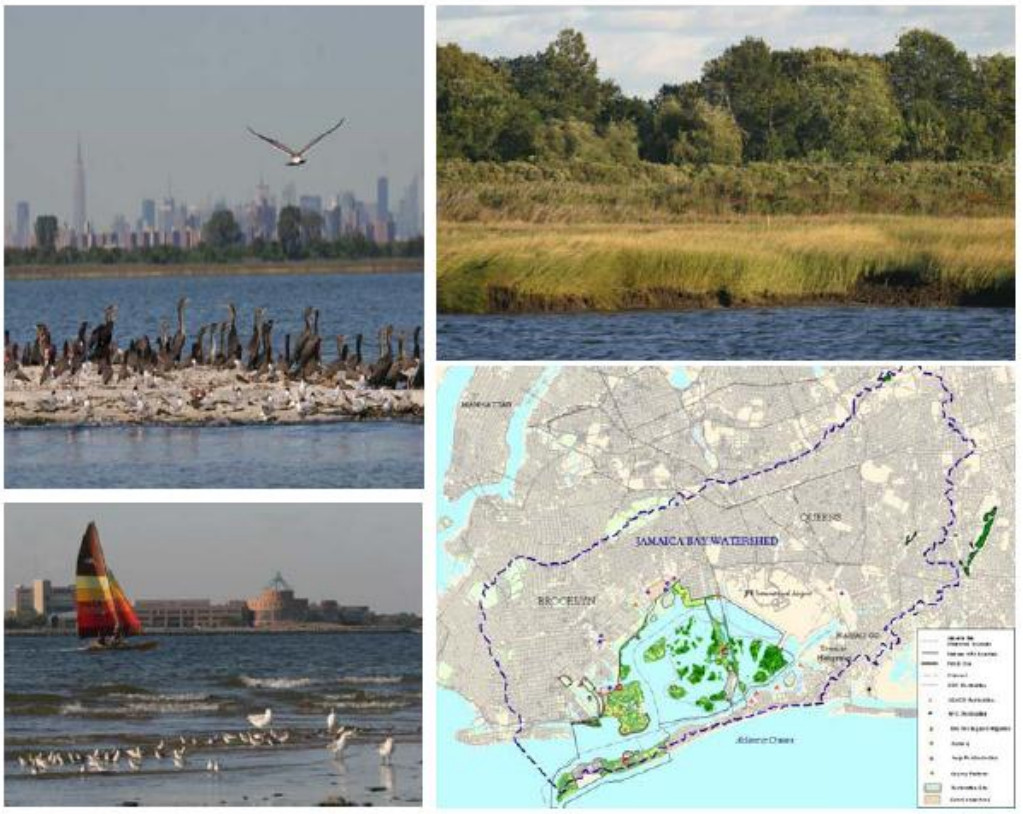

Jamaica Bay Watershed Protection Plan 2012 Update

New York City Department of Environmental Protection
Carter H. Strickland, Jr., Commissioner
October 1, 2012

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Jamaica Bay Watershed Protection Plan Update 2012

1. WATER QUALITY

***The matrix includes blacklined text for several implementation strategies that have been modified based on updated information.**

Reduce Nitrogen Loading to the Tributaries and Jamaica Bay				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Nitrogen Reduction & Other	*Jamaica Bay WWTP Upgrades* ~~*Carbon Addition*~~ ~~*Interim Carbon Addition*~~	Improve the overall ecology of Jamaica Bay by reducing nitrogen discharges from Jamaica Bay's WWTPs. Landmark agreement set out in negoiations with DEC and environmental stakeholder groups with respect to nitrogen loading reductions is pending submittal and approval. This first phase of the 26th Ward WWTP upgrade will reduce nitrogen discharges by more than 4,000 pounds per day, or 10% of the total nitrogen discharges from treatment plants into the bay.	DEP has continued its efforts under the February 2010 agreement with the New York State Department of Environmental Conservation (DEC), to improve the ecology of the bay, to improve overall water quality and to mitigate marshland loss in Jamaica Bay through a total of $115 million in new investments, including $15 million for salt marsh restoration projects around the bay.	See attached status report.
	Minimize Centrate Processing from other WWTPs in Jamaica Bay	DEP will continue its efforts to minimize transshipment of sludge for processing in Jamaica Bay.	DEP continues to limit shipments.	DEP submitted Sludge management Plan and certified in Dec 2011 that all Jamaica WWTP centrate will be processed at the 26th Ward WWTP.
	Sea Lettuce Harvesting Pilot	DEP skimmer boats used to harvest sea lettuce where it amasses in the waters of Jamaica Bay to determine if this approach is feasible and to chemically analyze sea lettuce for its use as biofuel.	Pilot investigations were completed in 2010 and draft report is in production.	See attached status report.
	Algal Turf Scrubbers Pilot	An ATS was constructed at the Rockaway WWTP. This technology will use algae to filter WWTP effluent for nutrient removal and as a source for biofuel.	Construction of ATS operational testing began o=in September 8, 2010. Extensive data gather was performed in 2011. Limited data gathering program being conducted in 2012 to fill a few data gaps.	See attached status report.
	Oyster Bed Pilot	A small oyster bed and a field of reef balls will be placed within Jamaica Bay to evaluate oyster growth, survival, reproduction, water quality and ecological benefits given existing environmental conditions in the bay.	Construction of a reef bed near Dubos Point and reef balls in Gerritsen Creek was performed October 2010. Monitoring of both systems is still ongoing. Oyster growth, health and density is being monitored.	See attached status report.

	Ribbed Mussel Pilot	Several artificial structures will be constructed to encourage the growth of ribbed mussels within one of the tributaries of Jamaica Bay. The study will monitor mussel growth to measure the effectiveness of ribbed mussels in removing nutrients and particulate organic matter from the water.	Construction was performed in late 2011 giving the systems time to acclimate prior to the beginning of 2012 spawning season. Monitoring is occuring regularly to maintain the system and inspect it for presence and density of ribbed mussels.	See attached status report.
Reduce CSO and Other Discharges to Improve Pathogen and DO levels				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Sewer System Maintenance	*Expanded Sewer Cleaning Program*	Clean sewers more proactively. Use newly purchased vactor trucks to continue cleaning lateral sewer system to remove sediment and debris. Launch an enhanced fats, oil and grease enforcement and inspection program to keep sewers clean.	Ongoing	In June, 2010, DEP announced the interceptor sewer cleaning project and set an ambitious timeline to survey all 136 miles of interceptor sewers and clean blockages. In June 2012 DEP completed a two-year sewer cleaning project aimed at increasing flow capacity and reducing the discharge of untreated wastewater into New York's waterways. More than 26 miles of pipe cleaned and nearly 29 million pounds of debris removed. Improved capacity will reduce combined sewer overflows by nearly 100 million gallons annually.
	26th Ward/Fresh Creek Combined Sewer and Interceptor Cleaning	Clean sediment in 26th Ward WWTP drainage area.	Cleaning was completed in June 2010.	Completed; cleaning removed approximately 15,000 tons of debris.
	Expanded Interceptor Inspection and Maintenance	Inspection program to determine cleaning and maintenance needs throughout the City.	Inspection of of all the NYC city interceptors has been completed.	Cleaning of all the interceptors will be completed in 2012.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Sewer Improvements	*26th Ward 50 MGD Expansion*	Increase wet weather capacity from 170 MGD to 220 MGD.	After a reevaluation of the expansion concept, DEP has determined that a more feasible approach will be to construct high level storm sewers in a portion of the drainage area; to conduct green infrastructure in the drainage area; and to improve influent pumping and priimary treatment capabilities at the 26th Ward WWTP.	Expansion eliminated and revised commitments incorporated into modified CSO Consent Order.
	Paerdegat CSO Detention	50 MGD facility to capture CSOs.	Construction completed and facility operational since mid-2011.	Completed.

Inflow/Infiltration Study with Corrective Measures	Identify and resolve sewer system anomalies.	Began in July 2010 using DEP in-house resources.	Study focused only within Coney Island drainage area.
Regulators in Bergen Basin	Modifications to Regulators 3 and 4 to reduce CSO overflows and a new 48" conveyance sewer under the Belt Parkway to bring wet weather flow to the Jamaica WWTP.	Project in design.	
Complete Storm Sewer Build out in Rockaways	Storm sewer construction in the Rockaways.	Total of 18 projects identified; 2 are in construction, designs of 8 are nearly complete with construction pending and 8 are in early design. Additional projects are currently being identified and scoped.	Total of 18 projects identified; 9 are constructed or in construction and 9 are in various stages of design. Additional projects are currently being identified and scoped.
Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Southeast Queens Drainage Plan	Sewer modifications to convert existing system to a mainly separated system with High Level Storm Sewers in the Laurelton area.	The drainage plans are complete. Project in Twin Ponds and Springfield Park areas near design completion.	The drainage plans are complete. Design is complete for Springfield Park and is in construction. Twin Ponds is in the design phase. Currently identifying additional storm sewer projects for design and construction.
Warnerville / Meadowmere Sewer Project	On February 17, 2010 DEP announced the completion of a project that will allow homeowners in the Meadowmere and Warnerville sections of southeast Queens, along Jamaica Bay, to connect to the City's sewer system.	Certified construction completion July 31, 2009. Of 85 homeowners, 67 have connected to system (79%) , 1 is under construction, 6 are obtaining permits and remaining lots are vacant land.	Completed.
Jewel Streets Storm and Sanitary Sewers	Install storm and sanitary sewers.	Joint DEP and DOT project is funded for FY 2018. Currently in design by DDC.	No change.
Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Install a Third Boat Pumpout Facility at Rockaway WWTP and Seek a No Discharge Designation for Jamaica Bay	Reduce wastewater discharges from recreational boats directly into Bay, and will initiate proceedings to create a NDZ for Jamaica Bay.	Application for NDZ was filed with DEC on October 31, 2010. EPA officially designated Jamaica Bay a No Discharge Zone on October 27, 2011.	Completed.

Increase DO Levels to Improve Ecological Productivity				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Remove CSO Sediment Mounds	*Dredge and Recontour Hendrix Creek*	To address CSO mounds, DO and ecological goals.	Dredging initiated in August 2010, and is anticipated to be completed in summer 2011.	Completed.
	Pursue Dredging of Paerdegat Basin, Fresh Creek, Bergen Basin and Thurston Basin	To address CSO mounds, DO and ecological goals.	Paerdegate Basin dredging permits received, final design completed, and contractor bids received in August 2012. Dredging of Fresh Creek, Bergen Basin and Thurston Basin is to be re-evaluated during development of CSO-LTCPs.	Notice to proceed for construction anticipated for March 2013.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Dissolved Oxygen	*Pursue Aerators at Fresh Creek, Bergen Basin and Thurston Basin.*	Add oxygen to improve dissolved oxygen levels.	To be re-evalauted as part of CSO-LTCPs.	
	Investigate Potential for Future Aeration in other CSO and Non-CSO Tributaries	Determine the need and efficacy of in-stream aeration for other creeks in Jamaica Bay.	To be re-evalauted as part of CSO-LTCPs.	
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Monitoring	*Enhanced Scientific Monitoring Program*	Develop enhanced water quality and ecological monitoring program. Coordinate monitoring among various entities.	DEP is working with the National Park Service and Brooklyn College to review current water quality monitoring efforts to determine more efficient use of monitoring resources.	Draft assessment of monitoring paramters is currently underway

2. RESTORATION ECOLOGY

Restoration Ecology				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Wetland Restoration	*Establish Salt Marsh Island Wetlands Priority Restoration Review Board*	Committee of various agency partners continue to meet and discuss advancing additional wetland restorations. DEP has provided letters of support for the restoration of future wetlands beyond Yellow Bar Hassock.	Representatives from DEP, DEC, NPS, and the USACE meet regualrly to discuss next restoration steps as identified in the Hudson Raritan Comprehensive Restoration Plan (CRP).	Completed - task now falls under CRP.
	Marsh Island Wave Attenuator Study	A wave attenuator pilot study will be developed and implemented around a section of a salt marsh island in Jamaica Bay. This study will determine if the attenuator would be a cost-effective method to slow the rate of wetland loss and accrete marsh building sediments.	Design completed for floating islands. Received NYSDEC permit but awaiting USACE permit before starting construction.	See attached status report.
	Wetland Restoration	Elders West, completed in summer 2010, restored an additional 35 acres of interior wetlands.	Construction of Yellow Bar, Black Wall and Rulers bar marsh islands currently being restored with completion expected in early summer 2013.	DEP /DEC are local cost share sponsors for Yellow Bar Hassock, Black Wall and Rulers bar marsh islands. DEP has allocated $7M towards restoration.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**

