</i>
	marsh wren	<i>Cistothorus palustris</i>
	seaside sparrow	<i>Ammodramus maritimus</i>
	Wading birds (egrets, herons)	Family Ardeidae
	fiddler crabs	<i>Uca</i> spp.
	ribbed mussel	<i>Geukensia demissa</i>
	mummichog	<i>Fundulus heteroclitus</i>
	sheepshead minnow	<i>Cyprinodon variegatus</i>
	Atlantic silverside	<i>Menidia menidia</i>
	Winter flounder (juvenile and larvae)	<i>Pleuronectes americanus</i>
	Bluefish (juvenile and larvae)	<i>Pomatomus saltatrix</i>
Salt shrub	marsh wren	<i>Cistothorus palustris</i>
Salt panne	mummichog	<i>Fundulus heteroclitus</i>
	sheepshead minnow	<i>Cyprinodon variegatus</i>
	Wading birds (egrets, herons)	Family Ardeidae

Source: Edinger, et al., 2002.; Niedowski 2000. Louis Berger & Assoc., P.C., 2013

Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Niedowski, Nancy. 2000. New York State Salt Marsh Restoration and Monitoring Guidelines. National Oceanic and Atmospheric Administration, prepared for the New York State Department of State & New York State Department of Environmental Conservation.

Wildlife species observed at the project area during field investigations include fish, most likely mummichog (*Fundulus heteroclitus*), marsh snail (*Melampus bidentatus*), ribbed mussel (*Geukensia demissa*), fiddler crabs (*Uca minax* and *Uca pugnax*), and diamondback terrapin (*Malaclemys terrapin*) within the tidal marsh habitat.

Feral cats (*Felis cattus*) were observed within upland areas of the project area. White-tailed deer (*Odocoileus virginianus*) were observed within upland and wetland areas of the project area.

Dragonflies (Order Odonata) and mosquitos, including the tiger mosquito (*Aedes albopictus*) were present within the project area. Spicebush swallowtail butterflies were observed in upland areas of the project area.

Bird species observed within the project area included snowy egret (*Egretta thula*), great egret (*Ardea alba*), marsh wren (*Cistothorus palustris*), swamp sparrow (*Melospiza georgiana*), belted kingfisher (*Ceryle alcyon*), red-winged blackbird (*Agelaius phoeniceus*), red-tailed hawk (*Buteo jamaicensis*), glossy ibis (*Plegadis falcinellus*), Canada goose (*Branta canadensis*), osprey (*Pandion haliaetus*), mallard (*Anas platyrhynchos*), and turkey vulture (*Cathartes aura*).

Historical fill, ditching, dumping, and invasion by nuisance plant species has degraded existing habitat quality within the project area, limiting habitat diversity and, therefore, decreasing wildlife species diversity. The goal of the Bank is to maximize the wetlands functions and services within the project area, particularly for wildlife habitat and water quality improvement. The project area's location designates it as an oasis for wildlife in a predominantly urban landscape, offering natural habitat in an area limited with such resources. The project area also serves as part of the Atlantic Flyway, providing a crucial stopover site for birds during their southbound migration in late summer and fall. The proposed wetland restoration and enhancement concept plan proposes to restore tidal hydrology to previously filled, hydrologically impaired, and *Phragmites*-dominated areas of the project area. In portions of the project area *Phragmites* has replaced native marsh plants species and its dense cover has adversely affected hydrology and, therefore, the use of open water and marsh surface by aquatic species. Implementation of Bank objectives would increase the heterogeneity of habitats, thereby allowing wildlife species diversity the opportunity to increase. Avian species, in particular, are found to be attracted to a variety of habitats in comparison to a single habitat type. The combination of mud flat, open water, low marsh, high marsh, and scrub-shrub proposed for the site would provide the diversity of habitat types needed to support a variety of wildlife species, whether on a migratory stopover or as a resident. Restoring the tidal flow to previously filled or degraded areas would allow fish, shellfish, and aquatic invertebrate species to use the tidal channels and provide valuable foraging opportunities for bird species along mudflats during low tide.

3.6 Threatened and Endangered Species

Louis Berger conducted a literature review and Natural Heritage Program database records search to identify the existence or potential occurrence of special status species and significant communities on or in the vicinity of the project area. Louis Berger requested information from NYSDEC Natural Heritage Program (DEC NHP) and the United States Fish and Wildlife Service (USFWS) regarding the potential presence of any federal and/or state threatened, endangered, proposed or candidate species in the vicinity of the project area, as well as any other species or habitats of special concern. Species information received from DEC NHP and USFWS is summarized in Table B-2.

