NYC GREEN INFRASTRUCTURE

2021 Annual Report

NYC Environmental Protection

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Hi!

The New York City Department of Environmental Protection (DEP) is excited to present the 2021 Green Infrastructure Annual Report. The Annual Report provides an update on the NYC Green Infrastructure Program (or the "Program"), including achievements and advancements through 2021, and provides a look at what is planned for 2022. Previous Annual Reports and the Green Infrastructure Plan can be found on DEP's green infrastructure webpage at https://www1.nyc.gov/site/dep/water/green-infrastructure.page.

Green infrastructure provides more than just stormwater management for New Yorkers. While the primary goal of the Program is to reduce combined sewer overflows (CSO) into New York Harbor in a cost-effective way, many of the distributed projects also provide community and environmental benefits to the city's neighborhoods and residents. These added benefits are commonly referred to as "co-benefits." Green infrastructure co-benefits can vary based on the type of green infrastructure practice implemented and whether or not is has vegetation, but can include reduced localized stormwater flooding, increased urban greening, urban heat island reduction, and more habitat for birds and pollinators around the city. The Program also seeks out strategic opportunities to implement green infrastructure in the separately sewered areas of the city to reduce polluted stormwater runoff, distributing green infrastructure co-benefits even further across the city.

By retrofitting NYC's streets, sidewalks, and other public properties with standard green infrastructure practices, incentivizing green infrastructure on private property, permitting projects triggered by stormwater regulations, and advancing daylighting opportunities in the Bronx and stormwater recovery and reuse projects, DEP is well on its way toward the 2030 CSO reduction goal of 1.67 billion gallons per year (BGY). As reported in past years, the Program has successfully installed and continues to install thousands of right-of-way (ROW) rain gardens and other green infrastructure practices in the City's combined sewer areas, and thousands more green infrastructure practices are in planning and design phases.

Program staff do more than just design and build projects; they also perform green infrastructure maintenance, oversee construction and enforce green infrastructure protection requirements, conduct research and development on green infrastructure, engage elected officials and civic stakeholders, work with private and public property owners implementing green infrastructure using incentives or abiding by regulations, review and track green infrastructure projects using GreenHUB (see 2018 Annual Report for more details), and lead planning, mapping, reporting and data management efforts.

In 2021, DEP submitted the list of constructed assets totaling 1,181 greened acres and 507 million gallons per year (MGY) CSO volume reduction for the 1.5% green infrastructure application rate milestone certification. Over 9,100 assets, constructed through over 50 individual construction contracts, went into the certification, demonstrating the tremendous effort that went into meeting the goal. The Program continued design and construction of ROW green infrastructure, initiated construction on over 40 public properties while simultaneously advancing designs for over 175 additional public properties, registered a $53M contract to advance green infrastructure on private property, finalized the draft Unified Stormwater Rule and initiated rulemaking, laid out a plan to accelerate green infrastructure as part of the New Normal Report and more.

As of early 2022, the Program has committed over $1.09 billion in capital funds since fiscal year 2012 and has approximately $771 million currently budgeted through fiscal year 2032 (see Exhibit A). These future funds are earmarked for ongoing design, construction, and construction management work. Implementation of the Program is undertaken by DEP with support from the Economic Development Corporation (EDC), the Department of Design and Construction (DDC), the Department of Transportation (DOT), and the Department of Parks and Recreation (Parks), for the ROW program. In addition, partnerships with Parks, the Department of Education (DOE), New York City Housing Authority (NYCHA), School Construction Authority (SCA), and others facilitate retrofits on public property.

Throughout 2021, DEP staff continued to engage the public through virtual workshops and presentations as well as community outreach events (see Exhibit B). This outreach has been critical to the success of the Program and also includes hundreds of correspondences and phone conversations with residents and local organizations.

PROGRAM HIGHLIGHTS

2,094
Greened Acres from 2010-2021

11,553
Assets constructed

$1B+
Committed since 2012

Things to look for in 2022 include: development of new partnerships and strategies for carrying out green infrastructure maintenance, advancement of area-wide ROW porous pavement design and finalization of porous pavement design standards and specifications, a new Community Stormwater Resiliency Grant Program, cloudburst neighborhood feasibility studies, advancement of projects on private property through Resilient NYC Partners, and new partnerships for green infrastructure research and development.

In 2021, DEP submitted the list of constructed assets for the 1.5% green infrastructure application rate milestone certification

IMPLEMENTATION PROGRAM UPDATE

STORMWATER MANAGEMENT IN RAIN GARDEN

RIGHT-OF-WAY GREEN INFRASTRUCTURE

The public ROW includes sidewalks, parking lanes, medians, and the roadway. It makes up approximately 30% of the impervious cover in the city and generates stormwater runoff during rain events. The public ROW offers a tremendous opportunity for siting green infrastructure and, as such, has been the largest implementation area of the Program thus far. In 2012, DEP launched area-wide green infrastructure projects, in partnership with the Department of Transportation (DOT) and Parks. To date, these area-wide projects have led to the vast majority of Program accomplishments, contributing entirely to the full list of constructed assets that was submitted to meet the 1.5% application rate milestone in accordance with CSO Order on Consent Section IV.C.5.

ROW implementation is focused in Priority CSO areas, as well as in limited areas within the East River/Open Waters (EROW) CSO tributaries, to improve public access and water quality in confined waterways. Most of the Priority CSO areas have been investigated and saturated with ROW green infrastructure practices, and DEP is continuing to implement area-wide projects for select EROW areas. Detailed descriptions of the area-wide implementation strategy and the design and construction processes are described in previous Annual Reports. Photos of ROW green infrastructure construction can be found on DEP's Flickr page at https://www.flickr.com/photos/nycwater/.

In 2021, DEP continued widescale implementation of green infrastructure in the ROW, reaching functionality by year end of over 4,700 practices over 19 construction contracts that were bid in 2019 across the Westchester Creek, Bronx River, Newtown Creek, Flushing Creek, and Jamaica Bay watersheds. Three additional construction contracts with over 1,000 rain gardens and infiltration basins combined, commenced work in 2021.

The GI Program's 1.5% application rate milestone was achieved entirely by over 9,000 practices constructed through ROW implementation

DEP initiated procurement on two additional construction contracts comprising of over 900 rain gardens and infiltration basins combined in Jamaica Bay and EROW CSO tributary areas. These contracts are anticipated to register in 2022. DEP took an opportunity to pivot design on five large areawide contracts in the Gravesend Bay CSO tributary area (Brooklyn) to permeable pavement, which will result in an estimated 250,000 LF of permeable pavement. One of these contracts will be piloted as a design-build contract, as opposed to the traditional design-bid-build structure. DEP is also proceeding with procurement of a design-build permeable pavement contract in the Bronx, aiming to implement 50,000 LF of permeable pavement (see Permeable Pavement section for more details on this work).

The types of green infrastructure practices that DEP installs in the ROW have evolved with the Program over the years. DEP's expanded GI toolbox improves upon the original ROW bioswale design by addressing issues such as varying field conditions and concerns from the community (see Figure 1 for photos and descriptions).

Updates are made regularly by the design team staff, who are in continuous communication with construction managers, contractors, and inspectors, as well as monitoring and maintenance staff, in a feedback loop to improve constructability and long-term performance of the ROW green infrastructure practices. Any updates are reflected in the standard details and specifications, so that subsequent construction work will reflect these changes. One major update that DEP worked on in 2021 was for permeable pavement in the roadway, in preparation for the upcoming areawide permeable pavement installation work. DEP is planning to publish another update to the Standard Designs, incorporating the revisions to the permeable pavement designs as well as minor updates for the other ROW green infrastructure practice types, in summer of 2022.

The DEP ROW implementation team also worked with DDC to publish the Standard Green Infrastructure Specifications, which was posted to DDC's public website in September 2021. This effort is anticipated to streamline the procurement and construction of green infrastructure by eliminating the need for project specific contract documents. DEP also anticipates that designers and engineers will be able to refer to these published specifications for implementing similar types of green infrastructure practices outside of the DEP ROW program, whether it be for regulated, incentivized, or voluntary stormwater management projects.

Also in 2021, DEP continued to have a strong field presence for maintaining quality control over the thousands of ROW green infrastructure assets constructed and being constructed. More information on DEP's construction oversight work is detailed in the Construction Management, Inspection, and Enforcement section.

CONCRETE TOP INFILTRATION BASIN

FIGURE 1: RIGHT-OF-WAY GREEN INFRASTRUCTURE TOOLBOX

The standard rain garden continues to be the most widely implemented type of ROW green infrastructure practice. The latest design improvements include new planting plans, a concrete walking strip, and sediment capture mechanisms to trap debris and reduce erosion.

Rain gardens with “Type D” inlets utilize a catch basin grate in the roadway instead of a curb cut inlet to redirect stormwater runoff into the practice. This reduces debris that flows onto the soil bed and also minimizes soil erosion from high intensity storms.

Infiltration basins are designed to match the existing sidewalk (concrete or grass strip). Although they do not provide the same greening co-benefits as rain gardens, they are the preferred alternative in high-density residential, industrial, or commercial areas where sidewalk space is limited and plants may not thrive.