	Implementation Strategy	Description	Updated Schedule	Status/Comment
Land Acquisition and Restoration Along Periphery of Bay	*Complete Restoration of Penn Avenue Landfill and Fountain Avenue Landfill*	Comprehensive and innovative ecological restoration and remediation of Class 2 inactive hazardous waste sites.	Remediation and ecological restoration completed in fall 2008.	Completed and discussion of transfer of properties to the National Park Service is currently underway.
	Paerdegat Basin Restoration	Improve water quality, create Ecology Park and restore Jamaica Bay wetlands and adjacent upland habitat.	Currently under construction; completion expected summer 2013.	See attached status report.
	Identify Opportunities for Green Infrastructure ~~*Transfer HPD Properties in the Edgemere Section of Queens to Parks*~~	Identification of land uses such as the public ROW that present significant opportunities for stormwater source controls which would also shade and cool the City, improve air quality, increase property values and provide urban wildlife habitat.	20-year implementation period in *NYC Green Infrastructure Plan*.	See attached status reports on the LTCP and Green Infrastructure Program..
	Identify Opportunities for Green Infrastructure ~~*Pursue Acquisition and Restoration Efforts in Vacant Areas*~~	See above.	See above.	See above.
	Identify Opportunities for Green Infrastructure ~~*Acquire Seagirt Avenue Properties in Rockaway;*~~	See above.	See above.	See above.
	Ecological Atlas and LIDAR Imagery ~~*Update and Inventory Dune and Beach and Other Habitats*~~	Use existing sources of information along with newly captured satellite imagery to develop a GIS-based Jamaica Bay Watershed Ecological Atlas.	Satellite wetland mapping began in spring 2010; and field data collection and GIS-mapping development began in 2011. All field work will be completed in 2012 along with potential ecological and stormwater restoration opportunities. The completed Ecological Atlas GIS-database will be completed in 2013.	See attached status report.
	Ecological Atlas and LIDAR Imagery ~~*Reduce the Extent of Invasive Vegetation*~~	See above.	See above.	See above.
	Ecological Atlas and LIDAR Imagery ~~*Determine RTE Restoration Priorities and Targets*~~	See above.	See above.	See above.
	Continue Beach Clean Up Efforts	DEP sponsored clean-ups and plantings; extend trash collection beyond Labor Day.	Ongoing.	On August 12, 2012 the New York City Department of Environmental Protection, together with the Department of Sanitation and the De-partment of Parks and Recreation, teamed up to launch the "Clean Streets, Clean Beaches" campaign to help inform citizens about how street litter can wash into the sewer system and enter local waterbodies. Several locations, including Gerrittsen and Plumb Beaches in Jamaica Bay were cleaned. Additional clean-ups planned for spring/summer 2013.

3. STORMWATER MANAGEMENT THROUGH SOUND LAND USE

On-Site BMPs for New and Existing Development

	Implementation Strategy	Description	Updated Schedule	Status/Comment
Pilot and Demonstration Projects	*Green Roof / Blue Roof Pilot*	Design, construct and monitor the effectiveness of a blue roof vs. green roof on the same existing building.	Construction completed in August 2010. Monitoring has been ongoing and will continue for a 3-year monitoring period.	Monitoring ongoing. See attached status report on Stormwater Pilot Monitoring Program.
	Rain Barrel Giveaway Program	Distribute 1,000 rain barrels to homeowners.	1,000 rain barrels distributed to homeowners in 2008 and 2009. Pilot completed.	Completed.
	Parking Lot Pilots	Install and monitor pervious pavement applications on two DOT municipal parking lots.	Two types of porous pavement were installed at a NYCDOT parking lot in Far Rockaway in mid-2011 and are currently being monitored for durability and for water absorption.	Monitoring ongoing. See attached status report on Stormwater Pilot Monitoring Program.
	Bronx River Houses Stormwater Pilots	Retrofit an existing NYCHA property with stormwater infiltration and detention source controls.	Construction of bioswales/raingardens, parking lot subsurface detention and rooftop detention was completed in 2010.	Construction complete and monitoring ongoing. See attached status report on Stormwater Pilot Monitoring Program. The technologies being tested are currently being applied to other housing facilities in the Jamaica Bay watershed; see attached status report on Green Infrastructure Implementation.
	Evaluate Rooftop Detention	Promote rooftop detention for new construction and assess practicality for existing large rooftops.	Design and construction was constructed for three different blue roof designs on a DEP warehouse in 2010. Two years of monitoring data have been collected.	Pilot construction complete and monitoring ongoing. See attached status report on Stormwater Pilot Monitoring Program. See also attached status report on the Guidelines for the Design and Construction of Stormwater Management Systems for detailed information about blue roofs.
	Porous Pavement on DEP Property	Install and monitor pervious pavement on DEP facility parking lots and other areas.	Porous pavement monitoring equipment at the Paerdegat Basin CSO Facility was installed in early summer 2012. Monitoring for maintenance activities at installations is ongoing.	Ongoing.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Economic Incentives	*Stormwater Rate Structure Study*	Evaluate alternative water, sewer and stormwater rate structures.	Two-year Rate Structure Study completed in June 2009. Parking Facility Pilot to be implemented in January 2011.	See attached status report.
	Incentive Programs	Being investigated under the Mayor's Interagency Task Force.	Green Roof Tax Abatement was approved by the State legislature and implemented as law on August 5, 2008. It is scheduled to sunset on March 15, 2013. OLTPS and DEP exploration of additional incentive programs is ongoing.	Ongoing.

	Cost Sharing Programs	Develop potential framework for design/build services incentive program.	Ongoing.	The City has implemented a green infrastructure grant program for combined sewer areas citywide. See staus report on the Green Infrastructure Program.
	Water Conservation Program	50 MGD savings through low flow fixture vouchers.	DEP has been monitoring leaks in a portion of the Delaware Aqueduct Rondout West Branch Tunnel (RWBT) that connects the Rondout Reservoir in Ulster County to the West Branch Reservoir.The leaks release between 15 and 35 million gallons of water a day. In order to address the leaks in the Delaware Aqueduct, DEP has developed the Water for the Future (WFF) initiative. Conservation measures include toilet replacemet rprogram and Municipal Water Efficiency program.	Ongoing.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Regulatory and Design Changes	*Zoning Code Parking Lot Design Requirements*	Add landscaping and bioretention components to commercial and community facility parking lots over 6,000 sf or 18 spaces. Parking lot amendment adopted on November 28, 2007.	NA	Completed.
	Code Review	Review sewer code and make recommendations for potential revisions to facilitate BMP installation.	Task force formed in March 2008. Draft language for new stormwater performance standard was developed. Stakeholder outreach began in fall 2010 and the rulemaking process is expected to be initiated in winter 2010/2011.	Completed. Stormwater performance standard promulgated in January 2012 and effective July 2012. See attached status report on the Guidelines for the Design and Construction of Stormwater Management Systems for more information about the stormwater performance standard and related guidance document developed.
	Guidelines for the Design and Construction of Approvable Stormwater Management Systems	Create companion guidance document to sewer code revisions specific to NYC conditions.	Ongoing; to be completed and distributed with the promulgation of DEP's stormwater performance	Completed. See attached status report on the Guidelines for the Design and Construction of Stormwater Management Systems.
	CEQR Technical Manual Revision	Revise CEQR Technical Manual to include a specific section to address proposed developments in Jamaica Bay.	Completed and released to public in May 2010 and updated in June 2012. The updated CEQR Technical Manual includes several new requirements for the tracking of proposed projects in the Jamaica Bay watershed through a standardized form and improved assessments of proposed projects' potential impacts on natural resources and water and sewer infrastructure. The Jamaica Bay Watershed Protection Plan form can be found in the Natural Rescources	Completed.

	Monitor Benefits of BMP Implementation	Develop indicators to track effects of BMP installations throughout the City over time.	Tracking of BMP implementation is ongoing and a database for data collection has been developed. All DEP BMP pilot projects will be monitored upon construction completion for a period of two-three	Monitoring protocols weredeveloped for DEP BMP pilots and instrumentation was installed for BMP pilots within Jamaica Bay watershed, i.e., green/blue roof pilot study, streetside swales and enhanced tree pits. See Stormwatr Pilot Monitoring Program status sheet.
	Zoning Code Pervious Surfaces Requirements	Potential front yard pervious requirements in R1-R5 zoning districts. Yards text amendment adopted on April 30, 2008.	NA	Completed.
Off-Site BMPs on Streets, Sidewalks, Highway Right-of-Ways, and Vacant Lands				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Pilot and Demonstration Projects	*NYCDOT Belt Parkway Bridges Demonstration Project*	Roadway improvement project with stormwater treatment and attenuation from section of Belt Parkway.	Design complete; construction underway and continuing through 2015.	BMPs will be installed for Paerdegat Basin, Rockaway Parkway and Gerritsen Creek bridges.
	Streetside Swale/Tree Pit Pilots ~~*Streetside Infiltration Swales Pilot Study*~~	Design and installation of 40'x 5' swales and 20' x 5' enhanced tree pits to capture, treat and monitor stormwater runoff from public right of way.	Swales and enhanced tree pits were constructed in summer 2010 and monitoring equipment was installed. Based on montioring results several modifications have been made to the systems to improve their performance.	See attached status report.
	Streetside Swale/Tree Pit Pilots ~~*Tree Pit Pilot Study*~~	See above.	See above.	
	North and South Conduit Stormwater Pilot	Use of an existing large highway median to maximize stormwater capture, subsurface infiltration and storage through ecologically-based soil manipulations and vegetative plantings.	Design complete and construction has been completed and monitoring is in progress.	See attached status report.
	Parking Lot Pilots ~~*Streetside Infiltration Swales Pilot Study*~~	See *Parking Lot Pilots*.	See above.	See attached status report on Stormwater Pilot Monitoring Program.
	Identify Opportunities for Green Infrastructure ~~*Vacant Parcels Pilot Study*~~	See *Identify Opportunties for Green Infrastructure*.	See *Identify Opportunties for Green Infrastructure*.	See attached status reports on the LTCP and Green Infrastructure Program.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Regulat-ory	*Zoning Code Review - Street Trees*	Potential requirement for new developments/enlargements to provide street trees.	NA	Completed.
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Greening	*PlaNYC Street Tree Planting*	Street tree planting throughout the City including Jamaica Bay watershed.	Ongoing	Since October 9, 2007, the MillionTreesNYC initiative has planted an astounding 612,277 trees.
	PlaNYC Greenstreets Initiative	Ongoing.	DPR built 35 new Greenstreets in the Jamaica Bay Watershed between fall 2008 and spring 2010.	See attached status reports on the LTCP and Green Infrastructure Program.

Open Space and Greening Projects	*East New York Community Forestry Management Plan*	Increase street tree stocking level in East New York.	Ongoing	Implementation of the NYCDPRs June 2007 Greening East New York report continues.
	Baisley Pond Park Project	Using stormwater BMPs, storm sewers will route stormwater into Baisley Pond.	Baisley Pond in design and construction start date 2014	See attached status report.
	Springfield Park Project	Using stormwater BMPs, storm sewers will route stormwater into Springfield Lake.	Springfield Gardens in construction.	See attached status report.

4. PUBLIC EDUCATION AND OUTREACH

Public Education and Outreach				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Public Awareness	*Enhance Jamaica Bay-related Educational Curriculum*	Educational Resource Directory	Completed in fall 2010 for posting on DEP's website.	Completed.
	Organize "State of the Bay" Scientific Symposium	Coordinate/guide scientific investigations and report scientific findings, and inform JBWPP Updates.	First symposium was held on June 27, 2008 and second was held on October 28-29, 2008. The third symposium will be scheduled for 2011.	The third sympoisum, "State of the Bay, Past, Present and Future" was held at Brooklyn College on October 27-28, 2011.
	Create a targeted campaign for developers, residents, and business owners to protect Jamaica Bay	Brochure on importance of the Bay, human activities in watershed, and pollutant reducing practices.	Brochure completed in 2007 and distributed at Jamaica Bay symposiums.	Completed.