Table B-2. Summary of State and Federal Listed Species

DEC NHP	Common Name	Scientific Name	NY State Listing	Heritage Conservation Status	Type of Use
T&E documented at or near the site, generally within 0.5 mile	Least bittern	<i>Ixobrychus exilis</i>	Threatened		
	Pied-billed grebe	<i>Podilymbus podiceps</i>	Threatened		
Rare animals documented at or in vicinity of site	Cattle egret	<i>Bubulcus ibis</i>	Protected bird	Imperiled in NYS	breeding
	Glossy ibis	<i>Plegadis falcinellus</i>	Protected bird	Imperiled in NYS	breeding
	Little blue heron	<i>Egretta caerulea</i>	Protected bird	Imperiled in NYS	breeding
	Snowy egret	<i>Egretta thula</i>	Protected bird	Imperiled in NYS	breeding
	Yellow-crowned night-heron	<i>Nyctanassa violacea</i>	Protected bird	Imperiled in NYS	breeding
	Southern leopard frog	<i>Lithobates sphenoccephalus</i>	Special concern	Critically imperiled in NYS	breeding
Plants listed as Endangered or Threatened	Nantucket juneberry	<i>Amelanchier nantucketensis</i>	Endangered	Critically imperiled in NYS	
	Persimmon	<i>Diospyros virginiana</i>	Threatened	Imperiled in NYS	
	Rose pink	<i>Sabatia angularis</i>	Endangered	Critically imperiled in NYS	
	Sweetbay magnolia	<i>Magnolia virginiana</i>	Endangered	Critically imperiled in NYS	
Rare species with historical records at the site or in the vicinity	Eastern mud turtle	<i>Kinosternum subrubrum</i>	Endangered	Critically imperiled in NYS	
	Log fern	<i>Dryopteris celsa</i>	Endangered	Critically imperiled in NYS	
	Orange fringed orchid	<i>Platanthera ciliaris</i>	Endangered	Critically imperiled in NYS	
USFWS	Common Name	Scientific Name	Federal Listing		
Species may occur within the project boundary and/or may be affected by project	Piping plover	<i>Charadrius melodus</i>	Threatened		
	Roseate tern	<i>Sterna dougallii dougallii</i>	Endangered		

The USFWS Long Island Ecological Services Office was contacted through the Information, Planning, and Conservation System (IPac) regarding the potential presence of species under the jurisdiction of the USFWS within the project area. The USFWS list indicates that the following threatened and endangered species may occur within the project area: piping plover (*Charadrius melodus* – threatened) and roseate tern (*Sterna dougallii dougallii* – endangered).

Piping plover: The piping plover is a small shorebird weighing 1.5 to 2.25 ounces and is 5.5 inches long. Piping plover forage on beaches, dunes and in tidal wrack. Piping plovers breed on dry sandy beaches or in areas that have been filled with dredged sand, often near dunes in areas with little or no beach grass. They occur along the Atlantic Coast from southwestern Newfoundland and southeastern Quebec south to North Carolina. In New York, this species breeds on Long Island's sandy beaches, from Queens to the Hamptons, in the eastern bays and in the harbors of northern Suffolk County. Habitat is only found at the shoreline, on barrier islands, sandy beaches and dredged material disposal islands. Potential suitable habitat for piping plover was not observed within the project area.

Roseate tern: The roseate tern is 14 to 17 inches long, with a wingspan of about 30 inches. Roseate terns feed primarily on American sand lance, a small marine fish. In New York, roseate terns are found nesting with common terns. The nest may be only a depression in sand, shell or gravel, and may be lined with bits of grass and other debris. The roseate tern breeds along the coasts of the Atlantic, Pacific and

Indian Oceans on salt marsh islands and beaches with sparse vegetation. In eastern North America, it breeds from the Canadian Maritime Provinces south to Long Island. In New York, this species breeds only at a few Long Island colonies. Potential suitable habitat for roseate tern was not observed within the project area.

DEC NHP indicates that the following threatened species have been documented at or near the project site, generally within 0.5 miles: Least Bittern (*Ixobrychus exilis*-state threatened) and Pied-billed grebe (*Podilymbus podiceps*-state threatened).

Least Bittern: The least bittern is the smallest member of the Ardeidae (heron) family in North America at just 13 inches in length, a wingspan of 17 inches, and an average weight of just three ounces. They are extremely secretive birds. Least bitterns initiate nesting in New York in late May to early June. In prime marsh habitat, least bitterns may nest in small groups of up to 15 pairs per hectare (≈ 2.5 acres). Least bitterns feed primarily on small fish, such as minnows, sunfish and perch. Additionally, they rely upon insects (such as dragonflies and beetles), snakes, frogs, tadpoles, salamanders, crayfish and some small mammals. Least bitterns occur in freshwater and brackish marshes with tall, dense emergent vegetation such as cattails, sedges, and rushes that are interspersed with clumps of woody shrubs and open water. In New York, least bitterns thrive in the large, expansive cattail marshes associated with the Great Lakes, the Finger Lakes, Lake Champlain, and the St. Lawrence and Hudson River Valleys. There is potential habitat for the least bittern in the project area.