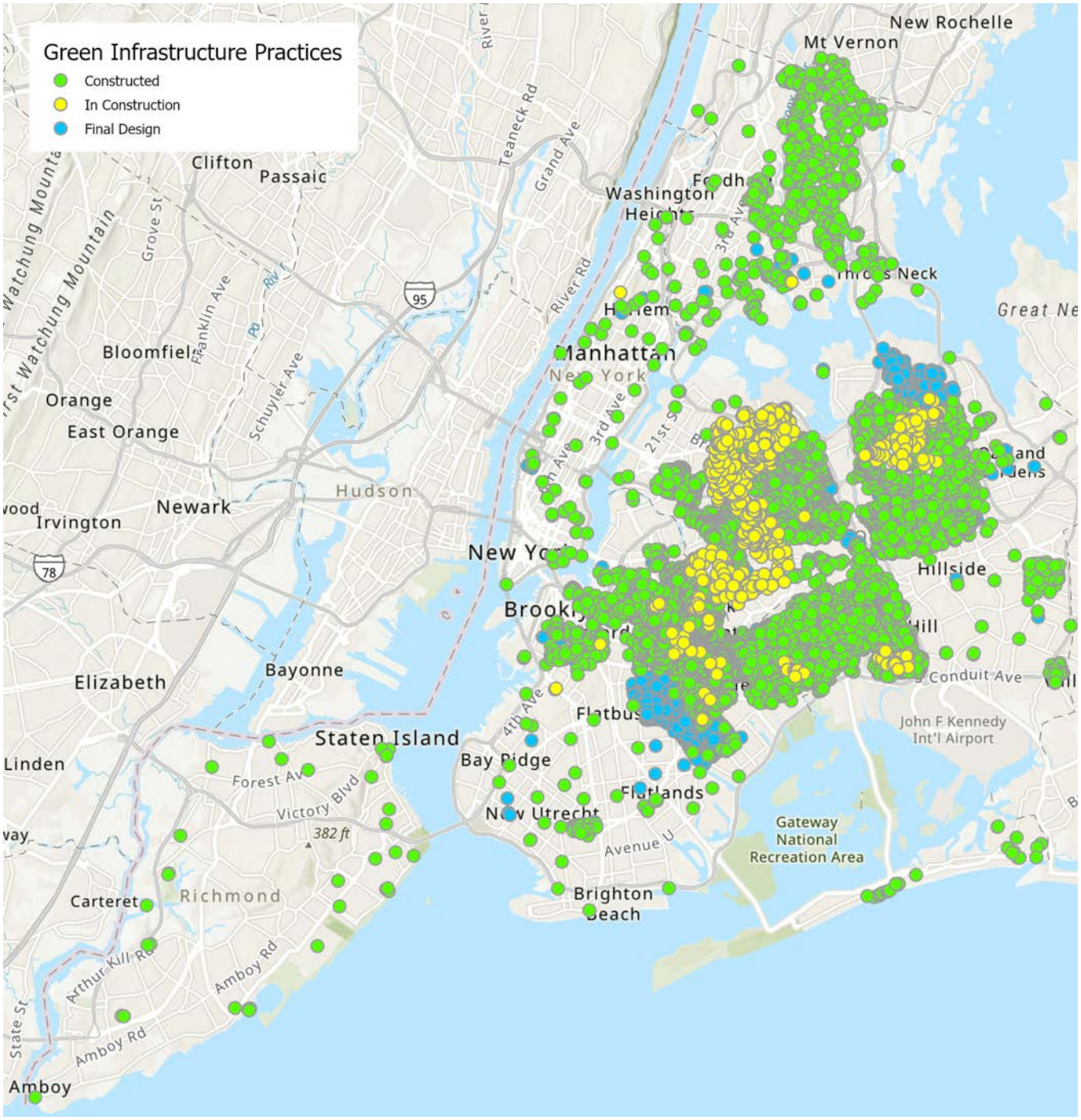
Permeable pavement installations in the roadway are ideal for neighborhoods with limited opportunity for green infrastructure on sidewalks due to existing trees, driveways, and other siting constraints.

Note: Constructed assets may differ from above images due to site-specific conditions and changes in design.

GREEN INFRASTRUCTURE PROGRAM MAP

The Green Infrastructure Program map is an interactive tool that allows residents to find green infrastructure practices in their neighborhoods, identify if they are constructed or coming soon, and learn other basic information like what the green infrastructure practice is - rain garden, green roof, infiltration basin, etc. The map is updated monthly.

View the complete map at nyc.gov/dep/gimap



PERMEABLE PAVEMENT IN THE ROADWAY

POROUS ASPHALT MAINTENANCE

DEP, in partnership with DOT, has been studying permeable pavement installations in the roadway through neighborhood scale pilots to meet the requirements of Local Law 80 (2013). The first pilot consisted of porous concrete gutters in Rego Park, Queens (Flushing Bay), followed by porous concrete and permeable pavers in Wakefield, Bronx (Hutchinson River). The third pilot was for porous asphalt on four streets in Maspeth, Queens (Newtown Creek). DEP has also constructed several blocks of porous concrete gutters in South Ozone, Queens (Jamaica Bay). Following construction, DEP has been conducting limited studies to evaluate the performance of these installations through various data collection methods, including in-sewer flow monitoring, surface infiltration testing, observation well monitoring, and modeling.

Through the pilots, DEP has found that permeable pavement has the potential to capture large volumes of stormwater and can be utilized in areas where curbside rain gardens have not been feasible due to siting and design constraints. As described earlier, DEP worked on planning design development for areawide porous pavement implementation in Brooklyn and in the Bronx in 2021. Some of the neighborhoods within the upcoming ROW implementation areas have streets where rain gardens have already been installed or were considered for rain gardens but rejected for various reasons. For the areas that DEP previously investigated, the design staff applied the available data that were collected previously – including geotechnical data such as soil type, bedrock, and groundwater elevations – to expedite the planning process.

DEP is also applying lessons learned through the design and construction of the permeable pavement pilots to refine the projections for the new permeable pavement implementation areas. Specifically, DEP has been working with DOT to update the siting criteria for permeable pavement, which differs from siting considerations for the rain gardens that are mainly in the sidewalks. The latest siting criteria avoids certain types of streets such as high bus and truck traffic, commercial and manufacturing zones, and high sloped streets. DEP completed most of this planning analysis work for the Brooklyn area-wide projects and will conduct similar types of analysis for the upcoming Bronx River and Westchester Creek projects through 2022.

In parallel with DEP's pilots, DOT has been working on three separate locations where it will be piloting permeable pavement for sidewalk applications. One sidewalk was constructed next to a Brooklyn park in the Fall of 2021 and the other two locations are slated for construction in 2022 and later. After construction, DOT will conduct monitoring for six months to study pedestrian comfort. A final report will be prepared by DEP and DOT after post-construction data are collected and analyzed for all study areas.

LARGE SCALE STREET MEDIANS

DEP's in-house design team is tasked with identifying opportunities for large-scale green infrastructure practices within City-owned medians to target both citywide water quality objectives and inland flooding challenges. In addition to their ability to target a multitude of objectives, large-scale green infrastructure opportunities are a cost-effective strategy because they manage more stormwater runoff than typical ROW assets and concentrate maintenance needs in central locations.

The in-house design team applies its expertise to individually site and design these large-scale practices to address the unique challenges associated with each specific location. Large-scale street median design prioritizes the conveyance of stormwater runoff into stormwater practices that facilitate stormwater capture, retention, and detention, dependent upon soil conditions. Moreover, street median cover materials are converted to softscape with plant species that are adapted and suitable for the site's specific soil conditions in lieu of concrete or asphalt paving materials. Through this work, medians are reconfigured and redesigned to contribute to a vibrant and attractive public realm that promotes a better quality of life and helps protect the city's urban ecology, enhancing the health and well-being of its residents.

These practices differ from those in DEP's standard ROW green infrastructure toolbox in that they utilize a combination of innovative stormwater best management practices (BMPs) to capture and convey larger volumes of street runoff to promote infiltration, minimize potential flooding risk, treat polluted stormwater runoff and help reduce CSOs. This customized approach to each location makes this implementation area unique compared to the highly standardized area-wide ROW program approach.

Currently, the team has a portfolio of 72 potential sites. As of Spring 2021, one project is in construction, one project is in bid procurement and another four projects are in final design. Additional projects are expected to be advanced in 2022.

DEP will continue to rely on in-house expertise to identify and develop other opportunities for green infrastructure on publicly owned spaces.

RENDERING OF LARGE SCALE GREEN INFRASTRUCTURE IMPLEMENTATION FOR WINCHESTER BLVD, HILLSIDE AVE, AND MARTIN VAN BUREN H.S., QUEENS

CONSTRUCTION MANAGEMENT, INSPECTION, AND ENFORCEMENT

Many aspects of green infrastructure construction are unique to the way in which these assets function, and DEP identified the need to further the understanding of the personnel involved at all levels – from laborers and site supervisors to inspectors and construction managers overseeing the construction projects.

DEP inspectors work closely with project managers and superintendents on active and upcoming construction projects in both the ROW and on public property, to confirm that green infrastructure practices are built as designed and function properly. Inspectors help contractors and construction managers to understand updated design standards, present lessons learned from previous projects, and highlight components that are critical to the performance of green infrastructure practices. Standard procedures for tests and checklists are prepared to be used by the inspectors. As part of the asset acceptance protocol, DEP requires hydrant testing for infiltration basins and certain types of rain gardens to verify that certain features of the practices not visible from the surface were constructed correctly. In 2021, DEP conducted over 600 hydrant tests to assess the construction quality and resulting stormwater management capacity of newly constructed infiltration basins.

Common issues that DEP construction management staff were able to respond to in the field include verifying that correct materials, such as soil type and stone sizes, are being placed into the asset and ensuring that the contractor is making adjustments as needed in areas where unforeseen site conditions prevent the original design from being implemented. By being present during construction activities, DEP field staff have made numerous recommendations to contractors on their construction methods in order to improve the quality of the final constructed product. DEP also works with landscaping professionals to monitor plant health, where consultants perform monthly inspections and submit reports with photos for every asset that is newly constructed and under contractor maintenance. Trainings for these inspections are given by DEP to ensure that all new staff are familiar with the planting and maintenance requirements. Finally, DEP staff also check to make sure that the green infrastructure construction contractors have the proper protections implemented on existing trees and utilities to prevent unnecessary impacts to the community during construction activities.