5. PUBLIC USE AND ENJOYMENT

Public Use and Enjoyment				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Public Access	*Rockaway /Gateway Greenway*	Establish an approximately 20-mile continuous greenway loop around the Bay.	The Shore Parkway Greenway is complete to 84th Street.	Federal grant in place for future buildout. DPR and New York State DOT continue to coordinate on ROW plans and designs.
	Laurelton and Cross Island Parkway Greenways	DOT and DPR to establish a 22-mile path through parkland; linking parks between Brooklyn/Queens Greenway and Jamaica Bay waterfront.	NA	No change.
	Southern Parkway Path and Conduit Boulevard	DOT to establish a greenway to connect Brooklyn/Queens Greenway system to Jamaica Bay waterfront.	NA	No change.
	Far Rockaway North Shore Greenway	Establish a greenway to connect Far Rockaway with Rockaway Gateway Greenway	NA	No change.
	Floyd Bennett Field/Gateway National Recreation Area	NPS capital project improvements within Gateway National Recreation Area.	Public meetings held on September 21, 2010 and September 27, 2010.	Senator Charles Schumer and Congressman Anthony Weiner formed a Blue Ribbon Panel to provide recommendations on possible improvements to Floyd Bennett Field.

Public Access	*Brooklyn/Queens Greenway -Eastern Parkway Extension*	Greenway improvement including landscaping, multi-use paths, bike racks, pedestrian ramps, traffic signals, etc.	DOT/DDC construction start date scheduled for September 2010.	Since 2010 approximately 46 miles of various pedestrian and bikelanes have been installed in Brooklyn and Queens, including arreas of Jamaica Bay watershed.

6. IMPLEMENTATION AND COORDINATION

Implementation and Coordination				
	Implementation Strategy	**Description**	**Updated Schedule**	**Status/Comment**
Plan Implementation	*Jamaica Bay Ecological Improvement Projects* ~~*Jamaica Bay Water Quality and Ecological Restoration Steering Committee*~~	Improve the overall ecology of Jamaica Bay by restoring or enhancing existing natural areas and champion need for additional projects and funding.	Ongoing.	See attached status report.
	Jamaica Bay Ecological Improvement Projects ~~*Support Army Corps ecological restoration projects*~~	See above.	See above.	See attached status report.
	BMP Implementation through Mayor's Office Interagency BMP Task Force	Mayor's BMP Task Force to coordinate BMP implementation strategies.	Ongoing	See attached status reports on the LTCP and Green Infrastructure Program.
	Education Steering Committee	Continue committee's efforts to implement education and outreach strategies.	See above.	See Educational Resource Directory
	Waterfront Planning	Cooperative effort between agencies and stakeholder groups to create a blueprint for the future of the City's waterfront.	DCPs Vision 2020 Comprehensive Waterfront Plan is expected to be completed by December 2010. EDC's Waterfront Action Agenda is anticipated to be completed by mid 2011.	See attached status report.
	Monitor and Review Changes to the Watershed	Track new development, BMP implementation, and overall growth in the watershed in coordination with other agencies.	Ongoing	No change.

Jamaica Bay Wastewater Treatment Plant Upgrades

Description: Improve the overall ecology of Jamaica Bay by reducing nitrogen discharges from Jamaica Bay's Wastewater Treatment Plants.

Schedule: Ongoing through 2020.

Estimated Cost: $100 million

The New York City Department of Environmental Protection (DEP) is proceeding with commitments made in its February 2010 Agreement including implementing Step Feed BNR at the 26th Ward WWTP starting in May 2010 and commencing operation of the 26th Ward Interim Carbon system as of December 2011 that has resulted in about a 6,000 pounds per day reduction in nitrogen discharges into Jamaica Bay from just 2 years ago. The Step Feed BNR construction at the Jamaica WWTP and design of a permanent supplemental carbon system are both underway; along with conceptual level planning associated with the upcoming Step Feed BNR upgrades planned for both Coney Island and Rockaway WWTPs. These investments, made in concert with $95 million the City already has committed for nitrogen control upgrades, will reduce the nitrogen loads discharged into Jamaica Bay by nearly 50 percent over the next ten years.

High levels of nitrogen can lead to reduced levels of dissolved oxygen in waterways and excessive algae growth, especially in warm weather months. Prior to any upgrades, the 240 million gallons of daily wastewater handled by the four wastewater treatment plants on Jamaica Bay result in the discharge of approximately 40,000 pounds of nitrogen each day. The Rockaway Peninsula and other anthropogenic constrictions prevent the circulation of oxygenated water with the ocean, which exacerbates nitrogen impacts in the bay. DEP's wastewater treatment plants were not originally designed to remove nitrogen, a naturally-occurring component of all wastewater.

DEP has also been engaged in an enhanced ongoing water quality testing program in Jamaica Bay at various sites throughout the Bay, including combined sewer overflow (CSO) post-construction monitoring in select tributaries.

Future improvements to 26th Ward will include the installation of a supplemental carbon system, to further reduce the effluent nitrogen loads. A demonstration project adding carbon to one of the treatment tanks at the plant has resulted in an additional decrease in effluent nitrogen load by 3,000 lb/d. This enhanced treatment will be implemented in the full plant by December 2015.

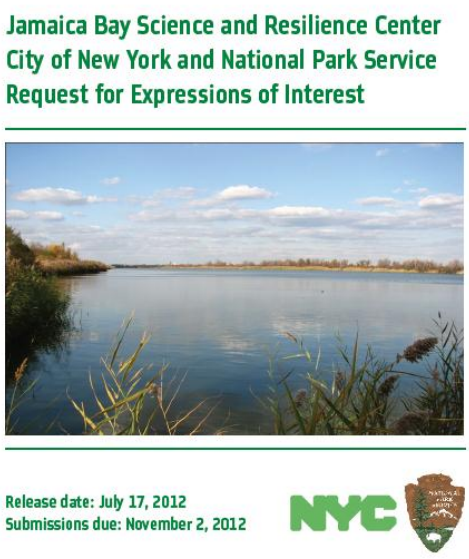
Environmental Protection

Jamaica Bay
On-Going Ecological Improvements

Description: Continue to improve the overall ecology of Jamaica Bay by restoring or enhancing existing natural areas based on science, champion need for additional projects and funding and engage federal, state, local agencies and environmental stakeholder groups.

Schedule: Ongoing.

City and Department of Interior Historic Agreement



In October 2011 Mayor Michael R. Bloomberg, U.S. Department of the Interior Secretary Ken Salazar and U.S. Environmental Protection Agency Region 2 Administrator Judith Enck announced a new cooperative agreement to improve the Federal and City parklands around Jamaica Bay and improve overall water quality in the Bay. The agreement was subsequently signed on July 17, 2012 and commits the City and Federal governments to a joint planning process that will devise a new, unified governing model and new, common objectives for the 10,000 acres of publicly-owned land in south Brooklyn and Queens. By allowing the National Park Service and the New York City Department of Parks and Recreation to work on each other's property, comingle resources and undertake joint planning, this innovative new partnership will serve to better connect urban communities to the natural beauty and history of Gateway National Recreation Area and adjacent city park lands. The agreement establishes a formal a partnership between the National Park Service and the New York City Department of Parks and Recreation for the agencies to collaborate in four areas: effective management of park lands; science and restoration of Jamaica Bay; access and transportation to park lands around Jamaica Bay; and engagement of New York City youth with hands-on science programs and fun public service projects to promote recreation, stewardship and "green" careers.

This process would begin with the development of a jointly-managed vision and governance structure to establish where Federal and City lands and programs could better connect and be more efficiently managed. The development of a Jamaica Bay Parks master plan particularly related to research projects on resilience to climate change in coastal environments and improving park access for the surrounding communities will also be developed.

The four key components to the park management agreement are:

- **Effective management through collaboration**: The National Park Service and New York City Parks manage contiguous lands with overlapping missions. Through effective land use and program planning that ignores boundaries, they can create a seamless and interconnected network of natural, historical, and recreation spaces urban park that all New Yorkers can visit, with or without a car.
- **Science and restoration:** Through better coordination of research, data gathering restoration efforts and pilot projects, government agencies, non-profit organizations and academic institutions can work closer together to restore and conserve the health of Jamaica Bay.
- **Access and transportation:** The city and the Park Service will work to improve public access to Jamaica Bay and within Jamaica Bay through existing and new transportation choices, and through better public information about those options.
- **Youth and education:** The city and the National Park Service can jointly develop a series of programs in which urban youth can learn the values of stewardship through service activities.

As part of this partnership, the City and the National Park Service also released a request for expressions of interest that calls for a university or other academic partner or science-focused organization to manage an intensive research program focused on the restoration of the bay, including potentially creating a new science and resilience center to coordinate and bolster research efforts. Proposals are due by November 2, 2012.

Jamaica Bay No Discharge Zone Designation

In addition, at the request of the City and the State Department of Environmental Conservation, on October 11, 2011 the U.S. Environmental Protection designated the majority of Jamaica Bay a "No Discharge Zone," which bans boats from discharging sewage into the bay, improving water quality. The new Jamaica Bay No Discharge Zone agreement between the City, the EPA and State Department of Environmental Conservation bans all boats from discharging sewage into a designated 20,000 acre area of Jamaica Bay. The area has adequate facilities for boats to pump out their sewage and boaters must now dispose of their sewage at these specially-designated pump-out stations.

Jamaica Bay Marsh Island Restoration

Over the last 150-years, Jamaica Bay has experienced wetland and habitat losses from a variety of factors, including sea level rise, anthropogenic manipulation (dredging and filling) throughout the bay, a loss of sediment and increased tidal heights. To date, the City has leveraged $7 million of these funds to help restore Yellow Bar, Black Wall and Ruler's Bar marsh islands with Federal and State matching funds, and has secured an additional $14 million for wetland restoration in Jamaica Bay. It is expected that the City will leverage the remaining $8 million and secure an additional $16 million of Federal and State funding over the next few years.

Additionally, habitat restoration along the periphery of Jamaica Bay continues and has been part of DEP's comprehensive plan to create highly productive ecological areas and improve habitat.

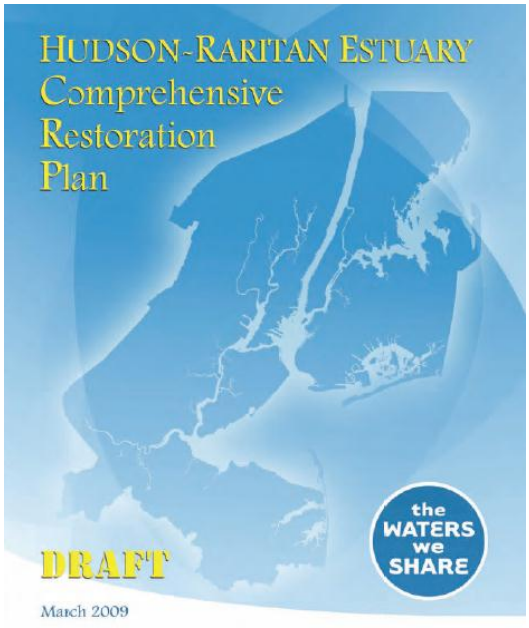
Large ecosystem restoration projects within Jamaica Bay continue to depend on the involvement of multiple government agencies and private stakeholder groups. DEP, along with many other government agencies such as the DEC, US Army Corps of Engineers (USACE), National Park Service (NPS), New York City Department of Parks and Recreation (DPR) and the Port Authority of New York and New Jersey (PANYNJ), is an active participant in the science based restoration and ecological improvements of Jamaica Bay. The significance of partnerships between different agencies is illustrated by the following restoration efforts either completed or currently underway:

- Construction of the **Elders Point East** and **Elders Point West** marsh islands were completed in 2006-2007 and 2009-2010, respectively. The cost for the restoration of approximately 80-acres for these two islands was nearly $25 million, with DEP contributing $5.25 million towards this effort.

- In January 2012 our restoration partner, the U.S. Army Corps of Engineers (USACE) awarded two separate contracts totaling $17.2 million for the construction and restoration of Yellow Bar Hassock marsh island. DEP contributed over $5.4 million towards this effort.

- In March 2012 our restoration partner also awarded a $3.4 million contract to restore Black Wall and Rulers Bar marsh islands. DEP contributed $990 thousand towards this effort.

Hudson Raritan Estuary – Comprehensive Restoration Plan



In 2007, under the Congressionally-authorized Hudson Raritan Estuary Ecosystem Restoration Project, the USACE and PANYNJ published the draft Comprehensive Restoration Plan (CRP). It was created collaboratively by scientists, professionals, city and state government agencies, nonprofit organizations, academic institutions, and environmental advocates. It's a plan to protect and preserve those habitats that still exist and restore habitats that have been lost (Harbor Estuary Program, HEP, 2010).