Pied-Billed Grebe: The pied-billed grebe is a small waterbird measuring approximately 11 to 15 inches in total length, with a 20 to 22.5 inch wingspan and average weight of just 0.75 to 1.0 pound. In New York, pied-billed grebe breeding records are scattered across the state but are most abundant in marshes associated with the St. Lawrence River Valley and Lake Ontario. Pied-billed grebes nest in freshwater marshes associated with ponds, bogs, lakes, reservoirs, or slow-moving rivers. Breeding sites typically contain fairly deep open water at depths 0.8 – 6.6 ft interspersed with submerged or floating aquatic vegetation and dense emergent vegetation. Pied-billed grebes occupy a greater diversity of habitats during the non-breeding season including freshwater ponds, impoundments, lakes, rivers, brackish marshes, estuaries, inlets and coastal bays. There is potential non-breeding habitat for the pied billed grebe in the project area, but breeding habitat is not found in the project area.

DEC NHP also reported that the following animals, while not listed by New York State as Endangered or Threatened, are of conservation concern to the state, and are considered rare by DEC NHP: cattle egret (*Bubulcus ibis*), glossy ibis (*Plegadis falcinellus*), little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*), yellow-crowned night-heron (*Nyctanassa violacea*), and southern leopard frog (*Lithobates sphenoccephalus*).

The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by DEC NHP: Nantucket juneberry (*Amelanchier nantucketensis*), rose-pink (*Sabatia angularis*), and sweetbay magnolia (*Magnolia virginiana*) are listed as Endangered; and persimmon (*Diospyros virginiana*) is listed as Threatened.

DEC NHP reports that the eastern mud turtle (*Kinosternon subrubrum*), and two vascular plants, log fern (*Dryopteris celsa*) and orange fringed orchid (*Platanthera ciliaris*), all listed as Endangered in New York State, have been documented in the vicinity of the project area at one time, but have not been documented since 1979 or earlier, and/or there is uncertainty regarding their continued presence.

According to NYSDEC Environmental Resource Mapper, old or potential records exist of rare plants and animals within 0.5 mile of the project area. Rare plant species recorded include orange fringed orchid (*Platanthera ciliaris*), Hyssop-skullcap (*Scutellaria integrifolia*), slender crabgrass (*Digitaria filiformis*), wild comfrey (*Cynoglossum virginianum* var. *virginianum*), Collin's sedge (*Carex collinsii*), and log fern (*Dryopteris celsa*). Rare animal species recorded include the eastern mud turtle (*Kinosternon subrubrum*), northern cricket

frog (*Acris crepitans*), the American burying beetle (*Nicrophorus americanus*), and the three following species of dragonfly: the mocha emerald (*Somatochlora linearis*); the Rambur's forkail (*Ischnura ramburii*); and the Needham's skimmer (*Libellula needhami*). The records listed are only potential areas for rare animals or rare plants. For these historical records, it is not known whether the rare plant or animal still exists at these locations. However, the rare plant or animal listed in the record may still occur in the area if habitat and site conditions are favorable.

Louis Berger conducted biological field surveys to determine the presence of any special status species and conducted habitat suitability assessments to determine the potential for special status flora and fauna to occur within the project area. Special attention was focused on special status flora and fauna identified through the literature review conducted prior to the field surveys. No special status flora and fauna were encountered or detected by sign within the project area.

3.7 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996, requires all federal agencies to consult with NOAA National Marine Fisheries Service (NMFS) on all actions, or proposed actions (i.e., permitted, funded, or undertaken by the agency), that may adversely impact Essential Fish Habitat (EFH). EFH is defined as waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. NMFS is required to make EFH conservation recommendations to both state and federal agencies whose actions may adversely affect EFH. EFH for 17 species has been designated in the area. To determine if their EFH exists on the site, the lead federal action agency will compare the characteristics of the site (depths, salinities, etc.) with the EFH designation information. It is likely that water depths on the site are too shallow to be considered EFH for some species such as red hake and others.

3.8 Significant Natural Communities

The New York Natural Heritage Program tracks locations of significant natural communities because they serve as habitat for a wide range of plants and animals, both rare and common, and because community occurrences in good condition support intact ecological processes and provide ecological value and services. Significant natural communities include rare or high-quality wetlands, forests, grasslands, ponds, streams, and other types of habitats, ecosystems, and natural areas. Two significant natural communities within the vicinity of the project area are recorded in the New York Natural Heritage Program's Biodiversity Database. A red maple-sweetgum swamp is located approximately 0.25 mile east of the project area and a maritime post oak forest is located approximately 0.5 mile north east of the project area.

The red maple-sweetgum swamp's NHP conservation status is "High Quality Occurrence of Rare Community Type" and is described as moderate size, mature, with a minimally disturbed core and less than one percent cover of exotic plants. It is considered vulnerable in its urban setting and has little connectivity to natural landscape.