With thousands of new green infrastructure locations and so much construction activity happening in and around New York City streets, it has been important for DEP to be proactive in green infrastructure protection by informing the broader contractor community about how to identify green infrastructure and protect it during street or on-site construction work. Typical damages identified by DEP staff in the field arise from land use activities on adjacent properties or from nearby routine and non-routine construction activity. For example, substances other than stormwater runoff can

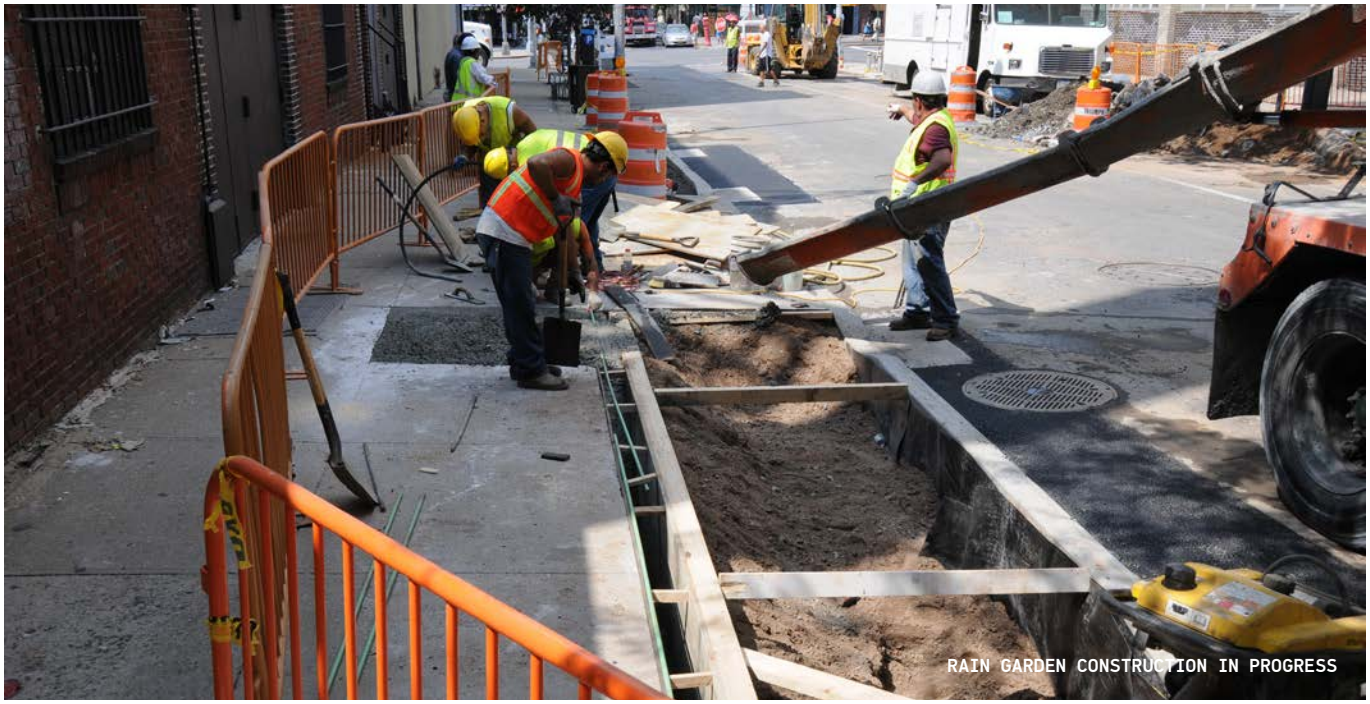
RAIN GARDEN INSPECTION

find their way into the assets and clog voids, which may prevent the system from functioning normally. In other cases, construction equipment or materials are stored too close or within the assets themselves creating safety hazards.

In response to this, DEP continues to work closely with DOT and utility companies to increase awareness and understanding of green infrastructure protection requirements. The DOT street opening permit, which contractors obtain prior to performing roadway work, includes two stipulations that are triggered whenever construction work is proposed in proximity to ROW green infrastructure. These stipulations require the permittee to properly protect the nearby green infrastructure practices throughout the duration of the construction. In addition to these permits, many construction contracts for utility work now include language requiring protection of green infrastructure as part of the construction work.

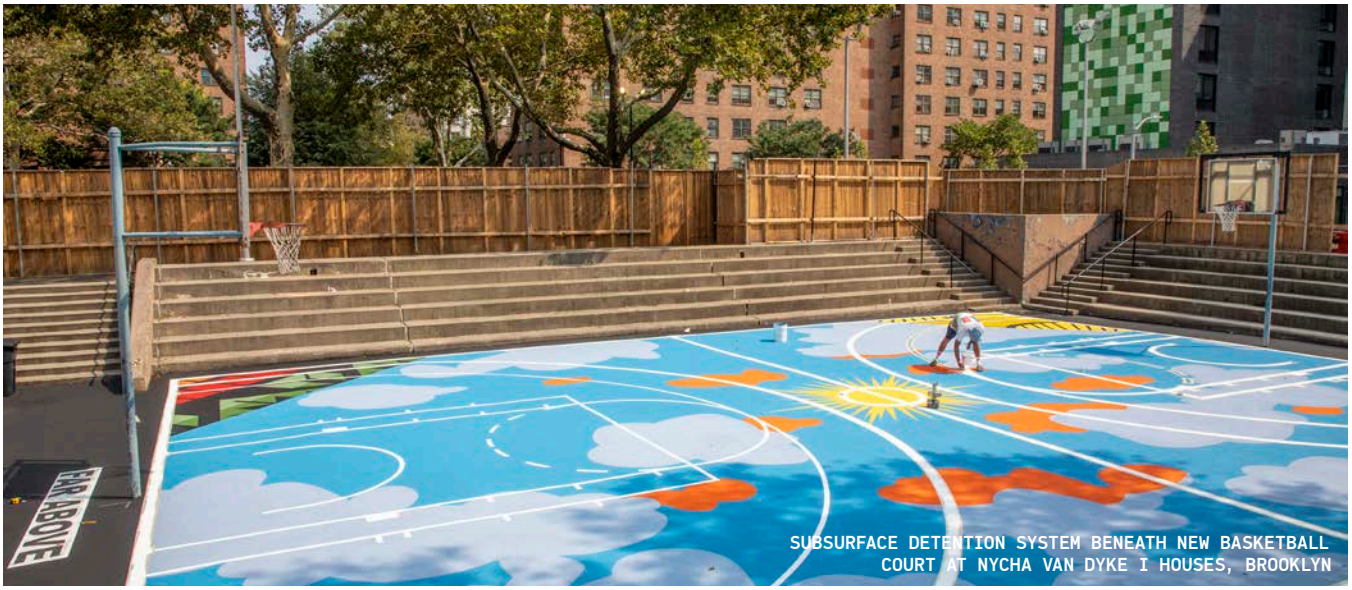
DEP provides training on green infrastructure protection for contractors, engineers, and supervisors working with and for Consolidated Edison, National Grid, and DOT, who are performing the majority of the street and sidewalk work in the city. The training sessions provide comprehensive guidance on proper protection measures for the different green infrastructure design types and also provide a space for open conversations to address concerns from contractors. Through this effort, DEP has established good communication with National Grid to ensure its subcontractors are always protecting existing green infrastructure assets within their work zone. The latest guidance on protection requirements, including detailed descriptions and graphics, can be found on the DEP website at https://www1.nyc.gov/assets/dep/downloads/pdf/water/stormwater/green-infrastructure/protection-requirements-for-right-of-way-green-infrastructure.pdf.

Following the new construction permitting requirements and increased outreach on green infrastructure protection requirements and enforcement activities, DEP has also been tracking notifications from in-house staff as well as from partner agency inspectors on damages to green infrastructure caused by activities in the city other than from construction activity. For example, some damages to green infrastructure have been caused by runoff from improper waste disposal operations from local businesses including restaurants, junk yards and vehicle repair shops, or structural damages resulting from parked cars on top of concrete top infiltration basins. If damages occur, DEP staff work with the involved parties to make repairs to the asset and/or issue a violation if needed. DEP will continue to work with agency partners and the construction community to improve green infrastructure protection techniques and update the guidance accordingly to provide more clarity.



RAIN GARDEN CONSTRUCTION IN PROGRESS

PUBLIC PROPERTY RETROFITS



SUBSURFACE DETENTION SYSTEM BENEATH NEW BASKETBALL COURT AT NYCHA VAN DYKE I HOUSES, BROOKLYN

DEP has been working with key public agency partners to implement green infrastructure retrofits on publicly owned land. This program area is typically referred to as "Public On-site." DEP's core public on-site partners are Parks, DOE, SCA, and NYCHA. Early on-site program achievements have been accomplished through direct contributions to agency capital work to incorporate green infrastructure or adding key properties to early area-wide ROW contracts managed by EDC. In 2017, DEP marked a major expansion of the public on-site implementation area by initiating three agency-specific design contracts, each with multiple consulting teams, to evaluate all opportunities in CSO priority waterbodies. In 2021, DEP continued green infrastructure design and construction with these core partners.