Since 2009, the following activities have occurred in support of revising the CRP and advancing the HRE Feasibility Study:

* Public Outreach meetings for the CRP including agency meetings, Target Ecosystem Characteristic (TEC) Workshop meeting and other public events;

* Participation at HEP Restoration Work Group and committees;

* Monitoring for baseline data collection for future restoration activities at Black Wall and Rulers Bar marsh islands in Jamaica Bay;

* Sea level rise evaluation;

* Preparation of "Process Guides" for restoration practitioners for Oysters, Eelgrass Beds, Wetlands and Maritime Forest TECs.;

* Advancement of the HRE Feasibility Study including evaluation of restoration opportunities outlined within the CRP including preparation of conceptual designs and digitization of the designs as well as coordination with the NYC Comprehensive Waterfront Plan of the original 294 restoration sites identified within the CRP; and

* Preparation of the Draft HRE Programmatic Environmental Impact Statement.

Water Quality Monitoring Coordination

To coordinate the existing water quality monitoring within Jamaica Bay, DEP in coordination with the Gateway National Recreation Area of the National Park Service (NPS) have teamed up with Brooklyn College to review current monitoring efforts by each agency. A greater coordination of effort and resources by government, academia and non-profit organizations is necessary to effectively utilize existing resources. The call for greater coordination as presented by Dr. Brett Branco at the October 20, 2011 Jamaica Bay Symposium was originally specified in the JBWPP, Program. Objective 1d was to "develop a robust and coordinated scientific program". Additional monitoring needs amongst the agencies needs to be a collaborative effort, with appropriate funding identified and information sharing of research and monitoring data collection.

Clean Streets/Clean Beaches

On August 12, 2012 the New York City Department of Environmental Protection, together with the Department of Sanitation and the Department of Parks and Recreation, teamed up to launch the "Clean Streets, Clean Beaches" campaign to help inform citizens about how street litter can wash into the sewer system and enter local waterbodies. Local students and volunteers helped with this first of many future beach clean-up efforts.

The event cleaned seven beaches citywide, including four within the Jamaica Bay watershed: The areas targeted were:

- **Conference House Park**
- ***Gerritsen Beach****
- ***Kaiser Park*** *
- ***Plumb Beach*** *
- **Pugsley Creek Park**
- ***Rockaway Beach****

- within Jamaica Bay watershed

Environmental Protection

Sea Lettuce Harvesting Pilot

Description: DEP trash skimmer boats used to harvest sea lettuce where it amasses in the waters of Jamaica Bay to determine if this approach is feasible and to chemically analyze sea lettuce for its use as a source of biofuel.

Schedule: Harvests completed in August and September 2010. Testing of sea lettuce for its use as biofuel was completed successfully in late 2010. Cost-benefit analyses of full-scale macroalgae harvest program ongoing.

Estimated Cost: $180,000

Excess nutrients promote overgrowth of marine macroalgae, including sea lettuce (*Ulva lactuca*). Sea lettuce is generally found attached to rocks and pilings but it is also commonly observed detached and free floating. In non-eutrophic estuaries, attached macroalgae provides beneficial habitat for juvenile crabs and fish. However, in eutrophic systems, such as Jamaica Bay, excessive overgrowth of macroalgae may form thick mats which accumulate along shorelines and in shallows.

DEP Skimmer Boat collecting sea lettuce.

Currently, Jamaica Bay experiences recurring blooms of sea lettuce from late winter through spring and again in late summer through fall; however, the timing and extent of these blooms can vary considerably from year to year. Where it accumulates, detrimental effects may include suffocation of benthic invertebrate communities, suppression of spawning/nesting activity by horseshoe crabs and diamondback terrapins, and interference with recreational boating and fishing activity. Decomposition of dense mats of sea lettuce along intertidal shores and beaches produces noxious odors and discourages beachgoers and nature watchers.

DEP recently completed a pilot study to demonstrate the effectiveness of sea lettuce harvesting on improving water quality and environmental conditions in selected areas of Jamaica Bay. The pilot project provided information regarding the feasibility and potential benefits of restoring habitat that is currently degraded by accumulation of sea lettuce. In addition, the harvested algae was evaluated for its potential use as a source of biofuel.

The goals of the DEP pilot study were to 1) Demonstrate the effectiveness of sea lettuce harvesting in benefiting water quality in selected areas of Jamaica

Bay; 2) Provide an important initial step toward restoring shallow, subtidal habitat in Jamaica Bay that is currently subjected to smothering by dense mats of detached sea lettuce; and, 3) Form the foundation for future larger-scale macroalgae removal projects that could ultimately benefit a variety of associated marine species and habitats.

Sea lettuce accumulation on Jamaica Bay shoreline

DEP characterized potential pilot study sites during the summers of 2009 and 2010 based on site location, recent history of algae accumulation, hydrology, sediments, and bathymetry. DEP tested their existing fleet of trash skimmer boats and found them to be effective at collecting floating trash mats of sea lettuce. Sea lettuce was also manually harvested from a number of locations throughout Jamaica Bay from May 2010 through September 2010. Throughout the pilot harvesting program, nearly 300 gallons of sea lettuce were collected and sent to the University of Arkansas for processing into biofuel. A sample volume of one liter of butanol was produced and delivered to DEP in December 2010.

First biofuel produced in NYC from macro-algae

A variety of potential beneficial use options have been identified as alternatives to disposal of harvested sea lettuce in landfills. Some of these are relatively straightforward to implement (e.g., use as compost/fertilizer) while others (waste-to-energy generation, high-volume biofuel distillation) will require additional research and development to determine feasibility and cost of implementation. A preliminary cost-benefit evaluation indicates that a range of potential ecosystem and societal benefits may be attributed to large-scale harvesting of sea lettuce in Jamaica Bay; further analyses and data gathering will be necessary to quantify these benefits.

Environmental Protection

Algal Turf Scrubber Pilot

Description: An Algal Turf Scrubber (ATS) was constructed at the Rockaway WWTP. This technology will use algae to filter WWTP effluent for nutrient removal and as a source for biofuel.

Schedule: Construction complete in September 2010.

Estimated Cost: $1.25 million

In September 2010, DEP completed construction of an Algal Turf Scrubber (ATS) pilot study. The system uses algae to filter nutrients from a small portion of the Rockaway WWTP effluent flow (max~2,400 gallons per hour) and provide a source of feedstock for biofuel production.

Algae drying for biofuel processing

Algal turf scrubbers are unique wastewater treatment technologies that harness the natural abilities of attached algae, bacteria, and phytoplankton to remove a variety of pollutants from water. The ATS is a patented water treatment technology developed by Dr. Walter Adey and held by the Smithsonian Institution with licensing to Hydromentia.

The ATS pilot system mimics a stream ecosystem in a constructed environment designed to promote algal growth. It consists of an inclined floway - a long, slightly sloped, shallow trough made of waterproof materials and raised on a support frame - and a screen liner. Wastewater effluent is pumped into the floway in regular pulses and algae uptake nutrients, carbon and other pollutants from the source water pumped through the floway while injecting high levels of oxygen into the water.

Algal turf scrubber floways at Rockaway

Periodic harvesting of the algal turf removes nutrients and pollutants from the system while stimulating continued algal growth and increasing algal uptake efficiencies. Algae collected during the summer 2012 season will be sent to the University of Arkansas for processing into additional butanol. The algae harvested from the ATS can be reused as a source of biofuel. The additional use of the algae as a beneficial by-product could possibly make the treatment of wastewater with ATS more cost-efficient. If current efforts to utilize algae for biofuel production prove effective, large volumes of algae produced from the ATS could potentially fuel vehicles used within the WWTP facility.

To offset some of the energy requirements of the system, DEP is evaluating the use of methane produced from anaerobic digestion to augment power and heating at the plant. If this option is found to be viable, heating and Light emitting Diode (LED) lighting of the ATS system from this energy source would increase nitrogen uptake and removal rates, especially during the non-summer seasons, but would require the construction of enclosures around the floways.

To date, land availability is one of the primary limiting factors to consider when evaluating the treatment potential of ATS at WWTPs with large discharges, although preliminary evaluations have identified few opportunities near WWTPs on Jamaica Bay. The pilot ATS at the Rockaway WWTP will continue to evaluate the ability of algal turf scrubbers to assist in the removal of nitrogen and other pollutants.

Environmental Protection

Oyster Bed Pilot

Description: A small oyster bed and a field of reef balls were placed within Jamaica Bay to evaluate oyster growth, survival, reproduction, water quality and ecological benefits given existing environmental conditions in the bay.

Schedule: Construction in October 2010, continuous monitoring ongoing.

Estimated Cost: $650,000

DEP is conducting two oyster reintroduction pilot studies within Jamaica Bay – the design and construction of an oyster bed off of Dubos Point, Queens, and the place-ment of oyster reef balls in Gerritsen Creek, Brooklyn. These oyster pilot projects are being conducted to evaluate whether climatic and environ-mental conditions within the bay are suitable for oyster growth, survival and repro-duction. The study is also measuring how effective these bivalves are at filtering various pollutants affecting the bay such as nitrogen, other nutrients, and particulate organic matter. If the pilot is successful, the oysters could not only help regenerate the natural environment of the bay, but also provide additional water quality benefits.

Oyster Reef Ball in Gerritsen Creek

To kick-off the project, DEP convened an oyster workshop in June 2009 that brought together local scientists working on oyster restoration issues. Since that time, DEP has continued to participate in a series of local workshops and quarterly meetings developed by the Hudson River Foundation that brings together Federal and State regulators and oyster experts from the east coast to discuss restoration efforts and permit implications.

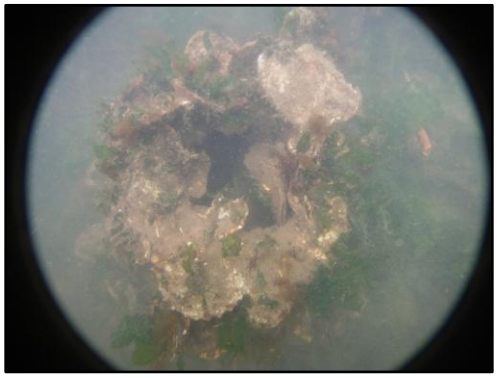
Oyster spat developing

Using information and recommendations generated by these workshops, DEP worked with the Suffolk County Cornell Cooperative Extension (CCE) Service to implant oyster larvae (spat) on New York State Department of Environmental Conservation (DEC) approved shell and reef balls. The spat-on-shell and spat-covered reef balls were then placed in Jamaica Bay in October 2010. The sites are monitored on a bi-weekly basis to determine if the oysters can survive, grow, reproduce and provide water quality and ecological benefits. Monitoring activities also include discrete and continuous water quality sampling, photo/video documentation, site maintenance, and investigation of sediment and current patterns.

The oysters are now at the end of their second year of growth, and appear healthy and continue to grow at fast rates. Preliminary results indicate adequate environmental conditions for oyster growth and survival within Jamaica Bay. Water quality data demonstrates ranges within normal tolerances for the Eastern oyster. During the summer of 2012, several oysters were tested for the presence of *Perkinsus marinus* (pathogen known to cause Dermo or now known as Perkinsosis) and a spore-forming protozoan known as *Haplosporidium nelson*ase. The data from these tests is currently being analyzed.

Throughout the project, the Team will develop information necessary for future attempts to restore a significant habitats type that once thrived in Jamaica Bay. In addition, the Team will continue to coordinate with other organizations and researchers undertaking similar efforts in the NY/NJ Harbor Estuary to help form a foundation for future oyster habitat development projects that will ultimately benefit a variety of associated marine species, including potentially larger installations to collect additional data.

Dubos Point Oysters on May 29, 2012



Gerritsen Creek Reef Ball #5 on May 30, 2012

Eel Grass (*Zostera marina*) Pilot

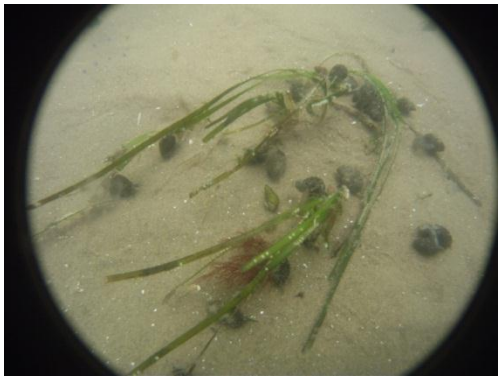
Description: Limited plantings of eelgrass established and monitored around the bay to evaluate the potential to restore eelgrass in the region.

Schedule: Initial planting April 2009 and 2010. Additional occurred in the fall of 2010, with follow-up plantings in the spring and fall of 2011.