The maritime post oak forest's NHP conservation status is "Rare Community Type" and is described as a small, but unusual mature occurrence with a minimally disturbed core. It is considered vulnerable in its urban setting with connectivity to only small forested landscape.

4.0 CULTURAL RESOURCES SURVEY

For the proposed Bank and following the 2012 CEQR technical manual (Section 9.320), Louis Berger submitted a written description of the project to the New York City Landmarks Preservation Commission (LPC). LPC has completed an initial environmental review of the proposed project area's lots and indicated that all lots possess archaeological significance and will require the completion of an archaeological documentary study for the proposed wetland mitigation bank site. LPC states that the project area's lots possess the potential for the recovery of archaeological deposits from the 19th century and Native American occupation along with prior

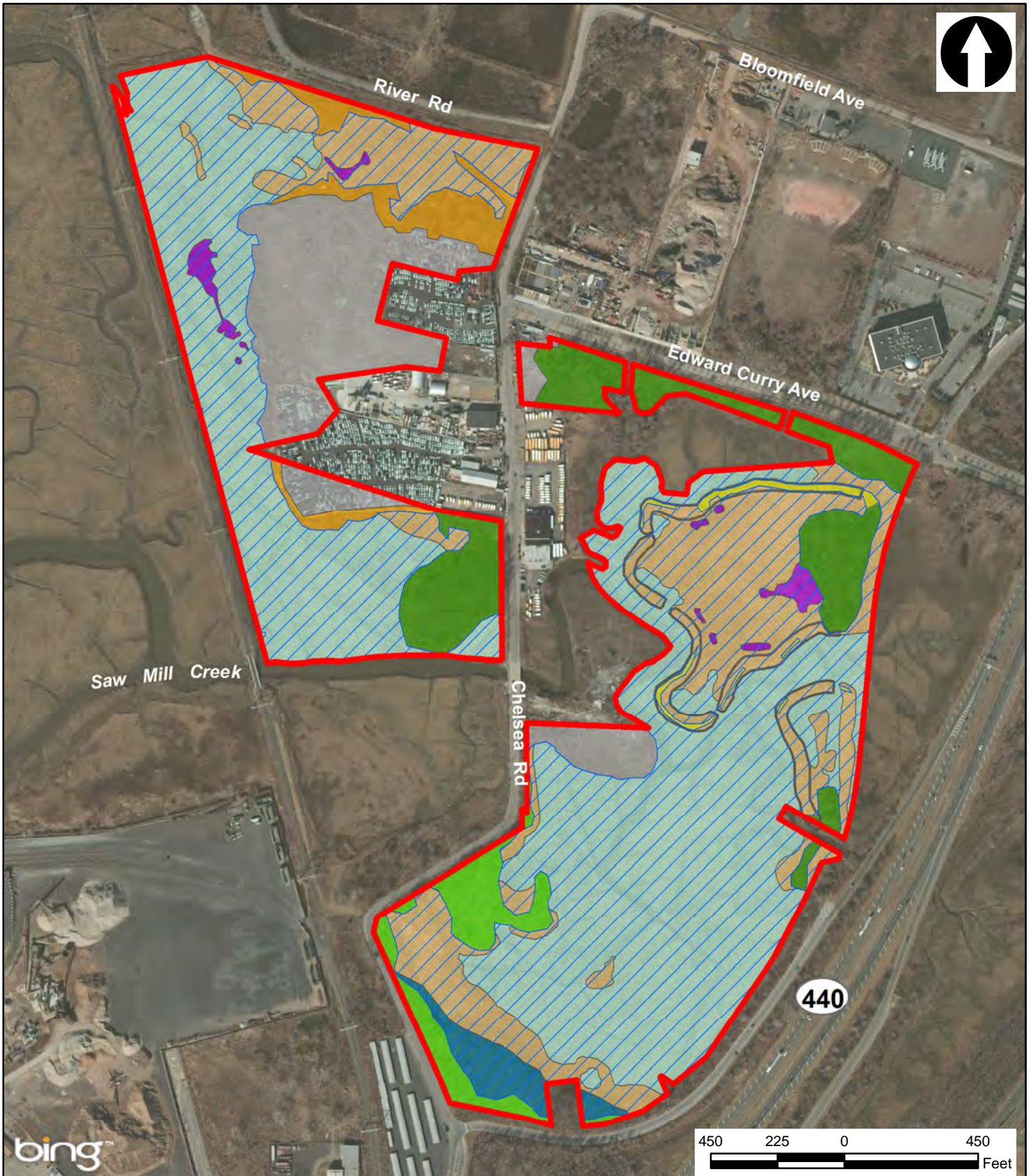
knowledge of human burials from the project site. NYCEDC's consultants are conducting an archaeological documentary study to determine whether intact archaeological resources might exist on the site and what they inform about the past. The documentary study's findings will provide a basis for deciding whether archaeological field work is needed.