As outlined in the NYC Green Infrastructure On-site Design Manual, the feasibility screening process for public on-site retrofits begins with GIS mapping, interagency and capital planning coordination, research into existing agency records and as-built drawings, and an on-site walkthrough. Sites passing this stage then proceed to site investigations, which can include subsurface borings, drain inspections, surveys, and tree inventories. Sites deemed feasible are then able to proceed with design. Some agency properties, like Parks and NYCHA, are assessed to capture both on-site and ROW stormwater runoff and multiple assets may be designed for each property. Typical challenges for implementing retrofit projects on publicly owned properties include incompatible site uses or programming needs, planned capital improvements, maintenance, and other site constraints. The NYC Green Infrastructure On-site Design Manual is available online at https://www1.nyc.gov/assets/dep/downloads/pdf/water/stormwater/green-infrastructure/nyc-green-infrastructure-onsite-design-manual-v2.pdf.

DEP recognizes these agencies and others for sharing its mission and for facilitating the design and construction of green infrastructure retrofits on public properties. In addition to the water quality benefits, these partnership projects include many co-benefits that deliver real improvements to New York City's schools, parks, housing, and other City-owned properties. More details on each agency partnership are provided in the sections below.

Partnership with Parks

DEP has been working with Parks since 2011 to implement green infrastructure in New York City. While the main goal is cost-effective stormwater capture, green infrastructure on Parks property can offer co-benefits such as reduced flooding and ponding on paved surfaces, greening within the park, and improved recreational spaces. NYC Parks is the steward of 14% of the City's land and nearly 1,000 playgrounds. Initially working together on ROW stormwater green streets, DEP and Parks started focusing on green infrastructure within Parks properties in 2014. Implementation within parks has occurred primarily through four areas: the Community Parks Initiative (CPI), direct funding provided to Parks capital work, and DEP-initiated retrofits

TABLE 1: PUBLIC PROPERTY RETROFITS BY PROJECT STATUS

Project Status	Parks/ Playgrounds	Public Schools	NYCHA Housing	Other Public	Total
In Construction/ Constructed	57	55	23	8	143
In Design	105	50	21	3	179
Potential	28	10	0	0	38
Total	**190**	**115**	**44**	**11**	**360**

through designs developed under areawide contracts with EDC and DEP-managed design contracts.

CPI, launched in 2014 under Mayor Bill de Blasio, funded the reconstruction of playgrounds located in communities with a historical pattern of disinvestment. DEP provided funding and design assistance for green infrastructure installations at 41 of the 67 CPI sites. The nature of these projects as full redevelopment projects offered a tremendous opportunity to incorporate as much stormwater management as possible, as well as transforming these spaces for nearby residents.

Retrofits initiated through DEP's EDC contracts and DEP-managed design contracts are well underway. Construction on the EDC-managed projects began in Summer 2021. Six Parks sites have been completed and 12 are currently in construction. Construction is expected to be completed on the EDC portfolio of projects by Fall 2022. The types of practices constructed within parks varies. At Belmont Playground, for example, modular precast porous concrete was installed around the footprint of an existing spray shower. At Pink Playground, construction was completed on the installation of a rain garden and a subsurface detention system, and an existing planted bed was retrofitted to receive ROW stormwater runoff through a street inlet under the sidewalk. A subsurface detention system was installed underneath the asphalt multi-purpose play area and resurfaced. A detailed design schematic and subsurface detention installation photos of the Pink Playground project are provided on the next page.

Significant construction progress is expected to continue into 2022 and 2023 as 73 green infrastructure assets in 64 parks are in procurement across Parks and DEP-managed construction contracts. Forty-one assets across 33 parks are in design development. DEP and Parks anticipate adding another 20 parks to DEP's design contract in 2022. Initial assessments will begin Spring 2022.

In addition to green infrastructure retrofit projects, Parks has been implementing green infrastructure through its own Capital Division as a part of sustainable park design and stormwater regulations. Parks will continue designing green infrastructure across large reconstruction projects citywide as required to meet the Unified Stormwater Rule.

Parks and DEP created procedures to streamline design, reviews, and approvals to ensure the success of green infrastructure implementation between the agencies

GREEN INFRASTRUCTURE INSTALLATION AT PINK PLAYGROUND, BROOKLYN

DEP-initiated green infrastructure retrofits on partnering agency properties take many shapes and forms. The most successful projects are those that offer an opportunity to saturate the site with green infrastructure practices, to manage as much impervious area as possible, working around existing infrastructure, and meeting some new need of the agency owner. Over the years, DEP and Parks have created a vision and a path for doing just this. Pink Playground was identified by Parks as a site in need of general site repairs, as part of its "state of good repair program," which for this site primarily meant upgraded asphalt in the sport court areas. Having this information was essential to the design approach for this property, and allowed DEP and Parks to direct the design team to find opportunities to maximize the tributary drainage areas for practices in light of site regrading that could be accomplished with the new asphalt work. Parks properties are also assessed for opportunities to manage stormwater runoff from the ROW within the park, given their proximity and access to these impervious areas. Combining ROW and on-site stormwater runoff within a retrofit makes the overall cost per stormwater managed quite efficient. At Pink Playground, an existing planting bed in the southeast corner of the playground was retrofitted to receive ROW stormwater runoff through a street inlet installed under the sidewalk.

The design schematic in Figure 2 shows the subsurface detention practice, as well as the rain garden planting bed and corresponding tributary drainage areas implemented at Pink Playground in 2021. It also shows how the design team was able to work around existing conditions to maximize stormwater management on the property. Figure 3 on the next page shows the progression of a subsurface detention system being installed underneath the park's multi-purpose play area and the resurfaced area after installation.

FIGURE 2: DESIGN SCHEMATIC OF GREEN INFRASTRUCTURE INSTALLATION AT PINK PLAYGROUND, BROOKLYN

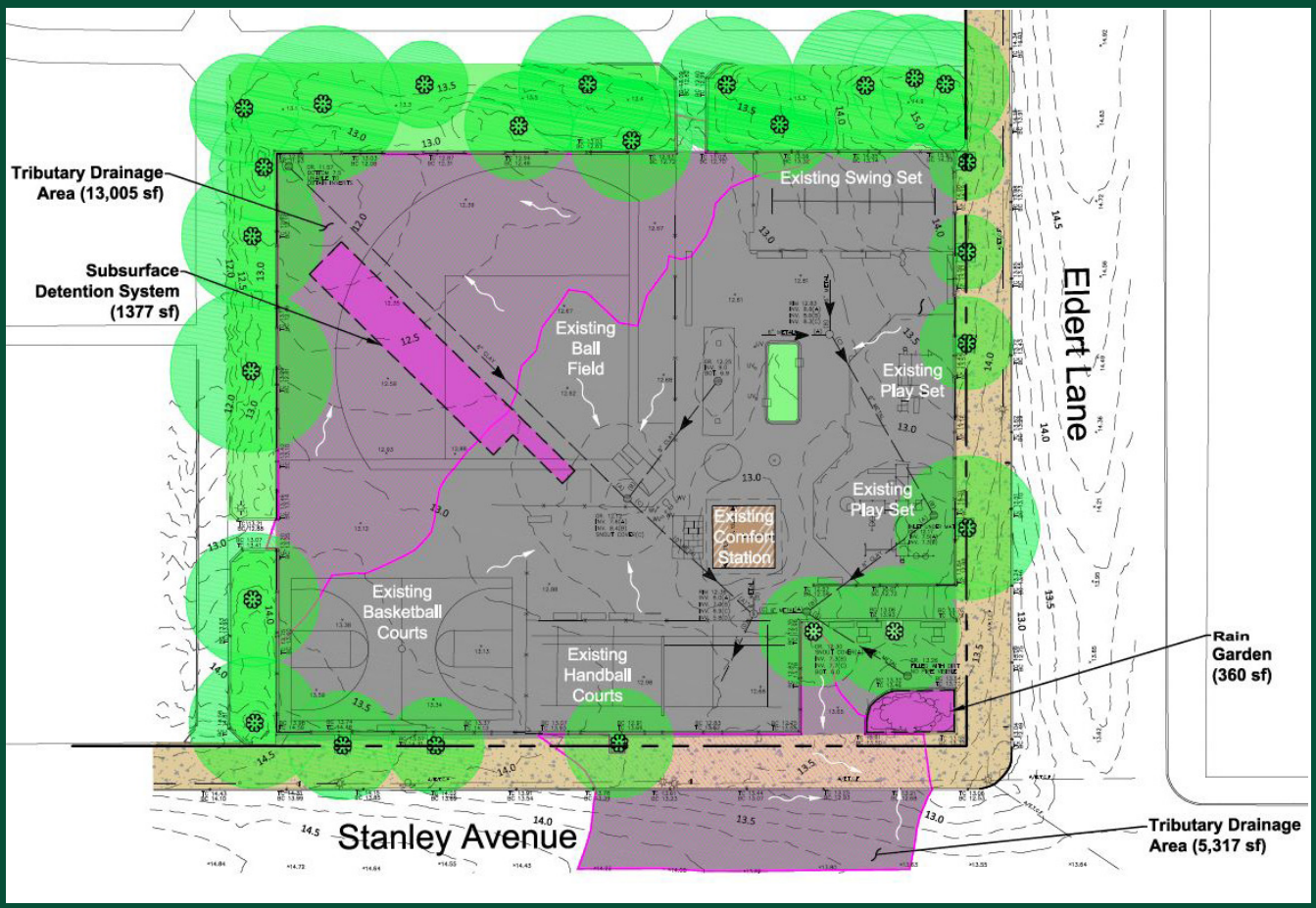
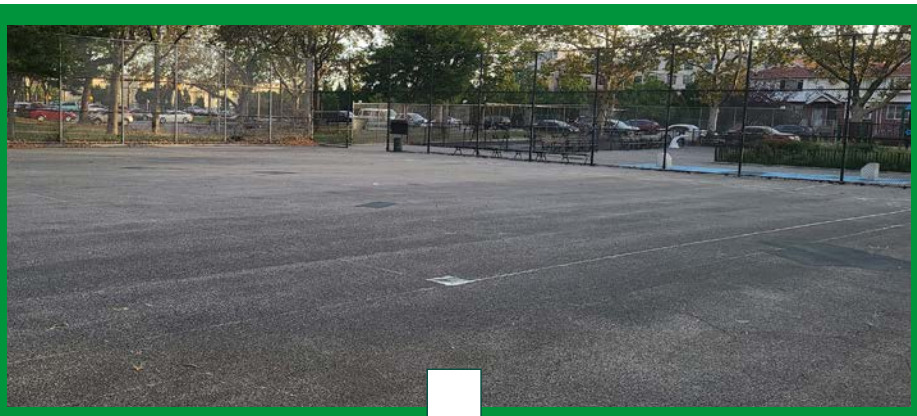