Estimated Cost: $485,000

Eelgrass in April 2011

Submerged aquatic vegetation (SAV) beds are important for a number of fish and shellfish species. For this reason, various planning and scoping documents developed for the Hudson Raritan Estuary, including the Jamaica Bay Watershed Protection Plan (JBWPP), call for determining the potential of restoring SAV such as eelgrass in the region.



Eelgrass in June 2011

To better understand how to restore eelgrass within Jamaica Bay, over the past three years Cornell Cooperative Extension (CCE) in cooperation with DEP, has conducted a series of test plantings of eelgrass throughout Jamaica Bay. Other objectives of the study included refining site selection parameters, planting methodology, appropriate planting depths, timing of plantings, and propagule (seed vs. adult shoot) selection since historically there has never been an attempt to restore eelgrass in Jamaica Bay. These investigations were necessary to compare with the potential long term environmental conditions present after the completion of the scheduled WWTP upgrades.

Eelgrass in July 2011

Although these initial plantings near Floyd Bennett Field, Little Egg Wetland, Dubos Point, Kingsborough Community College, and the Breezy Point Yacht Club did not result in a

sustainable establishment of eelgrass in Jamaica Bay, they did provide additional insight into issues affecting planting in the area. Building on these results, 8,000 plants were collected from Eastern Long Island and transplanted at Breezy Point in Queens, New York in the fall of 2011.

The site was monitored on a bi-weekly basis through the summer of 2012, which included transect sampling, photo/video documentation, photosynthetic light measurements, and discrete and continuous water quality sampling, to determine not only whether or not eelgrass restoration is viable within the Bay at this time, but what parameters may or may not be affecting eelgrass sustainability.

Breezy Point Eelgrass on May 31, 2012 – covered by blue mussels

Preliminary data indicates that eelgrass meadows in Jamaica Bay under existing conditions face significant environmental and physical stressors. It is likely that the mortality experienced among the various planting populations throughout the Bay were due to a number of conditions which differ from site to site. However, current monitoring suggests that water quality at the Breezy Point location appears to be suitable for growth and that the high mortality is more attributable to blue mussel colonization and strong sediment movement (sand waves) that buried many of the tender shoots. The potential causes of low survival rate for eelgrass at all pilot sites will undergo further assessment, and the continued collection and analyses of data will help to determine the long term efficacy of this particular restoration method. Major areas of interest will be seasonal fluctuations in various environmental disturbances and observed predation.

The pilot project has provided DEP a continuous learning opportunity not just about eelgrass but about the overall conditions within the bay.

Environmental Protection

Ribbed Mussel Pilot

Description: Several artificial structures were constructed to encourage the growth of ribbed mussels within one of the CSO impacted tributaries of Jamaica Bay. The study is monitoring mussel growth and water quality to measure the effectiveness of ribbed mussels in removing nutrients and particulate organic matter from the water.

Schedule: Construction occurred in July 2011.

Estimated Cost: $75,000

The discharge from combined sewer overflows (CSOs) and wastewater treatment plants contains organic particulates, nutrients, and undesirable chemical contaminants. Filtration of these discharges by mussels could potentially remove substantial quantities of these constituents that accumulate in water and degrade water quality. While the filtering capacity of mussels is well known, what is unclear is whether or not that capacity can be adapted to the practical application of filtering discharges to improve water quality. DEP is undertaking a pilot study to evaluate if a "wall" of ribbed mussels can be built to support a large enough concentration of mussels to carry out effective filtration and improve water quality.

Fresh Creek Mussel Spat on June 4, 2012

Ribbed mussels are being used because they occur in Jamaica Bay, are very abundant in some locations, and thus are a local species that can tolerate existing lower water quality conditions that seasonally occur in some locations. Ribbed mussels are also desirable to use for biofiltration purposes in that they are not sought after by humans for food, so there is minimal risk of poaching in closed waters.

To advance the mussel pilot project, DEP held a workshop in January 2010, inviting mussel researchers and restoration practitioners to discuss potential alternatives for Jamaica Bay. Participants in the workshop discussed site selection, monitoring, and water quality effects. The knowledge and advice from the team of technical advisors was considered during the development of DEP's pilot project.

Based on the discussions held at the workshop and field reconnaissance, DEP selected Fresh Creek as a pilot site. Fresh Creek has several suitable characteristics for the study including a CSO discharge and a number of stormwater outfalls, but is free of other obvious potential pollution sources. The Creek currently supports ribbed mussels and there is a wetland edge over most of its length. In addition, the Creek has little boating activity so that structures placed in the water will have little interaction with navigation vessels. Based on a more site-specific field reconnaissance in March 2010, a section near the middle of Fresh Creek was selected due to its narrow channel which concentrates tidal flows in the pilot project area. This location will enhance the chances of detecting water quality differences across the array of mussels

Fresh Creek Mussel Wall Array on November 7, 2011

To create the wall of mussels, five arrays with artificial substrates for the growth of ribbed mussels were constructed within Fresh Creek in July 2011. Each array contains three segments, and each segment is comprised of one of two materials meant to encourage mussel growth: cargo netting and metal grating. Since construction, monitoring and maintenance of the Fresh Creek structures is conducted biweekly, and consists of checking the structures for any ribbed mussels and other organisms, removing debris, photographing the site, and collecting continuous water quality data from the sondes (devices for measuring water quality parameters) located in Fresh Creek.

Naturally recruited mussel spat was observed on all five arrays beginning in June 2012. More mussel spat and other organisms (e.g. barnacles) are expected to attach to the structures throughout the larva dispersal period. The spat was generally observed to occur in the nooks and crannies of the cargo netting and metal pilings. Monitoring of the arrays will continue on a monthly basis into 2014. If ribbed mussel populations increases to significant densities, then correlations between mussel growth and changes to the baseline water quality data will be analyzed.

Marsh Island Wave Attenuator Study

Description: A wave attenuator pilot study will be developed and implemented around a section of a salt marsh island in Jamaica Bay. This study will determine if the attenuator would be a cost-effective method to slow the rate of wetland loss and accrete marsh building sediments.

Initial Schedule: Construction and deployment expected late 2012.

Estimated Cost: $850,000

A wave attenuator is an anchored island of floating materials offshore of a wetland or shoreline which deflects and reduces the energy of waves.

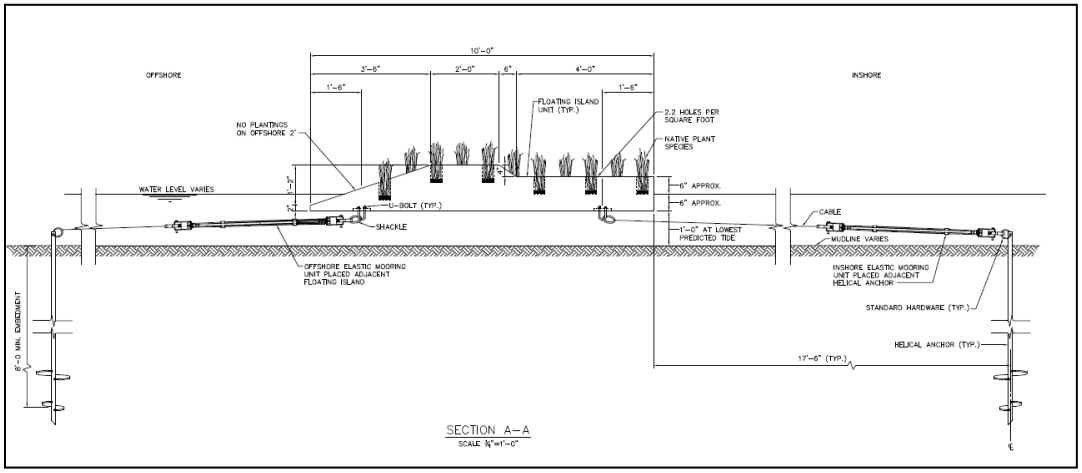
This pilot study will evaluate the potential for wave attenuation on a section of an eroding shoreline to investigate the rate of shoreline loss and accretion of beneficial building sediments. These temporary structures are a "proxy" for future oyster beds around wetland islands to evaluate wave energy reduction potential. There are no plans to use these structures other than for their use as a proxy for oyster beds.

Wave attenuator at Brandt Point will reduce wave energy impacts on shoreline

DEP identified seven potential shorelines with wetland loss and low marsh accretion within Jamaica Bay. DEP was unable to secure permission from the Gateway National Recreation Area (GNRA) to construct the wave attenuators at the two primary candidate sites - Elders West Marsh Island (newly restored) and East High Island. As an alternate, DEP is pursing the potential construction of the wave attenuator at Brant Point along the southern shoreline of Jamaica Bay.

Two types of wave attenuators - a floating island and a timber wave break - were evaluated for the pilot sites based on an exhaustive study of available technologies. The technologies had to meet specific criteria related to: sufficient water depth, dominant wind direction, reflective effects and impact on bottom habitat conditions. Several key parameters determined the design

of the wave attenuators. These site specific considerations included: water depth, storm data, wave action, and soil conditions. DEP determined the placement, sizing and anchoring of the attenuators using modeling, field characterization and research on historical weather patterns. DEP at this point is pursuing the construction of the floating island wave attenuator system. Permits for construction have been filed with the NYS DEC and US Army Corps of Engineers. DEP has the NYS DEC permit in-hand and is anticipating approval of the permits toward the end of 2012.



The floating island wave attenuator uses a system that contains manmade materials and plants to reduce wave energy

Paerdegat Basin Restoration

Description: Improve water quality, create Ecology Park and restore Jamaica Bay wetlands and adjacent upland habitat.

Schedule: Construction completion anticipated May 2013.

Estimated Cost: $15 million

Wetland restoration in Paerdegat Basin

In January 2010, DEP announced the registration of a $15 million American Resource and Recovery Act (ARRA) funded contract to restore 38 acres of wetlands and coastal grasslands adjacent to the Paerdegat Basin CSO Facility located entirely within Paerdegat Basin, a tributary of Jamaica Bay. This investment will greatly improve the ecology of the Paerdegat Basin area and, when finished, will enable the community to enjoy a five-acre 'Ecology Park' surrounded by native plant and animal life. The combination of absorbing more stormwater and the creation of tidal wetlands will improve water quality in Paedergat Basin. This is just one part of DEP's larger commitment to improve water quality and ecology throughout Jamaica Bay.

The "Ecology Park," will offer access to salt marsh intertidal mudflats, grassland, shrublands and include educational exhibits about coastal habitats. Construction began in spring 2010 and was temporarily suspended Fall 2010, due to discovery of unsuitable material that needed to be removed and properly disposed off-site. Construction resumed January 2012 and is expected to be completed by June 2013. The project is funded through Clean Water State Revolving Funds — a program administered by the New York State Environmental Facilities Corporation and authorized under ARRA.

New wetland cove within Paerdegat Basin

The restoration will complement the $357 million capital investment that DEP is making in building the Paerdegat Basin CSO abatement project, which will store 50 million gallons of CSOs during storms. When stormwater surges into sewers it can trigger CSOs when sewers and treatment plants reach capacity, which protects the sewer system and treatment plants by design. CSO tanks reduce this problem by storing flows until storms pass, allowing for release and treatment. The City continues to invest in major infrastructure projects that improve the wastewater treatment system and has budgeted $1.9 billion in capital improvements. The City is also taking steps to incorporate sustainable strategies that keep stormwater from reaching sewers in the first place.

Belt Parkway Stormwater Control Measures

Description: Use of highway medians and shoulder areas to divert and manage stormwater runoff using ecologically-based bioinfiltration practices that promote subsurface infiltration and storage using engineered soil media and vegetative plantings.

Schedule: Design complete; construction underway and continuing through 2015.

Estimated Construction Cost: $2.6 million

Three bridge crossings along the Belt Parkway within the Jamaica Bay watershed are being replaced and upgraded. In conjunction with these major highway upgrades a targeted effort to provide management (water quality and quantity) of stormwater runoff is being pursued. In each case, the stormwater management practices (SMPs) had to be retrofitted into pre-existing roadway and bridge replacement designs. The original roadway designs consisted of conventional roadway drainage elements such as catch basins and storm drains that conveyed the untreated parkway runoff directly to Jamaica Bay.

The objectives of the stormwater management retrofits are to:

- Provide water quality treatment (using the NY DEC criteria) for Parkway runoff using innovative approaches that include vegetative uptake and filtering, infiltration, and vegetated conveyance,
- Provide habitat for native flora and fauna,
- Serve as demonstration sites that highlight stormwater management approaches that reduce runoff volumes, reduce pollutant loads to Jamaica Bay, and limit the impacts associated with concentrating runoff, and
- Provide safe and stable conveyance for larger frequency storm event criteria (i.e., 10-year peak discharge).