5.0 FEDERAL AVIATION ADMINISTRATION COORDINATION

Per Advisory Circular 150/5200-33 *Hazardous Wildlife Attractants On or Near Airports*, the Federal Aviation Administration (FAA) recommends a separation distance of 10,000 feet for any potential hazardous wildlife attractant for airports that serve turbine-powered aircraft. The FAA also recommends a distance of 5 miles between the farthest edge of the airport's air operations area and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace. The project area is within 5 miles of Linden Airport and Newark Liberty International Airport, but is outside of the 10,000-foot separation criteria for both airports. Coordination with the FAA is ongoing to ensure that the Bank does not affect airport safety by creating a hazardous wildlife attractant or increasing the wildlife hazards for either airport.

6.0 CONCLUSIONS



All information collected to date indicates that the site is ecologically suited to be established as a wetland mitigation bank.



Sources: Image courtesy of USGS, Microsoft Corporation 2013;
Approximate Delineation and Cover Types, Berger 2013.

Legend

 	General Project Area	 	Successional shrubland
 	Delineated Wetland (Non-surveyed)	 	Successional southern hardwood
 	Remnant Berm	 	Chestnut oak forest
 	Tidal marsh	 	Phragmites upland
 	Red maple-sweetgum swamp	 	Urban vacant lot
 	Phragmites wetland		
 	Panne		

 New York City Economic Development Corporation	
Saw Mill Creek Wetland Mitigation Bank Staten Island, New York Wetland Delineation & Habitat Cover Types	
 Louis Berger & Assoc, PC	August 2013 Figure B-1

SAW MILL CREEK PILOT WETLAND MITIGATION BANK

PROSPECTUS - EXHIBIT C

CONCEPTUAL DESIGN PLAN

1.0 Overview

The purpose of the project is to pilot a Wetland Mitigation Bank (Bank) in New York City. As the Bank Sponsor, the City of New York will restore, enhance, and maintain a portion of 91.1 acres of emergent wetlands, scrub shrub wetlands, forested wetlands, open water channels/pools, mudflat habitat, and uplands on Staten Island in accordance with the provisions of a MBI (to be developed) and regulatory permits (to be obtained). It is anticipated that the Bank will be established in two Phases, with Phase 1 of the Bank established first and Phase 2 of the Bank established later. The portions of the project area to be included in Phase 1 and Phase 2 of the Bank will be determined once topography, soils, hydrology, vegetation and other studies are completed.

The City of New York has developed a preliminary concept plan for the Bank which is described below. The design plan will be further developed once the ongoing site studies are completed. The City of New York may elect to exclude portions of the 91.1 acre project area in the Bank, but will include as much of the area as practical and cost-effective. Therefore, the following discussion focuses on the approach to restoring/enhancing the entire project area with the understanding that some parts of the project area may not be included in the Pilot Bank. No buildings, structures and other built features are expected to remain on the Bank site after construction. Upon construction completion, signed and sealed as-built drawings will be submitted to the IRT for review and approval.

The proposed site provides a significant tidal wetland restoration opportunity in New York City and in the NYSDEC Atlantic Ocean/Long Island Sound Watershed and the HUC08 Sandy Hook-Staten Island subbasin (02030104). It is anticipated that the pilot bank will provide the following wetland functions and services:

- Improved water quality,
- Improved flood attenuation;
- Improved sediment quality,
- Increased plant diversity, and
- Increased wildlife species abundance and diversity.

It is anticipated that the restoration will be comprised of the elements described below, with the understanding that the final restoration design will be dependent on the results of the ongoing field studies and agency comments. The first goal is to restore and maintain targeted tidal hydrology by restoring tidal flow with new tidal creeks. The second goal for the restoration design is to provide the correct site topography to support the desired tidal marsh vegetation and features. Once appropriate tidal hydrology and topography are established on the site, the next goal is to establish native vegetation and habitat. To encourage native plants, an invasive species control plan will be implemented, followed by the planting of native saltmarsh species. In addition to the proposed plantings, additional native species, such as salt marsh fleabane (*Pluchea odorata*, *P. purpurescens*), are anticipated to colonize the site. The growth of these native species will be encouraged, while the growth of invasive species, such as *Phragmites australis* (common reed), will be discouraged by the select application of an EPA-approved herbicide and by establishing a more natural tidal hydrology.

The final goal for the restoration design is to maximize wetland functions and services, particularly for wildlife habitat and water quality improvement. The site's location designates it as part of the Atlantic Flyway, providing a crucial stopover site for birds during their southbound migration in late summer and fall. It also serves as an oasis for wildlife in a predominantly urban watershed, offering natural habitat in a watershed limited with such resources. The dominance of *Phragmites* throughout portions of the site has created a monoculture of habitat, which limits habitat and decreases wildlife species diversity. *Phragmites* has replaced native plant species and its dense cover has

adversely affected hydrology and the use of open water and marsh surface by aquatic species. By restoring the marsh to contain heterogeneity of habitats, wildlife species diversity will improve. Avian species, in particular, are found to be attracted to a variety of habitats in comparison to a single habitat type. The combination of mud flat, open water, low marsh, high marsh, and scrub-shrub proposed for the site would provide the diversity of habitat types needed to support a variety of wildlife species, whether on a migratory stopover or as a resident. Restoring tidal flow allows fish, shellfish, and aquatic invertebrate species to use the tidal channels and provide valuable foraging opportunities for bird species along mudflats during low tide.