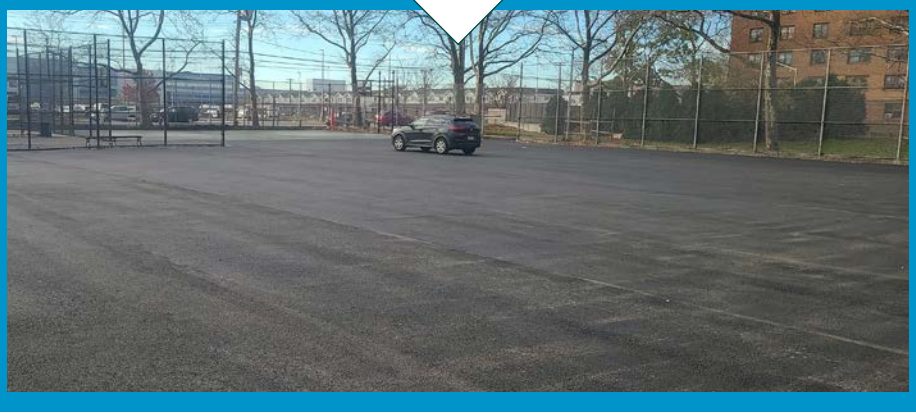
FIGURE 3: SUBSURFACE GREEN INFRASTRUCTURE INSTALLATION AT PINK PLAYGROUND, BROOKLYN.



"Before" conditions

Subsurface detention system installation

Subsurface detention system installation



"After" conditions: repaved parking lot

Partnership with School Construction Authority and Department of Education Division of School Facilites

NYC schools offer another prime opportunity for green infrastructure implementation, and the SCA and DOE Division of School Facilities (DSF) have been great partners in seeing this effort through. Implementation within DOE-owned school properties has primarily occurred through four areas – direct funding provided to SCA capital work, funding provided to SCA to implement the Trust for Public Land (TPL) partnership, DEP-initiated retrofits through designs developed under areawide contracts with EDC and constructed through DOE DSF-managed job order contracts, and retrofits initiated through DEP-managed design and construction contracts.

School properties in NYC can be quite constrained and most outdoor space is highly programmed. SCA's capital program is robust and capital project priorities and schedules can shift quickly. Despite these constraints, the partnership has seen a lot of success due to SCA's commitment to green playgrounds and regular coordination between SCA, DEP, and DOE.

Most green infrastructure retrofits at schools are implemented within playgrounds or athletic fields. Typical practices include storage under synthetic turf fields or paved play yards, permeable pavements, and rain gardens. Green infrastructure retrofits, particularly for those projects implemented with TPL (see below), often result in an improved or upgraded play area for students.

Many of the retrofits designed under EDC areawide design contracts are being constructed through DOE DSF-managed JOCs. DOE DSF has completed green infrastructure retrofits at 10 schools, with another three schools in construction now and nine more beginning in 2022. These projects largely consist of subsurface storage within playgrounds and some rain gardens.

Through the DEP-managed design contract for schools, 33 schools are in design status, with designs being finalized on a rolling basis and projects expected to be bid in 2023. As part of the DEP-managed design contract, DEP is assessing hybrid green roof and solar system feasibility at five schools in Brooklyn. This work is being coordinated closely with SCA and factors in SCA roof replacement schedules and solar implementation goals. Initial feasibility studies were completed to assess the condition of the existing roof membrane and to determine if the loading capacity of a potential hybrid rooftop system can be accommodated. The studies are being reviewed by DEP and SCA to determine which roofs can progress to design. DEP will begin construction on these projects starting in 2023.

RAIN GARDEN AT ROY WILKINS PARK, QUEENS

Partnership with Trust for Public Land

DEP's partnership with Trust for Public Land (TPL) began with the PlaNYC 2030 Schoolyards to Playgrounds Initiative, which kicked off in 2013. TPL is a national conservation group working to protect land for public use, and its work within NYC schoolyards has been transformative. TPL projects incorporate larger playground redevelopment work and DEP adds funding for green infrastructure. The green infrastructure elements that are incorporated into playground designs, such as rain gardens, stormwater turf fields, permeable surfaces, trees and subsurface storage systems, help soften these playgrounds and allow them to absorb stormwater more efficiently, which benefits the surrounding community and NYC waterways.

DEP project managers meet regularly with TPL partners and discuss all aspects of project planning, design, and construction. TPL playground projects integrate student, teacher, and school staff input into each schoolyard design. Where feasible, school playgrounds are open to the public after school hours to foster a sense of community and to make outdoor space more accessible.

Through the DEP TPL Schoolyards to Playgrounds Initiative, TPL constructed three projects in 2021, bringing the total number of projects constructed through the partnership to 25. TPL anticipates starting construction on four schools in 2022. Twenty-two additional projects are in the design and planning stages.

Other Publicly Owned Properties

As opportunities arise, DEP can partner with other public agencies to implement strategic retrofits. DEP continues to work with DDC's Public Buildings Unit to facilitate retrofits where cost-effective and feasible. Construction of three rain gardens and one green roof are underway at a DDC-managed facility upgrade project for the Taxi and Limousine Commission property in Queens.

Individual sites in the pipeline for each watershed are listed in the WATERSHED section of this report. Photos of constructed projects can be seen on DEP's Flickr webpage at https://www.flickr.com/photos/nycwater/.

TPL GREEN INFRASTRUCTURE AT P.S. 744 ELMHURST EDUCATIONAL CAMPUS, QUEENS

Partnership With New York City Housing Authority

NYCHA has been a long-standing partner of DEP on sustainable water management. Given NYCHA's extensive property portfolio, the size of their developments and their commitment to sustainability, they were identified as an early partner for stormwater management and green infrastructure implementation and the success has been tremendous.

Due to their size and configuration, NYCHA developments typically offer multiple opportunities for stormwater retrofits – whether it be in parking lots, playgrounds, interior sidewalks and roadways or other impermeable surfaces. The benefits to the city are vast – DEP is managing or has plans to manage a significant amount of stormwater across the portfolio of NYCHA properties, which eases pressure on neighborhood sewers and reduces CSOs and untreated stormwater runoff into local waterways. Through this work, DEP and NYCHA are also able to bring property improvements to NYCHA residents, including upgraded parking lots and walkways and improved on-site stormwater management, which reduces ponding during storm events and in some cases increases green spaces.

Some of DEP's earliest green infrastructure retrofits were constructed on NYCHA properties, including Bronx River Houses and Edenwald Houses in the Bronx, and Hope Gardens Houses and Seth Low Houses in Brooklyn. A variety of green infrastructure was implemented through these early projects, including permeable pavers, porous asphalt, porous concrete, rain gardens and subsurface storage systems. Valuable information has been gleaned through the planning, designing, construction and maintenance of these projects and has contributed to the larger public on-site portfolio and the subsequent generation of NYCHA retrofits in particular.

2021 marked the busiest construction year for DEP-initiated green infrastructure at NYCHA properties. DEP kicked off approximately $29 million in drainage upgrades for 19 separate properties. Together, DEP and NYCHA held resident engagement meetings with all the NYCHA Tenant Associations that have green infrastructure construction planned on their properties. Given this significant undertaking, mobilization and construction have been planned to reduce disturbance of playground and parking access to residents. DEP and NYCHA ensure that construction schedule updates are communicated with each NYCHA property manager at all active and upcoming construction sites.

To date, 18 NYCHA properties have been retrofitted with green infrastructure through the partnership, with an additional 19 projects in design. DEP and NYCHA are currently scoping out a path for NYCHA to manage upcoming green infrastructure construction to incorporate resident hiring opportunities for forthcoming construction work. Projects currently in design are anticipated to go into construction starting in 2023.

Constructed Projects: Bronx River Houses, Seth Low Houses, Hope Gardens Houses, Edenwald Houses, Boulevard Houses, Van Dyke I, Van Dyke II, Seth Low Phase 2, Pennsylvania-Wortmann Avenue Houses, Tilden Houses, Gowanus Houses, Throggs Neck Houses, Linden Houses, Brownsville Houses, Glenmore Houses, Howard Houses, Cypress Hills and Kingsborough Houses.

BEFORE CONDITIONS AT NYCHA THROGGS NECK HOUSES, BRONX

SUBSURFACE DETENTION SYSTEM INSTALLATION AT NYCHA THROGGS NECK HOUSES, BRONX

AFTER CONDITIONS AT NYCHA THROGGS NECK HOUSES, BRONX

TIBBETTS BROOK AND VAN CORTLANDT LAKE IMPROVEMENTS

Tibbetts Brook originates in Yonkers and flows through Van Cortlandt Park in the Bronx before discharging into Van Cortlandt Lake (also known as Hester and Piero's Mill Pond). Since the early 1900s, the brook has been diverted as it leaves Van Cortlandt Lake into an 8 ft diameter tunnel that connects to a combined sewer flowing to the Wards Island Wastewater Resource Recovery Facility (WRRF). During wet-weather events, overflow from the combined sewer discharges to the Harlem River at an outfall on W 192nd St, which, volumetrically, is one of the largest CSO discharge points in New York City. As part of the DEP Citywide Open Waters Long Term Control Plan (LTCP), the Tibbetts Brook Daylighting and Van Cortlandt Lake Improvements Project proposes to reduce CSO discharges to the Harlem River.