The three bridge crossings where stormwater management is being targeted include: the bridge over Paerdegat Basin, the bridge over Rockaway Parkway, and the bridge over Gerritsen Inlet. Each site has unique design elements that reflect the site specific opportunities and constraints. Paerdegat and Rockaway are similar in that the facilities are located on the Jamaica Bay side of the Parkway, while the Gerritsen facilities are primarily located in the reconstructed medians of both approaches to the new bridge.

In all cases, the primary form of stormwater management is bioinfiltration swales or bioretention. Bioinfiltration swales and bioretention have been shown to be effective at removing pollutants by creating conditions suitable

for sedimentation, biodegradation, and nutrient uptake. Moreover, bioinfiltration swales and bioretention support native vegetation and wildlife.

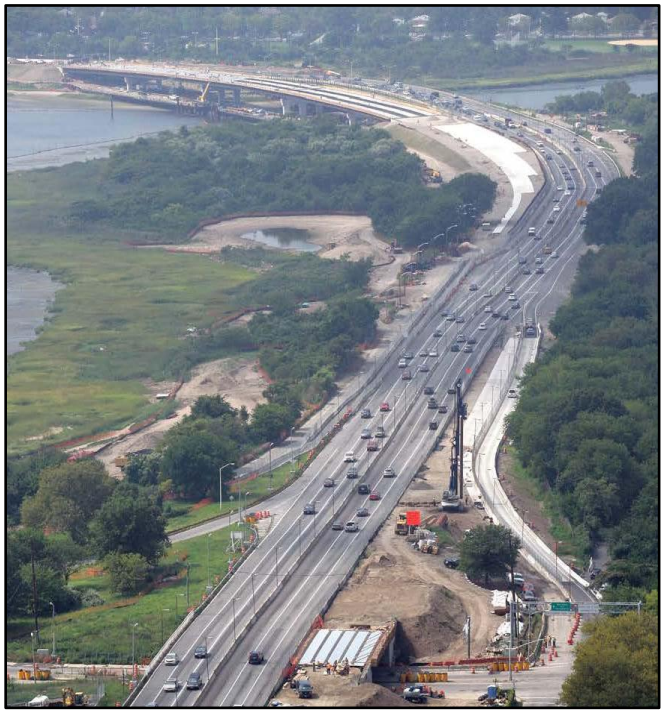
Specific design considerations associated with each site are provided below.

Paerdegat

The Paerdegat site design is comprised of two swales that receive runoff diverted from the main roadway conveyance system. The locations of the swales were determined by identifying the available areas that limit disturbance to existing trees, shrubs, wetlands and paths. Invert elevations of the storm drains and their relationship to adjacent topography also informed the feasibility of how to divert flows from manholes in the main conveyance system. Ultimately, three points of diversion were deemed suitable for water quality treatment with the larger, west swale receiving runoff from two diversions. Approximately 6.9 acres of impervious cover is being treated by the two swales.

Rockaway

The Rockaway site design is comprised of a 640-foot long bioinfiltration swale that receives diverted runoff from the main roadway conveyance system. The swale is located to minimize tree and wetland impacts and to take advantage of site elevations that accommodate diverting flows from the storm drain network. Four catch basins were deemed suitable for water quality treatment and an alignment for the bioinfiltration swale area was designated. One acre of impervious surface is being treated by the practice.

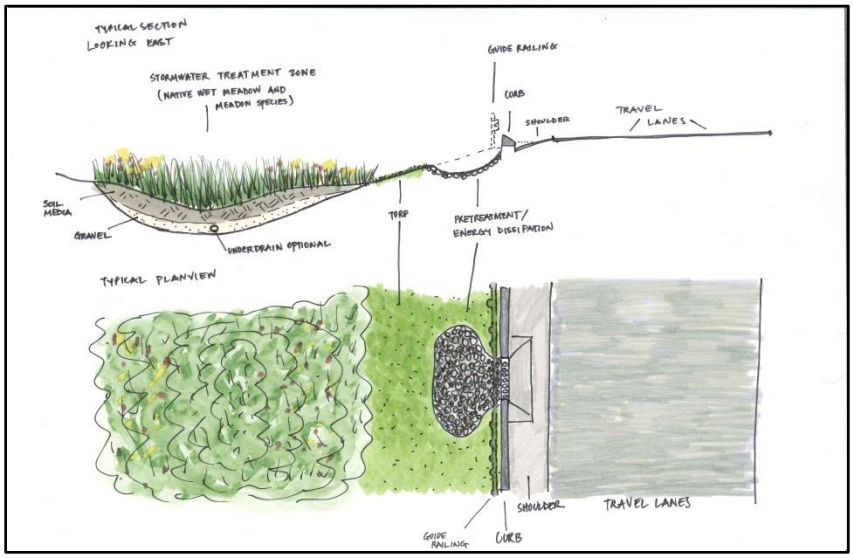


Aerial showing rough grading of Rockaway (foreground) and Paerdegat sites

Gerritsen

The Gerritsen Inlet site SMP design is comprised of 2,430-foot of bioretention that receives diverted runoff from the main roadway conveyance system via curb cuts located upslope of adjacent catch basins or via sheetflow where no curbs are proposed or currently present. The location of the bioretention facilities were determined by identifying areas that limit disturbance to existing natural areas while maximizing the amount of impervious roadway surface draining to each SMP. The four targeted locations will provide water quality treatment for 3.5 acres of impervious surface.

Three bioretention facilities are being proposed that are located within the median. These SMPs contain underdrains that connect to the existing and proposed median inlets located at the low point in the system. The underdrain, consisting of perforated pipe surrounded by stone, conveys filtered runoff from the bottom of the facility to the catch basin. The catch basin also serves as the overflow outlet via its grate. The fourth facility is located along the north shoulder of the Parkway and does not contain an underdrain. This facility is located on native permeable sandy soils, and overflows via a cobble outlet weir away from the roadway, to a wooded area to the north.



Concept plan and profile of curb cut to bioretention median

Green Infrastructure Program Implementation

Description: Areawide implementation of green infrastructure (GI) citywide including the 26th Ward Green Infrastructure Demonstration Project in the Jamaica Bay Watershed.

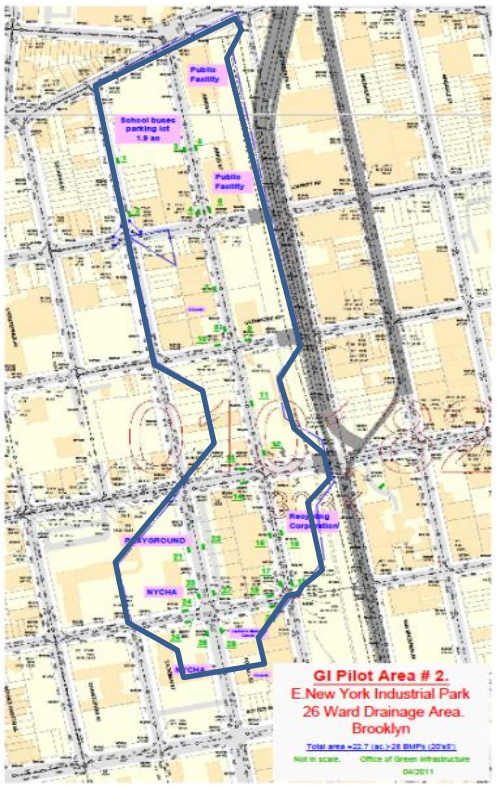
Schedule: Construction commenced in August 2012 and is anticipated to be complete in fall 2012.

Cost Estimate: $192 million citywide by 2015; $880,000 for the 26th Ward Demonstration Project right-of-way bioswales (ROWB) and $400,000 for onsite installations.

On September 28, 2010, Mayor Bloomberg announced a comprehensive approach toward harbor water quality improvements that would replace the City's current CSO strategy with the *NYC Green Infrastructure Plan*. Over the course of the past two years, DEP has made meaningful progress toward implementing the goals set forth in the Plan. In March 2012, DEP and the New York State Department of Environmental Conservation (DEC) amended a consent order to reduce CSOs which includes milestones for building green infrastructure and cost-effective grey infrastructure. Specific elements of the 2012 Modified Consent Order ("Consent Order") related to GI include:

- An adaptive management approach based on post-construction monitoring, modeling and reporting (i.e., quarterly, annually and for five-year implementation periods);
- Management of runoff from 10% impervious surfaces in combined sewer areas citywide by 2030;
- GI Demonstration Projects in three watersheds: 26th Ward, Hutchinson River, and Newtown Creek ; and
- Expanded NYC GI grant program.

The 26th Ward Demonstration Project to be applied in the Jamaica Bay watershed is one of several GI projects being implemented to achieve the requirements of the Consent Order. Areawide contracts to construct ROWB are also being initiated within the Jamaica Bay Watershed to achieve the 10% citywide goal. The Hutchinson River and Newtown Creek demonstration projects and GI grant program are partially funded through the Environmental Benefits Project (EBP) funding. These projects were undertaken by DEP in connection with the settlement of an enforcement action taken by DEC for violations of New York State law and DEC regulations.



The goal of the demonstration projects is to test the effectiveness of GI systems on a multiple block scale. The 26th Ward Demonstration Project is a 22.7-acre watershed in Brooklyn located in the East New York section of the City. The watershed is generally located west of Pennsylvania Avenue and south of Atlantic Avenue and Eastern Parkway. The area discharges into a combined sewer that is relieved at regulator 26W-R2 and discharges to the head end of Fresh Creek through outfall 26W-003 located near where Flatlands Avenue crosses the Fresh Creek.

This demonstration project drainage area is long and narrow, being approximately two blocks wide and four blocks long. All the combined sewers within the area drain to a single point, located at the intersection of Belmont Avenue and Junius Street, where they combine to form a single 24-inch sewer that conveys all combined sewage out of the catchment area. A portion of the demonstration project is also being constructed at the Seth Low Houses, a New York City Housing Authority (NYCHA) facility, located along Junius Street between East New York and Belmont Avenue in the Brownsville section of Brooklyn.

The demonstration areas were chosen because the existing combined sewer systems were suitable for monitoring pre- and post-construction flow in a single sewer pipe that drains a single multi-block area. The demonstration project will encompass approximately 23 acres and will include three main green infrastructure elements: 30 bioswales, subsurface detention (stormwater chambers) and permeable pavement. Monitoring equipment was installed in the existing sewer at the intersection of Junius Street and Belmont Avenue and data collected between fall 2012 and spring 2013 will be used to support the LTCP process. DEP has conducted several meetings and outreach events regarding this demonstration project, in an effort to actively involve the public and Seth Low residents. Additional opportunities for public participation will be provided during the LTCP development process, beginning in July 2015.

Once construction is complete, DEP will collect and analyze monitoring data to determine the changes in wet weather flows within the demonstration areas. The data captured from the demonstration areas will set parameters for future siting for GI installations, the cost effective installation rate, and the CSO Long Term Control Plans. This knowledge will then be extrapolated for

calculating and modeling water quality and cost-benefit information on a waterbody and citywide basis.

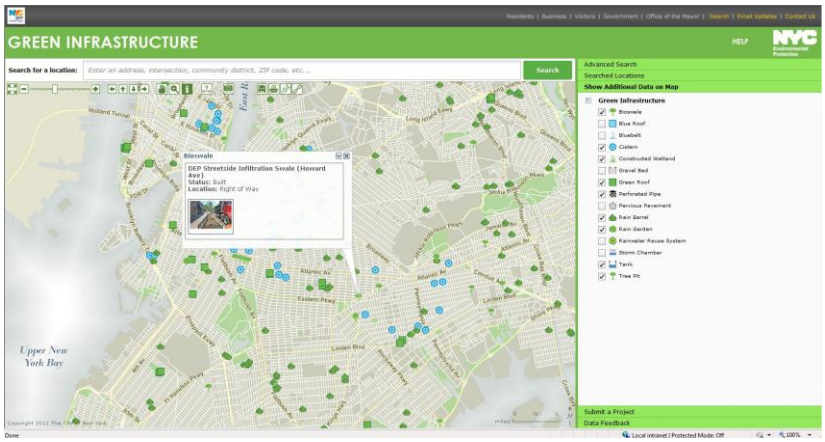
DEP will be maintaining data on built green infrastructure projects as they are implemented throughout New York City with the GI Webmap, DEP's web-based Geographic Information System (GIS) storage and tracking application. The GI Webmap can be accessed from DEP's website www.nyc.gov/dep/greeninfrastructure.