2.0 Conceptual Restoration Design Plan

The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR 332.2) defines “restoration” as the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation. Re-establishment means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions. Rehabilitation means the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Based on the mitigation definitions from the NYSDEC *Guidelines on Compensatory Mitigation*, “restoration” means reclaiming a degraded wetland to bring back one or more functions that have been partially or completely lost by such actions as filling or draining. It is the preferred form of mitigation because it typically has the greatest chance of successfully establishing natural wetland functions.

In accordance with the federal and state definitions, the proposed Bank will restore former and degraded wetlands to natural/historic functions. The wetland concept plan proposes to restore tidal hydrology to previously filled, hydrologically impaired, and *Phragmites*-dominated portions of the project area. The restoration design strives to maximize ecological restoration and avoid indirect impacts to adjacent properties. As part of the design process, technical studies were undertaken to assess topography, tidal elevations, and other features. A New York State licensed land surveyor conducted a survey to develop a surface topographic map that will be used as the basis of the design plans. Bio-benchmark surveys of key vegetative communities were performed to aid in determining target wetland planting elevations, which dictate design grades. Hydrologic and hydraulic analyses have been initiated and are ongoing. Final design elevations and optimal habitat ranges will be determined through integration of the bio-benchmark and hydrology data and incorporation of project goals and site/constructability constraints.

Restoration of ditched, filled, and/or degraded wetland and upland areas to a high level of function shall be accomplished by a combination of practices, including removal of remnant berms and other fill material, regrading to suitable tidal marsh elevations, restoration of tidal creeks, treating non-native invasive species with an EPA-approved herbicide for use in aquatic habitats, and replanting with native vegetation similar to those listed in Table C-1. The design will be conducted in accordance with the *New York State Salt Marsh Restoration and Monitoring Guidelines* and the *Native Species Planting Guide for New York City and Vicinity*. Additional tidal creeks will be constructed to convey tidal flows to support native low and high marsh vegetation and to serve as a barrier to *Phragmites* invasion from surrounding areas.

Portions of the site will also be enhanced. *The Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (33 CFR 332.2) defines “enhancement” as the manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). The concept restoration and enhancement plan is described in the following sections and the proposed habitats are depicted on Figure C-1.

Table C-1. Anticipated Species to be Planted at Bank

Planting Zone	Scientific Name (Common Name)
Low Marsh	<i>Spartina alterniflora</i> (smooth cordgrass)
High Marsh	<i>Distichlis spicata</i> (spike grass)
	<i>Spartina patens</i> (saltmeadow cordgrass)
	<i>Spartina alterniflora</i> (smooth cordgrass)
	<i>Juncus gerardii</i> (black grass)
Scrub-Shrub Wetland	<i>Baccharis halimifolia</i> (groundsel tree)
	<i>Iva frutescens</i> (high tide bush)

2.1 Project Area West of Chelsea Road

Wetland Restoration (Re-establishment)

Much of the central portion of the western section consists of construction/demolition debris and other fill material over former marshlands. This material will be removed and the area graded to low and high marsh elevations, tidal creeks will be excavated to restore tidal flow and circulation, and the marsh plain will be planted with appropriate native salt marsh grasses and shrubs. Sampling studies are being conducted to determine if the fill material in this area is contaminated. If the soil and groundwater sampling indicates an area of concern, the area will be over-excavated and backfilled with a clean sand cap to create a clean substrate for the marsh plain. The area will then be planted with native salt marsh species.

Wetland Restoration (Rehabilitation)

The northeast and southern portions of the western parcel are dominated by fill and invasive *Phragmites*. Survey data indicates that elevations in this area are too high to support salt marsh species and this area will be excavated to achieve suitable elevations to support a tidal salt marsh. Debris and fill material will be removed and the area graded to low and high marsh elevations, tidal creeks will be excavated to restore tidal flow and circulation, and the marsh plain will be planted with appropriate native salt marsh grasses and shrubs. Sampling studies are being conducted to determine if the fill material in this area is contaminated. If the sediment sampling indicates an area of concern, the area will be over-excavated, backfilled with a clean sand cap and planted with native salt marsh species.

Wetland Enhancement

Parts of the project area consist of low and high marsh, as well as several pannes. Based on conditions within the proposed Bank boundary, it is expected that *Phragmites* will continue to be the primary invasive species threatening wetland habitats. To prevent the decline of these aquatic resources, *Phragmites* would be managed during the life of the Bank in low and high marsh habitats through spot applications of an EPA-approved herbicide. In addition, these marshes are threatened by the pervasive dumping in the area. Existing debris in these areas will be removed. By enhancing these wetlands as part of a mitigation bank, the threat of illegal filling and dumping is minimized. The design will include impediments to dumping to the maximum extent possible. Subsequent to site construction and planting, the site will be posted and frequently inspected.