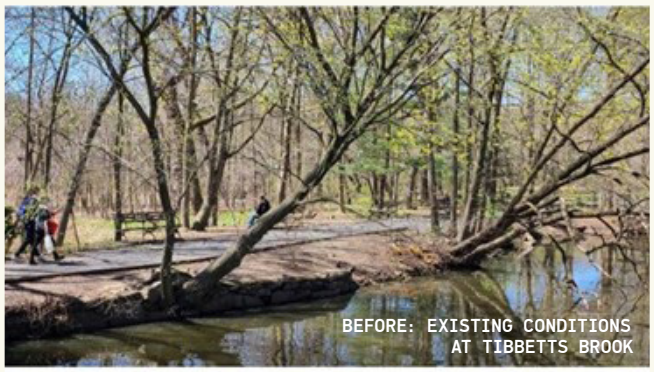
The City is planning to implement this project in two phases. Phase 1 will focus on Van Cortlandt Lake improvements such as removing invasive vegetation, restoring lake vegetation and the littoral zone, and piloting a living shoreline design. Phase 2 will focus on daylighting Tibbetts Brook, including re-routing flow from its current path through the sewer into a new channel and constructing a corresponding greenway.

Daylighting Tibbetts Brook, by diverting the stream away from the sewer system and into its own channel, is the City's largest green infrastructure project to date. Once completed, daylighting would reduce CSOs to the Harlem River by an estimated 215-220 MGY (about a 25% reduction at the existing outfall). The channel is designed for a baseflow of 7 CFS and maximum wet weather flow of 38 CFS, which means approximately 2.1 billion gallons of water would be diverted away from the combined sewer system in a typical year. With the brook flowing through its own channel instead of the sewer system, the local capacity of the sewer and wastewater infrastructure would increase. Daylighting would also allow for the Wards Island WRRF to operate more efficiently by no longer treating freshwater during dry weather, which would result in energy savings and reduced greenhouse gas emissions.

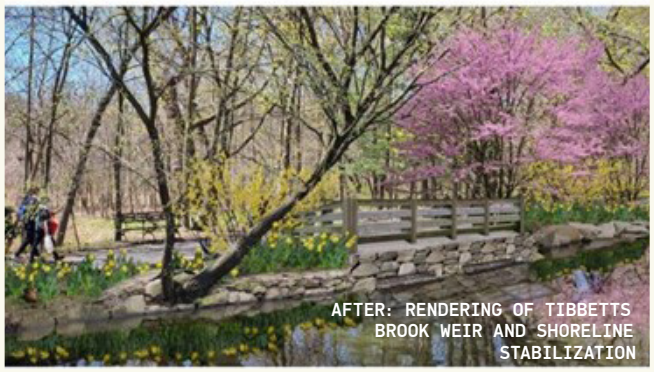
In addition to increasing infrastructure efficiency and reducing CSOs, daylighting Tibbetts Brook would also expand public amenities through the construction of new greenway paths and the acquisition of 3.95 acres of new parkland. The City is proposing to create, alongside the new open channel, a greenway with a bike path and pedestrian walkway called the Putnam Greenway. The name pays respect to the New York and Putnam Railroad, the original owner of the ROW. The City is working with relevant property owners to acquire the new parkland for the proposed daylighted Tibbetts Brook and Putnam Greenway.

The City currently estimates that the Van Cortlandt Lake improvements portion of the project will commence in 2023. This includes controlling invasive plants, such as water chestnut and Phragmites, and restoring the lake vegetation and littoral zone with native plants. In coordination with the Van Cortlandt Park Alliance and the Bronx Council of Environmental Quality, the City also plans to pilot a living shoreline in Van Cortlandt Lake designed to pump lake water into a wetland system for treatment.

The City currently estimates that the design to daylight Tibbetts Brook and extend the Putnam Greenway will be completed in 2023. This design will include a new side weir to allow stream flow from the lake to enter the new stream channel, daylighting in Van Cortlandt Park and the CSX property, and connecting to the Harlem River through Metro North's property. This joint project between DEP and NYC Parks is fully funded.



BEFORE: EXISTING CONDITIONS AT TIBBETTS BROOK



AFTER: RENDERING OF TIBBETTS BROOK WEIR AND SHORELINE STABILIZATION

STORMWATER REDUCTION & REUSE

DEP is implementing stormwater reduction and reuse projects in the EROW waterbodies that provide a synergistic approach to demand management and CSO reduction goals. In addition to reducing potable demand, these projects also reduce discharge to the combined sewer system (CSS), contributing to the Program's goal to reduce CSOs by 1.67 billion gallons per year (BGY).

Through these projects and others, DEP has been actively working to reduce flows to sewers and wastewater facilities through water conservation and reuse, as part of an integrated approach to water resources management in New York City.

Central Park

In 2021, DEP continued coordinating with Central Park Conservancy (CPC) and Parks on the North End Recirculation Project. The project is currently in design and will save up to an estimated 0.83 MGD of potable water by recirculating stormwater between the park's northern waterbodies, including the Harlem Meer. DEP and CPC continue to meet and coordinate regularly to discuss design alternatives, operation and maintenance, and to quantify the multiple benefits of this integrated, One Water project. In addition to the potable water reduction, other benefits include a CSO reduction of up to 3 MGY in the East River and improved water quality in the park's northern waterbodies. DEP also continued coordinating with Parks to execute a Memorandum of Understanding (MOU) to facilitate the funding transfer from DEP to Parks.

Prospect Park

In 2021, DEP continued coordinating with Prospect Park Alliance (PPA) to replace an existing service line valve in Prospect Park to achieve an estimated demand savings of 0.8 MGD. The service line supplies potable water to Prospect Park Lake and during rain events, PPA staff discharge water from the lake into the CSS to avoid flooding the park. Additionally, during summer when evaporation occurs, Prospect Park Lake is supplied with an estimated 1 MGD or more of potable water, to maintain health and aesthetics. As an integrated, One Water project, this valve replacement is expected to reduce CSOs during rain events to Gravesend Bay and the Upper Bay by up to 12 MGY. In December 2020, DEP and Parks executed a MOU for this project and completed the funding transfer from DEP to Parks. An engineering firm was hired by PPA to design and construct this engineering project. Design is currently underway and will continue to be coordinated between DEP and PPA.

HARLEM MEER, MANHATTAN

PRIVATE PROPERTY INITIATIVES

TWO BRIDGES NEIGHBORHOOD COUNCIL RAIN GARDENS, MANHATTAN

Green Infrastructure Grant Program

Since its introduction in 2011, the Grant Program has sought to strengthen public-private partnerships and public engagement regarding the design, construction, and maintenance of green infrastructure on private property throughout New York City. DEP offered two virtual workshop webinars in the spring and fall of 2021 and expects to offer four in 2022. To date, the Grant Program has committed more than $14 million for 34 private property owners to build green infrastructure projects. Photos of planned and constructed green infrastructure projects can be found on DEP's Green Infrastructure Grant Program webpage at https://www1.nyc.gov/site/dep/water/green-infrastructure-grant-program.page.

In 2021, DEP updated the Grant Program's application process to make it simpler for applicants to do a pre-application screening with grant program project managers prior to submitting a formal application. The new process replaces the previous online application portal with a new pre-application form accessible directly from the program webpage. When this new form is submitted, DEP schedules a pre-application meeting with the property owner to determine eligibility and answer any questions. After eligibility has been confirmed, application materials are provided to the applicant and the applicant can submit the application package as soon as the information is ready.

In the fall of 2021, DEP conditionally awarded a grant for a green roof project on an apartment building in East Harlem, which is currently in design review. Four additional projects are expected to begin construction throughout 2022-2023.

In December 2021, Two Bridges Associates L.P. completed construction on a green infrastructure project at Two Bridges Tower. The building provides subsidized housing, offices for social services, and a community facility that serves the low-income residents of Manhattan's Lower East Side. The grant project involved the redevelopment of a playground space with 1,743 SF of green infrastructure beds and 1,549 SF of planting beds, which will capture more than 200,000 gallons of stormwater each year. The revitalized playground area will be used as a living laboratory for Two Bridges' afterschool and summer camp programs to integrate planning, sustainability, and ecology lessons into the curriculum.

DEP has committed more than $14 million to 34 private property owners to build green infrastructure projects

Resilient NYC Partners

In 2021, DEP registered a $53 million contract to retrofit private properties with green infrastructure and officially launched Resilient NYC Partners, formerly known as the Private Property Retrofit Incentive Program.