The GI Webmap is a versatile tool which allows the general public and other interested parties to access information on various types and locations of green infrastructure technologies planned or in use across the City. The GI Webmap was developed through collaboration between the departments of Environmental Protection and Information Technology and Telecommunications (DOITT).

Users of the GI Webmap can:

- Search for a project location by address, block and lot, intersection or place of interest;
- Access information, photos and related details for green infrastructure projects;
- Submit a GI project, entering information and related details on the project to the GI Webmap database via an electronic data entry form; and
- Provide data feedback on the GI Webmap via an online data entry form.

The GI Webmap serves as the central repository for green infrastructure projects across the city. Together with DEP's internal asset management database, the GI Webmap is an important tool to help the city track and meet the goals of the Consent Order as well as PlaNYC.



Ecological Atlas and Dynamic Reconnaissance Mapping of Wetlands

Description: Use existing sources of information along with newly captured satellite imagery and field work to develop a GIS-based Jamaica Bay Watershed Ecological Atlas.

Schedule: Satellite wetland mapping began in spring 2010; and field data collection and GIS-mapping development began in 2011. All field work will be completed in 2012 along with potential ecological and stormwater restoration opportunities. The completed Ecological Atlas GIS-database will be completed in 2013.

Estimated Cost: $500,000 Ecological Atlas and $187,000 for Wetland Mapping

Ecological Atlas

Building on the completed JBWPP, DEP is developing a Jamaica Bay Watershed Ecological Atlas. Work includes developing an inventory of existing City-owned Block and Lot data, field verifying the information and collecting additional information about existing ecological and stormwater charac-teristics. Based on the existing data, potential ecological and stormwater restoration opportunities are being developed and prioritized.

Sample Neighborhood Pathway Concept

Consistent with New York City's Waterfront Revitalization Plan (WRP), the Jamaica Bay Watershed Ecological Atlas project proposes to provide (1) a complete and updated inventory of all City-owned properties and a characterization of their habitat and stormwater attributes; (2) a GIS-mapping and information data layer that can be used by restoration practitioners to develop and leverage future ecological restoration designs; and (3) a prioritized list and map of potential sites for ecological and stormwater restoration and conservation.

The restoration and conservation actions enabled by this project will ultimately provide critical benefits for plant and animal species, and will be

integrated with urban stormwater runoff management practices to benefit comprehensive ecological improvements for the Jamaica Bay watershed.

Wetlands Mapping and New York City Wetlands Strategy

Historic wetlands coverage in New York City (Courtesy of RPA)

In January 2009 the City released *New York City Wetlands: Regulatory Gaps and Other Threats* to recommend policy options for wetland protection. One of the primary findings of this report was that up-to-date mapping was needed before determining the most appropriate wetlands protection strategies. The survey of likely wetland areas based on satellite imagery and aerial photography has been completed. In September 2010 the preliminary mapping report was issued and is available for review on the PlaNYC 2030 website. The report contains preliminary wetlands maps as well as technical information explaining the methodology used to develop these maps. This work was completed by the Lamont-Doherty Earth Observatory at Columbia University under the management of the New York City Department of Environmental Protection.

This preliminary survey was completed by combining current, high-resolution satellite imagery with archival imagery to identify potential wetland areas on the basis of multiple factors such as topography, soil moisture, standing water, and vegetation dynamics. These maps utilize an alternative approach to traditional wetlands mapping. Prior to this effort, most wetland maps have been based on visual interpretation of aerial photographs followed by field verification. This preliminary wetlands survey provides a unique perspective that is impossible to obtain from the ground. While remote sensing does not eliminate the need for field verification, this imagery does provide a valuable reconnaissance tool to help scientists and decision-makers focus field validation efforts. In an effort to develop a 1' Digital Elevation Model (DEM), DEP has subcontracted with Spatial Analysis Laboratory of the University of Vermont. The 1'DEM will provide a greater level of granularity for greater wetland mapping refinement and for mapping impervious coverage, siting of green infrastructure, understanding sea level rise, and DEP's infrastructure critical elevations.

This effort is the first step in a long process to correctly identify and better interpret the data on the maps. In May 2012 the City released the New York City Wetlands Strategy (WS) report, a follow up to the preliminary mapping effort and outlines 12 initiatives to help protect, preserve and enhance the City's wetlands. This analysis and other considerations have led the City to establish an overall goal and initiatives to achieve this goal by addressing four key areas: protection, mitigation, restoration, and assessment. The wetlands strategy establishes the goal of no net loss of wetlands and recognizes that addressing the quantity of wetlands in New York City does not provide a clear enough picture. This strategy also establishes the goal to improve the quality of the city's remaining wetlands and maximize their ecological functions to the greatest extent possible.

To help improve the long term success of wetland restorations, avoid under-sized restorations with limited to no buffering capacity to resist environmental forces and provide greater wildlife habitat, a consolidated wetland mitigation proposal as recommended in the WS is currently being explored and evaluated. To ensure a comprehensive assessment, several consolidated mitigation programs developed in other regions have been reviewed, including that of the Florida Department of Environmental Protection's *Uniform Mitigation Assessment Method*. The goals as defined by the UMAM that would help restoration efforts and permitting include:

- Practical for use within permitting timeframes;
- Consistent process;
- Use with reasonable scientific judgment and;
- Account for different ecological communities

To develop an accurate assessment of specific wetland conditions at any location, the UNAM determines the value of functions provided by wetlands and other surface waters by considering:

- Current condition
- Hydrologic connection
- Uniqueness
- Use by fish and wildlife
- Location

The City will continue to evaluate the UNAM for modified application to wetlands within New York City and explore the option of developing a pilot consolidated wetland mitigation site within Jamaica Bay.

Stormwater Pilot Monitoring Program

Description: Evaluation of constructed stormwater pilot performance, including storm hydrology and hydraulics, water quality, maintenance and additional benefits, through a comprehensive monitoring program.

Schedule: All Jamaica Bay pilots constructed; over one year of monitoring and data collection complete; monitoring program continues.

Cost Estimate: $3.05 million

In 2010 and 2011, several stormwater pilots were constructed in the Jamaica Bay watershed and are being monitored through a comprehensive monitoring program.
These pilots include enhanced tree pits, street-side infiltration swales, bioretention, a wet meadow, a blue roof and a green roof. The *NYC Green Infrastructure Plan: 2011 Preliminary Pilot Monitoring Results* report summarizes initial monitoring results and preliminary observations made in 2011 for these Jamaica Bay stormwater pilots. The purpose of the monitoring effort is to evaluate the effectiveness of various green infrastructure practices at managing the 1-inch rainfall event and provide data that will allow DEP to extrapolate the runoff reduction benefits on a large scale. The report, including monitoring results and data for the Jamaica Bay pilots, is available on DEP's website:
http://www.nyc.gov/html/dep/pdf/green_infrastructure/gi_annual_report_update_supplement_2012.pdf.

The following summarizes each pilot type constructed in the Jamaica Bay watershed. **Table 1** includes additional information for each pilot site, including the impervious area managed.

- **Enhanced Tree Pits:** Street runoff is diverted by curb cut and routed into the enhanced tree pits, where specially engineered soils and native plant species are used to absorb water and filter pollutants. Different subsurface storage technologies are being evaluated as part of the pilot including stormwater chambers, 2 inch crushed stone and 3/8 inch recycled crushed glass.

- **Street-Side Infiltration Swales:** Similar to enhanced tree pits, street-side infiltration swales utilize engineered soils and native plants to absorb water and filter pollutants. This type of green infrastructure also provides depression storage on the surface for increased capture of stormwater volumes.

- **Bioretention:** Bioretention areas treat and capture runoff that would otherwise flow directly into the combined sewer system. Bioretention areas consist of shallow basins underlain with engineered sandy soil media that remove pollutants from runoff, provide temporary storage to reduce runoff flow rates and increase groundwater recharge.

- **Wet Meadow:** A stormwater wetland, also called a wet meadow, manages runoff from an impervious surface, which is then conveyed to the source control through catch basins. Overflow from the wetland is directed into a bioswale designed to promote infiltration into the soil.

- **Porous Asphalt and FilterPave:** Porous pavement systems, including asphalt and FilterPave (made of crushed glass), function by allowing rainfall to infiltrate through the pavement surface material while providing a subsurface gravel storage zone to encourage infiltration into the subsoil and attenuate outflow rates.

- **Blue Roof:** A blue roof regulates flow to the sewer system and provides temporary storage of stormwater. Design components include controlled flow roof drains with an overflow to limit ponding at the drain to two inches and intermediate check dams to address roof slope and distribute ponding across the roof surface.

- **Green Roof:** Green roofs consist of a vegetative layer that grows in a specially-designed soil, which sits on top of a drainage layer. On a green roof, water drains from the roof to existing drains at existing slopes. Design features include a root barrier to protect the membrane from root penetration, a drainage mat to facilitate flow of excess water in the soil to the roof drain, and a 4-inch depth growing media to support plants.

Table 1: Jamaica Bay Watershed Pilots and Impervious Area Managed at Each Monitoring Site

Green Infrastructure Application	Site	Source Control	Impervious Area Managed (SF)
Right-of-Way (ROW)	Autumn Avenue	Enhanced Tree Pit	2,250
	Blake Avenue	Enhanced Tree Pit	2,175
	Ridgewood Avenue	Enhanced Tree Pit	4,420
		Street-Side Infiltration Swale	4,420
	Union Street	Enhanced Tree Pit	1,680
		Street-Side Infiltration Swale	2,230
	Eastern Parkway	Street-Side Infiltration Swale	19,880
	Howard Avenue	Street-Side Infiltration Swale	6,630
	99th Avenue	Street-Side Infiltration Swale	3,300
	North & South Conduit	Bioretention	81,870
On-Site	Canarsie Parking Lot	Bioretention	10,050
	Far Rockaway Parking Lot	Bioretention	8,900
		Porous Asphalt	6,380
		FilterPave	4,260
	Spring Creek Parking Lot	Wet Meadow	14,000
	PS118	Blue Roof; Check Dams	3,500
		Green Roof	3,500
		TOTAL	**179,445**

Guidelines for the Design and Construction of Stormwater Management Systems

Description: Create companion guidance document to sewer code revisions specific to New York City conditions.

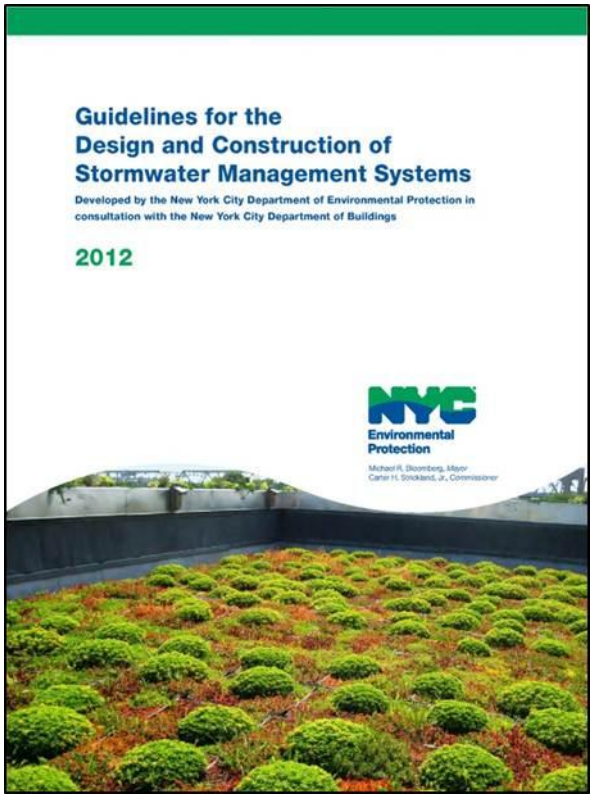
Schedule: Completed and distributed in July 2012 in conjunction with the promulgation of DEP's stormwater performance standard.

DEP's stormwater performance standard (or "stormwater rule") took effect in July 2012. By slowing the flow of stormwater to the sewers, the stormwater rule allows the city to manage stormwater runoff from new development and redevelopment more effectively and maximize, to the greatest extent possible, the capacity of the city's combined sewer systems. The rule is a key component of PlaNYC and the 2010 NYC Green Infrastructure Plan, which aims to manage 10% of the runoff from impervious surfaces citywide by 2030 through green infrastructure (GI). Therefore, the stormwater rule is one of several GI strategies that will continue to be evaluated as part of the Long-Term Control Plan (LTCP) development process, DEP's comprehensive approach to reduce combined sewer overflows (CSOs) using a combination of green and grey infrastructure.