Buffer Rehabilitation

The forested buffer within the western section adjacent to Saw Mill Creek and Chelsea Road is currently dominated by invasive species and debris. This area contains Hurricane Sandy storm surge-driven debris as well as historic debris such as tires, plastic containers, and other floatable debris. This forest will be rehabilitated through removal of debris and non-native, invasive species that compromise native diversity and wildlife usage. Target invasive species include, but are not limited to, *Polygonum cuspidatum* (Japanese knotweed), *Celastrus orbiculatus* (Oriental bittersweet), and tree-of-heaven. These and other dominant non-native invasive species will be managed through the application of an EPA-approved herbicide for use in aquatic habitats and by the seeding and/or planting of select

native species. Subsequent to site construction and planting, the site will be posted and frequently inspected to discourage dumping.

2.2 Project Area East of Chelsea Road

Wetland Restoration (Re-establishment)

The concept plan for the former junkyard area located south of Saw Mill Creek and east of Chelsea Road (urban vacant lot) consists of removing existing debris (tires, cement, asphalt, etc.) and excavating the fill to a target elevation that will support low and high marsh. Sampling studies are being conducted to determine if the fill material in this area is contaminated. If the soil and groundwater sampling indicates an area of concern, the area will be over-excavated, backfilled with a clean sand cap and planted with native salt marsh species. Portions of remnant berms located in this area consist of *Phragmites* and *Ailanthus altissima* - (tree of heaven) dominated uplands. These berms will be removed and the area will be graded to an appropriate marsh plain elevation and planted with native salt marsh species.

Wetland Restoration (Rehabilitation)

This area consists of *Phragmites*-dominated remnant berms and elevations that are too high to support salt marsh species. Restoration of this area will consist of excavating and grading the area to achieve proper tidal marsh elevations and excavating tidal creeks to provide hydrology. Sampling studies are being conducted to determine if the fill material in this area is contaminated. If the sediment sampling indicates an area of concern, the area will be over-excavated, backfilled with a clean sand cap and planted with native salt marsh species. The marsh plain will be planted with appropriate native salt marsh grasses and shrubs.

A barren panne located east of an island in the northeast corner of the eastern section only holds water at its western extremity. The Concept Plan includes improvements to the habitat and function of this area by excavating and grading the area to establish appropriate depth for fish species occurring in pannes (i.e. mummichogs) and establishing connections with tidal creeks at elevations that would allow flooding of the panne only during spring tides.

Areas dominated by *Phragmites* in the southern portion of the eastern section will be graded to proper salt marsh elevations and natural creeks reestablished, and the marsh plain planted with appropriate native salt marsh grasses and shrubs. This area will be managed for any reinvasion by *Phragmites* through select application of an EPA-approved herbicide for use in aquatic habitats.

Wetland Enhancement

Parts of the project area consist of low and high marsh, as well as several pannes. Based on conditions within the proposed Bank boundary, it is expected that *Phragmites* will continue to be the primary invasive species threatening wetland habitats, especially in the eastern section where there are several freshwater inputs. To prevent the decline of these aquatic resources, *Phragmites* will be managed during the life of the Bank in low and high marsh habitats by spot applications of an EPA-approved herbicide. Existing debris will be removed.

A red maple-sweetgum swamp located within the southern portion of the eastern section contains some storm surge debris that will be removed to enhance habitat quality and function. To prevent the decline of this aquatic resource, *Phragmites* encroachment into this area will be managed through select application of an EPA-approved herbicide.

In addition, these marshes are threatened by the pervasive dumping in the area. By enhancing these wetlands as part of a mitigation bank, the threat of illegal filling and dumping is minimized. The design will include impediments to dumping to the maximum extent possible. Subsequent to site construction and planting, the site will be posted and frequently inspected.