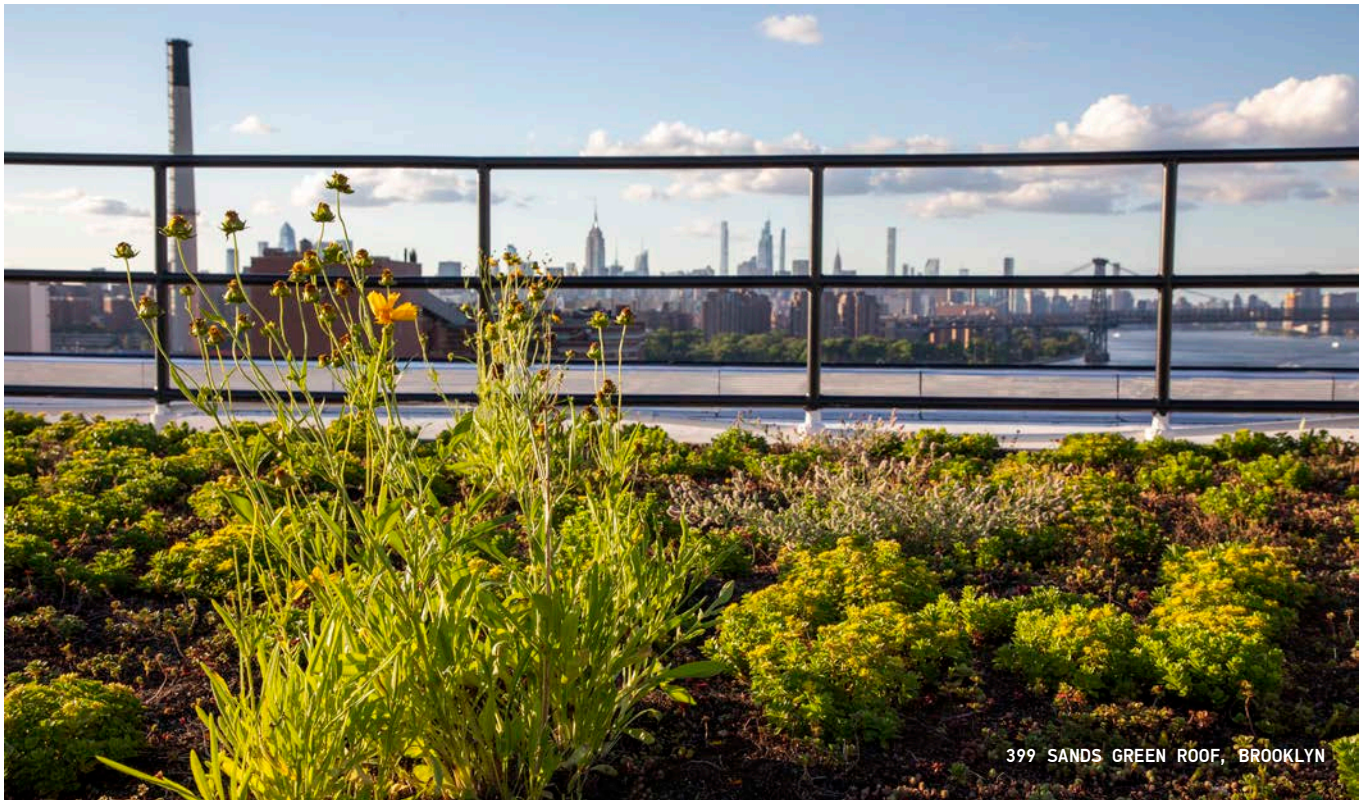
Resilient NYC Partners funds the design and construction of site-level green infrastructure practices such as rain gardens, subsurface storage, and permeable pavements on properties of 50,000 SF or more with lots of impervious area, with the goal of managing up to 200 Greened Acres (see Exhibit E for a description of "Greened Acres"). The program provides an opportunity for large property owners to improve their property by addressing localized flooding and other drainage issues, resurfacing parking lots, and adding more greenery, all while helping the City to manage stormwater.

As a part of the program's kick-off, DEP worked closely with the Program Administrator to launch the Resilient NYC Partners webpage, develop program branding and outreach materials, and finalize property owner agreements to create a streamlined process for applicants. To date, more than 100 highly impervious private properties in the combined sewer area have been identified for strategic outreach. There is great potential for the program to reach many private property owners in New York City. As of the date of this report, the program team is advancing conceptual plans for projects on three different private properties. For more information on NYC Resilient Partners, visit https://www1.nyc.gov/site/dep/whats-new/resilient-nyc-partners.page.

Community Stormwater Resiliency Grant Program

As previously reported, DEP has been developing a community-level grant program to complement and round out existing incentive opportunities. The Community Stormwater Resiliency Grant program is designed for community groups, local organizations, and small property owners that want to get involved and help their communities strengthen their resiliency against future extreme weather events. The new grant program aligns with the resiliency goals laid out in the City's New Normal Report, released in October of 2021 as a response to the devastating aftermath of Hurricane Ida.

Through this new program, DEP aims to fund a myriad of structural and nonstructural stormwater best management practices (BMPs), such as construction of green infrastructure practices, maintenance of existing green infrastructure practices, educational out-



399 SANDS GREEN ROOF, BROOKLYN

reach, litter cleanups and rapid assessment of DEP right-of-way rain gardens. This program was delayed due to funding constraints caused by the COVID-19 pandemic but is expected to be launched in 2022.

Green Roof Tax Abatement

Administered by NYC Department of Finance with application review and approval by DOB, the Green Roof Tax Abatement provides a one-time property tax abatement for properties that install green roofs. In 2019, New York State authorized the City to designate priority community districts to receive an enhanced tax abatement for green roof installation. Properties within the priority districts will receive a tax abatement of $15 per square foot for the installation of a green roof. All other community districts will receive the standard tax abatement of $5.23 per square foot. The list of priority districts and the final rule were released in January 2021 and can be found on the NYC Mayor's Office of Sustainability website at https://www1.nyc.gov/site/finance/benefits/landlords-green-roof.page.

Local Laws 92 and 94 of 2019

As of November 2019, all new buildings and alterations of existing buildings where the entire roof deck or roof assembly is being replaced must provide a sustainable roofing zone covering 100% of the roof. The sustainable roof zone must include a solar photovoltaic system, a green roof system or a combination of the two. Vertical and horizontal enlargements must also comply with these requirements. For more information about the requirements of Local Law 92 and 94, see the DOB's Bulletin 2019-010 at https://www1.nyc.gov/site/buildings/codes/building-bulletins-2019.page.

Collectively, the enhanced NYC Green Roof Tax Abatement and Local Laws of 2019 will substantially increase the number of green roofs across the city. DEP looks forward to working with the relevant agencies to provide green roof design resources and best practices and to track constructed projects toward citywide stormwater management goals.

CORPORATE COMMONS THREE GREEN ROOF, STATEN ISLAND

STORMWATER REGULATIONS

Establishing and updating stormwater regulations is a core part of DEP's work to improve water quality and enhance sewer operations. Development offers an opportunity to improve on-site stormwater management on properties that were developed at a time when stormwater management best practices were not well-understood or widely implemented and current stormwater management regulations were not yet in place. Stormwater management practices constructed within the combined sewer system areas of the city, as a result of stormwater regulations, are entered into GreenHUB so that the projects can be tracked and reported here in the same manner that DEP's publicly funded/initiated and externally funded green infrastructure projects are tracked.

2012 Stormwater Performance Standard

New development and redevelopment projects often require a sewer certification from DEP for new sewer connections to confirm the adequacy of the existing sewer to receive flow from the development. Sewer certifications require either a Site Connection Proposal (SCP) or a House Connection Proposal (HCP). Since 2012, projects that require certification in the CSS areas have been complying with an enhanced performance standard (2012 Stormwater Performance Standard), which reduces peak discharges to the city's sewer system during rain events by requiring greater on-site storage of stormwater and slower release to the sewer system. DEP tracks the number of new SCPs and HCPs submitted to the Agency that are affected by the 2012 Stormwater Performance Standard. Since the enhanced performance standard took effect in July 2012, approximately 2,273 sites have been required to meet reduced stormwater release rates of 0.25 CFS or 10% of the allowable flow, whichever is greater.

NYC stormwater regulations apply to public and private property and project metrics are tracked the same way as DEP-funded projects

Certified SCPs and HCPs are valid for two years. Therefore, some SCPs and HCPs certified under the 2012 Stormwater Performance Standard may not yet have been constructed, though the 2012 standard has been updated (see next section). DEP will continue to report on these construction projects, in addition to those under the new rule, and will be reflected in future reporting despite the 2012 Stormwater Performance Standard no longer being in effect.

As of 2021, DEP has incorporated 1,125 assets and 511.5 Greened Acres into GreenHUB and reported in Table 3 on page 28. Table 2 below provides a breakdown of the type of stormwater management structures employed by applicants affected by the rule.

DEP has developed new stormwater regulations, referred to as Unified Stormwater Rules, which includes updated technical requirements for SCPs and HCPs and have now superseded the 2012 Stormwater Performance Standard. These new stormwater regulations are discussed below.

TABLE 2: SUMMARY OF STORMWATER PERFORMANCE STANDARD ASSETS AND GREENED ACRES IN GREENHUB

GI Type	Asset Count	Greened Acres
Subsurface Retention	26	12.3
Green Roof	2	1
Other Rooftop System	382	104.9
Detention System	524	282.4
Drywell	86	15.15
Multiple GI Components	103	95.5
Rain Gardens	2	.25
Total	**1125**	**511.5**

Unified Stormwater Rule and New NYC Stormwater Manual

As reported in previous Green Infrastructure Annual Reports and in the New York City Stormwater Management Program Plan (SWMPP), DEP developed amendments to Chapters 31 and 19.1 of Title 15 of the Rules of the City of New York (RCNY) as part of a Unified Stormwater Rule. The City published draft rules in the City Record on December 10, 2021, and held a virtual meeting on the proposed rules on December 20, 2021. The Unified Stormwater Rule was published as effective on February 15, 2022.

The Unified Stormwater Rule marks a substantial improvement in the way that individual new and redeveoped properties manage stormwater. Through updates to DEP's site and house connection requirements and Stormwater Construction and Maintenance Permitting Program, stormwater regulations have been enhanced and unified for citywide sewer operations and water quality objectives. Figure 4 below summarizes the components of the two permitting programs that make up the Unified Stormwater Rule and the requirement.