The stormwater rule applies to new development or the alteration of an existing development in combined sewer areas of the city. For a new development, the Stormwater Release Rate will be the greater of 0.25 cubic feet per second (cfs) or 10% of the drainage plan Allowable Flow, unless the Allowable Flow is less than 0.25 cfs, in which case the Stormwater Release Rate shall be the Allowable Flow. For alterations, the Stormwater Release Rate for the altered area will be directly proportional to the ratio of the altered area to the total site area and no new points of discharge are permitted (see link below for further details).

In conjunction with the implementation of the new stormwater rule, DEP published a companion document, Guidelines for the Design and Construction of Stormwater Management Systems, to assist New York City's development community and licensed professionals in the selection, planning, design and construction of onsite source controls that comply with the new rule. The guidelines were developed in consultation with the Department of Buildings, and feature guidance on siting, design and construction considerations for various stormwater control systems, as well as operation and maintenance recommendations. Likewise, DEP went through an extensive peer review process that incorporated input from

representatives of multiple city agencies, members of design, engineering, real estate communities and leaders in sustainability.



In the months between the promulgation and effective date of the new stormwater rule, DEP conducted several outreach sessions to inform the engineering, design, finance, development and affordable housing community, as well as private sector plumbers, code consultants, professional associations and other city agencies. The objective was to explain the new rule, how to use the accompanying guidelines, and to provide an opportunity for dialogue and discussion. The overview presentation from these sessions can be accessed on DEP's website along with the Guidelines for the Design and Construction of Stormwater Management Systems at: http://www.nyc.gov/html/dep/html/stormwater/stormwater_management_construction.shtml.

Long Term Control Plan (LTCP)

Description: Water quality planning process for NYC's local waterways: creation of 10 waterbody-specific and 1 citywide LTCP.

Schedule: Multi-year planning process – first LTCP due June 2013; Jamaica Bay and Tributaries LTCP due June 2016; citywide LTCP due December 2017.

On March 8, 2012, the New York State Department of Environmental Conservation (DEC) and DEP signed a groundbreaking agreement to reduce combined sewer overflows (CSOs) using a hybrid green and gray infrastructure approach. As part of this agreement, DEP will develop 10 waterbody-specific LTCPs plus 1 citywide LTCP to reduce CSOs and improve water quality in NYC's waterbodies and waterways. The goal of each LTCP is to identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards, consistent with the Federal CSO Policy and the water quality goals of the Clean Water Act (CWA).

The LTCP process:

- Assesses feasibility of attaining current water quality standards, next highest standards and fishable/swimmable standards;
- Builds off of Waterbody/Watershed Facility Plans or the first phase of the planning process;
- Requires robust, targeted public process; and
- Identifies grey-green balance for different watersheds.

On June 26, 2012 DEP co-hosted a Citywide Public Kickoff Meeting and Open House to initiate water quality planning processes for long term control of combined sewer overflows. The Citywide Public Kickoff Meeting and Open House was the first of many opportunities for public participation as part of the LTCP development process. As part of DEP's LTCP Public Participation Plan, posted on DEP's LTCP Program website (www.nyc.gov/dep), the public will have multiple opportunities to provide feedback and participate in the development of waterbody-specific and citywide LTCPs. DEP will also use feedback from the public to continue to improve the Public Participation Plan throughout the planning process.

The Jamica Bay and Tributaries LTCP is due in June 2016. Consistent with the goals and activities listed in the LTCP Public Participation Plan, DEP will reach out to and include the Jamaica Bay Task Force and other Jamaica Bay stakeholders to encourage diverse stakeholder input on water quality-dependent uses of Jamaica Bay and Triubutaries and alterantvies to be evaluated for the development of the LTCP during the Jamaica Bay and Tributaries LTCP development process, beginning in July 2015.

Stormwater Rate Structure Study

Description: Evaluate alternative water, sewer and stormwater rate structures.

Schedule: Study began in July 2008 and was completed in December 2009. Sewer charge for stormwater for parking lots was implemented in January 2011. DEP continues to analyze potential future phases.

The Water Board completed a study in December 2009 that evaluated expenditures, revenue sources, and alternative water, wastewater and stormwater rate structures. A primary goal of the study was to research possible structures that could be implemented in New York City to enhance revenue stability, equity for customers, and resource conservation.

One strategy resulting from the study is the Sewer Charge for Stormwater for Parking Lots. Parking lots are typically completely impervious and therefore, generate large amounts of stormwater. The charge applies to parking lots that have no water service and therefore do not pay for wastewater services, yet are generating demands on the wastewater system. 267 stand-alone private parking lots without water service citywide were charged an annual wastewater charge for stormwater of $0.05 per square foot of property area, per year, beginning in January 2011. A credit program was rolled out in tandem with the pilot program in an effort to incentivize construction of approvable green infrastructure technologies. The $0.05 fee is waived for property owners who implement green infrastructure. In FY2011 (a partial year), the pilot program generated $83,799.31. In FY2012 (a full year), the pilot program generated $114,236.20. DEP is using this revenue for stormwater-related expenditures.

Overall, the pilot program had a compliance rate of 72%. No green infrastructure was implemented through the credit program. Based on an analysis of charges and costs, green infrastructure is thought to be cost-prohibitive. Regarding next steps, DEP will continue to analyze stormwater charges applied to lots and as part of this ongoing analysis, DEP will monitor stormwater-related expenses. DEP will also continue to update information on the number of citywide parking lots that should be charged and also, determine potential application of sewer charges for stormwater to other types of land uses of lots with widespread impervious surface coverage with little to no water supply.

Springfield Gardens, Baisley Pond and Areawide Sewer Improvements

Description: Multiple projects and critical infrastructure projects, including Springfield Gardens and Baisley Pond, to reduce chronic flooding and increase environmental restoration in Southeast Queens.

Schedule: Springfield Gardens in construction; Baisley Pond in design and construction start date 2014

Estimated Cost: $68 million (Springfield Gardens); $4.3 million (Baisley Pond)

Southeast Queens is a target location for long-term sewer buildout and significant capital investment into the future to alleviate the chronic flooding conditions within Southeast Queens. This investment includes two Bluebelt-type projects: Springfield Gardens and Baisley Pond.

Since 1998, the City of New York has allocated $130 million on infrastructure improvements in the Springfield Gardens neighborhood of Southeast Queens. These improvements include reconstructed streets, sanitary sewers, water mains and storm sewers to address flooding problems. The Springfield Gardens Phase D project, the latest phase of infrastructure improvements in the area, includes reconstruction and replacement of new curbs, sidewalks, storm and sanitary sewers and water mains. The project area is approximately 80 acres and is generally bounded by South Conduit Avenue to the north, 149th Avenue to the south, 145th road/146th Avenue/225th Street to the east and Springfield Boulevard to the west. Phase D also includes major Bluebelt restoration features in Springfield Park, including restoration of Springfield Lake. Restoration of Springfield Lake will include three tidal wetland best management practices (BMPs), which will provide enhanced wildlife habitat and improved aesthetics for the surrounding communities. Construction is anticipated to comment in mid-October 2012 and is expected to be complete in fall 2014. The total estimated project cost is $68 million, which includes design, construction and construction supervision and inspection.

The Baisley Pond project ($4.3 million) includes new storm and sanitary sewers in Lakeview Boulevard East between 118th Avenue and 122nd Avenue. Similar to the Springfield Gardens Phase D project, the Baisley Pond project will also include Bluebelt restoration elements in Baisley Pond Park, including a BMP outlet into Baisley Pond. Construction is anticipated to begin in FY2014.

In addition to Springfield Gardens and Baisley Pond, DEP continues to invest in critical sewer improvements in the Jamaica Bay watershed including the following:

- **Jewel Streets Storm and Sanitary Sewers:** Installation of new storm and sanitary sewers near Jewel Street; currently in design. Construction is anticipated to begin FY2018.

- **Complete Sewer Build-out in Rockaways:** Total of 18 projects identified; 9 are constructed or in construction and 9 are in various stages of design. Additional projects are currently being identified and scoped.

- **Southeast Queens Drainage Plan:** Sewer modifications to convert existing system to a mainly separated system with High Level Storm Sewers (HLSS) in the Laurelton area. The drainage plans are complete for Springfield Park and Twin Ponds. Springfield is in construction and Twin Ponds is in the design phase. DEP is currently identifying additional storm sewer projects for design and construction.

Waterfront Revitalization Program

Description: Cooperative effort between different agencies and stakeholders to create a blueprint for the future of the City's waterfront.

Schedule: *Vision 2020*: New York City Comprehensive Waterfront Plan and the New York City Waterfront Action Agenda were completed in early 2011. The City is tracking progress through regular updates and an annual progress report.

The Waterfront Vision and Enhancement Strategy (WAVES) will reconnect New Yorkers and visitors to the water and reclaim New York City's standing as a premier waterfront city by transforming the City's waterfront with new parks, new industrial activities and new housing. It will capitalize on investments in water quality that have set the stage for ecological recovery, including enhancements to our natural waterfront and wetlands.

Vision 2020, the Comprehensive Waterfront Plan, sets forth a new long range vision for a 21st century New York City waterfront. Specifically, *Vision 2020* identifies key opportunities for improving our waterfront and outline strategies to realize this new vision. The Plan included extensive public outreach, including ten public meetings in all five boroughs and discussions with thousands of community and waterfront stakeholders. The Waterfront Action Agenda is the three year implementation component of *Vision 2020*. It includes 130 specific, high-priority projects that demonstrate the City's commitment to investing in our waterfront's transformation. Each project is organized under one of the eight goals of *Vision 2020*, identifies the dollar amount allocated to the project, the City agency leading its implementation, and the date by which the project will be undertaken. The eight overarching goals include 1) expanding public access 2) enlivening the waterfront 3) supporting the working waterfront 4) improving water quality 5) restoring the natural waterfront 6) enhancing the Blue Network 7) improving government oversight and 8) increasing climate resilience.

In May 2012, the City issued its One-Year Progress Report on the Waterfront Action Agenda, reporting that within the first year of WAVES, the City completed 34 initiatives and another 71 initiatives are on schedule for completion (84 percent of total projects). Fourteen initiatives (11 percent) are progressing, but with delays. Five projects (4%) have been reconsidered for reasons such as the availability of funding and changes to development plans.

For additional information, please visit:
http:/www.nycedc.com/sites/default/files/filemanager/Projects/Waves/Waves.2012.pdf

Acronyms

AMR	Automated Meter Reading
ARRA	American Recovery and Reinvestment Act
ATS	Algal Turf Scrubbers
BMP	Best Management Practice
CB	Community Board
CEQR	City Environmental Quality Review
CFS	Cubic Feet per Second
CRP	Comprehensive Restoration Plan
CSO	Combined Sewer Overflow
DCP	New York City Department of City Planning
DDC	New York City Department of Design & Construction
DEC	New York State Department of Environmental Conservation
DEP	New York City Department of Environmental Protection
DO	Dissolved Oxygen
DOB	New York City Department of Buildings
DOE	New York City Department of Education
DOI	United States Department of the Interior
DOT	New York City Department of Transportation
DPR	New York City Department of Parks & Recreation
DRM	Dynamic Reconnaissance Mapping
EDC	New York City Economic Development Corporation
EPA	United States Environmental Protection Agency
FY	Fiscal Year
GIS	Geographic Information System
GNRA	Gateway National Recreation Area
GPS	Geographic Positioning System
HEP	Harbor Estuary Program
HPD	New York City Department of Housing Preservation & Department
HRE	Hudson-Raritan Estuary Comprehensive Restoration Plan
JBWPP	Jamaica Bay Watershed Protection Plan
LTCP	Long Term Control Plan
MGD	Million Gallons per Day
MTA	New York City Metropolitan Transit Authority
NOI	Notice of Intent
NPS	National Park Service
NYCHA	New York City Housing Authority

NDZ	No Discharge Zone
OLTPS	Mayor’s Office of Long Term Planning and Sustainability
OMB	New York City Office of Management and Budget
PANYNJ	Port Authority of New York and New Jersey
ROW	Right-of-Way
SCA	New York City School Construction Authority
SPDES	State Pollutant Discharge Elimination System
USACE	United States Army Corps of Engineers
VGP	Vessel General Permit
WRP	New York City's Waterfront Revitalization Program
WWTP	Wastewater Treatment Plant

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