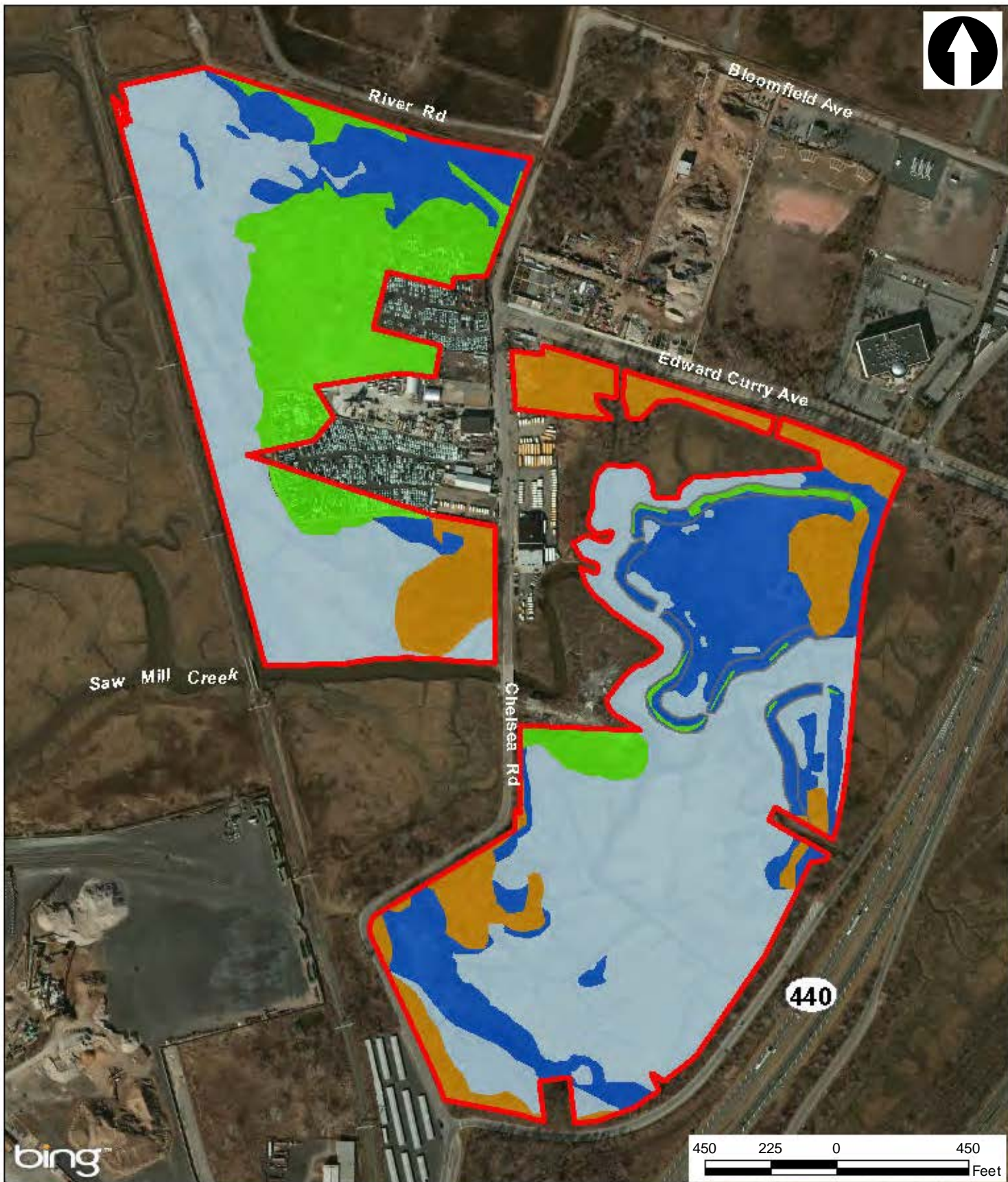
Buffer Rehabilitation

Forested buffers within the eastern section will be rehabilitated through removal of debris and non-native, invasive species that compromise native diversity and wildlife usage. Target invasive species include, but are not limited to,

Polygonum cuspidatum (Japanese knotweed), *Celastrus orbiculatus* (Oriental bittersweet), and tree-of-heaven. These and other dominant non-native invasive species will be managed through the application of an EPA-approved herbicide for use in aquatic habitats and by the seeding and/or planting of select native species. Subsequent to site construction and planting, the site will be posted and frequently inspected to discourage dumping.

3.0 Sea Level Rise

In the aftermath of Hurricane Sandy, it is important to plan for sea level rise (SLR) impacts in designing tidal wetland restoration projects. To support the project design, Louis Berger will calculate the low, medium, and high rates of relative SLR at the site at five-year intervals for a period of 50 years from the assumed 2014 project start date, under both build scenario and the no-build scenario. Predicted hydrology will be incorporated into project plans produced in the subsequent design tasks. Levels for mean low water (MLW), mean high water (MHW), and mean high water spring (MHWS) (with the sea level rates incorporated) will be calculated to provide the data for a subsequent impact analysis. Based on the results, design or operations and maintenance measures that should be implemented to minimize adverse consequences of SLR while maximizing beneficial effects will be identified.



Sources: Image courtesy of USGS, Microsoft Corporation 2013; Concept Plan, Berger 2013.

Legend

- General Project Area
- Remnant Berm
- Buffer Rehabilitation
- Wetland Restoration (Re-establishment)
- Wetland Restoration (Rehabilitation)
- Wetland Enhancement

 <small>New York City Economic Development Corporation</small>	
Saw Mill Creek Wetland Mitigation Bank Staten Island, New York Concept Plan	
 Louis Berger & Assoc, PC	October 2013 Figure C-1