In combined sewersheds, the Unified Stormwater Rule will lead to a reduction in Combined Sewer Overflow

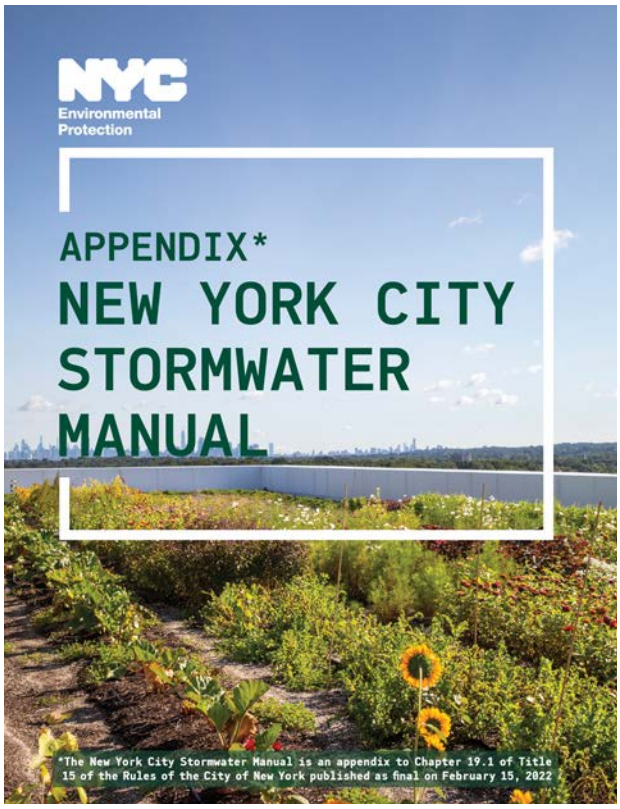


FIGURE 4: UNIFIED STORMWATER RULE CHAPTER AMENDEMENTS

Unified Stormwater Rule

Aligns the RCNY Chapter 31 stormwater quantity and flow rate requirements with the RCNY Chapter 19.1 Construction/Post-Construction permitting program water quality requirements.

Ch. 31
Stormwater Quantity and Flow Rates

Site/House Connection Proposal

- Applies to CSS/MS4 projects that require a sewer connection proposal
- Projects must provide new detention volume and maximum-release rates
- Simplified formulas and change in minimum orifice size to streamline design

+

Ch. 19.1
Water Quality Requirements

Stormwater Construction Permit

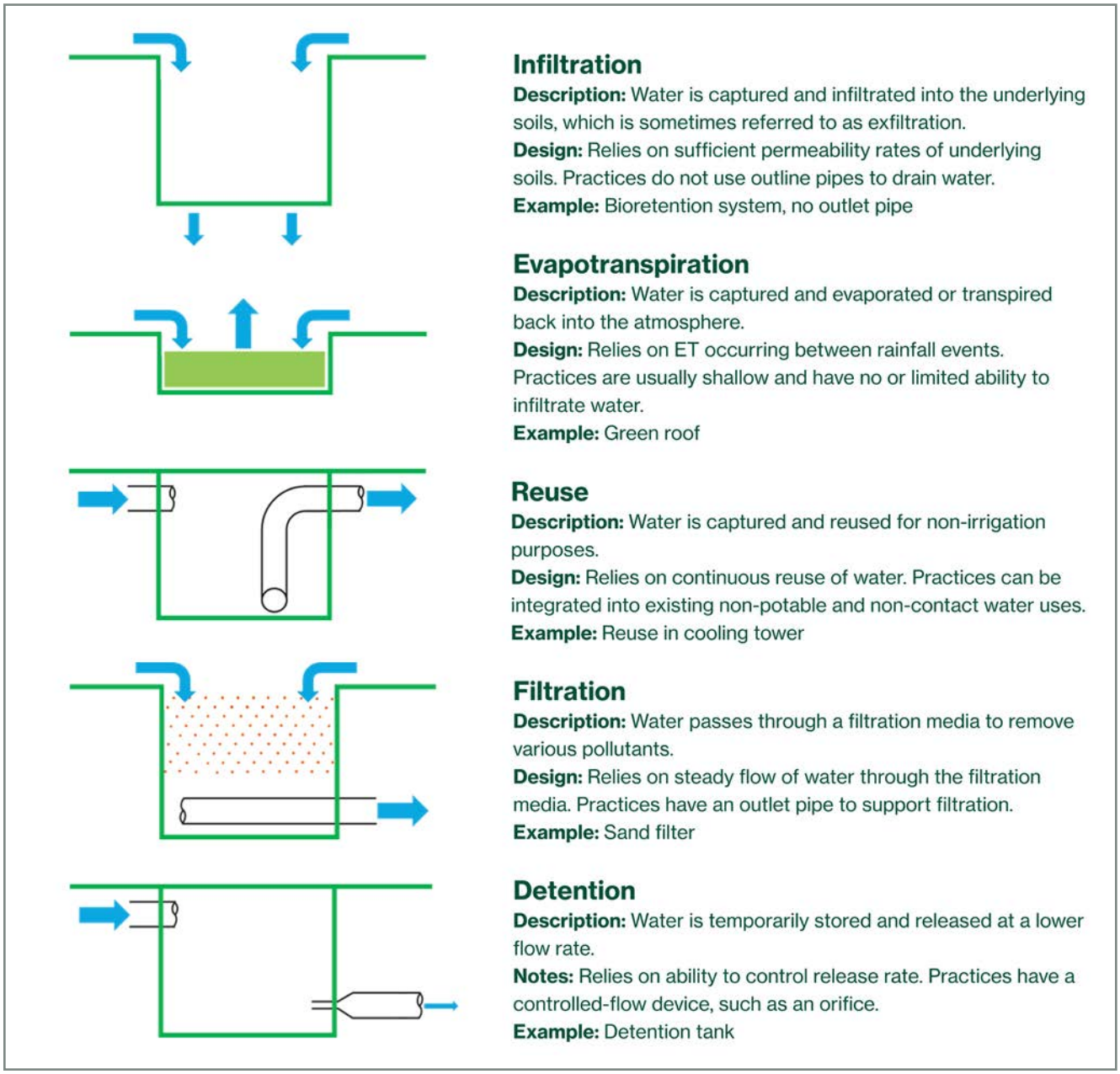
- Applies to CSS/MS4 projects that disturb 20,000 sf or more of soil, or add 5,000 sf or more of new impervious surface
- On-site projects must manage volume of 1.5-inch rainfall event using a new retention-first stormwater management practice hierarchy
- ROW projects also have construction and post-construction requirements

Green infrastructure framework supports the application of practices to meet both objectives

(CSO) volume as lots redevelop over time. The benefits from the new rule will contribute to the Program's 2030 CSO reduction goal and continue on beyond the Program, helping to institutionalize green infrastructure in new development across the city. Post-construction stormwater practices constructed in the combined sewer as part of the Stormwater Construction and Maintenance Permitting Program will be tracked in GreenHUB similar to those constructed through SCP/HCP certifications and reported in Table 2 on page 24.

In 2021, DEP held 15 stakeholder meetings with the public, the state, developers, and other City agencies. These meetings included the first of two informational briefings that provided an overview of the Rule and an introduction to the NYC Stormwater Manual. The published Unified Stormwater Rule and NYC Stormwater Manual can be found on DEP's website at https://www1.nyc.gov/site/dep/water/unified-storm-water-rule.page.

FIGURE 5. SMP FUNCTION DIAGRAMS (NYC SWM), reproduced below, illustrates the the various functions of stormwater management practices and can be found in the NYC Stormwater Manual.



Watersheds by the Numbers

PROGRESS TOWARD 1.67 BILLION GALLONS PER YEAR OF CSO REDUCTION

The NYC Green Infrastructure Program was launched in 2011 and was incorporated into the 2012 amended Consent Order (the Order)[1] between the NYC Department of Environmental Protection (DEP) and NYS Department of Environmental Conservation (DEC). The goal of the Program is to manage stormwater and reduce Combined Sewer Overflows (CSOs), thereby improving water quality and promoting sustainability. The Order requires DEP to implement green infrastructure to manage the equivalent of stormwater generated by 1 inch of precipitation on 10% of impervious surfaces in combined sewer system (CSS) areas in the following five-year increments: 1.5% (December 31, 2015), 4% (December 31, 2020), 7% (December 31, 2025), and 10% (December 31, 2030) and establish an equivalency rate for the green infrastructure application to City-wide CSO volume reductions. In 2016, as required by the Order, DEP developed CSO volume reduction equivalency rates to manage the equivalent of stormwater generated by one inch of precipitation for the 1.5% and 10% green infrastructure application rates through the Performance Metrics Report (PMR). The PMR established that DEP can achieve 507 million gallons per year (MGY) of CSO reductions with the initial 1.5% green infrastructure application milestone target for 2015 and 1.67 billion gallons per year (BGY) CSO reductions for the 2030 10% green infrastructure application milestone target as the "City-wide baseline CSO reduction credit." DEC approved the PMR in 2017.

On December 30, 2021, DEP submitted the list of constructed assets totaling 1,181 greened acres and 507 million gallons per year (MGY) CSO volume reduction for the 1.5% green infrastructure application rate milestone certification, in accordance with Section IV.C.5 of the Order (see Exhibit C for watershed summary of asset list). The certification is pending completion of inspection and final acceptance by DEC. Applying the equivalency rates established in the PMR, DEP established the next program milestone of 668 MGY CSO Volume Reduction. For this milestone, DEP submitted a contingency plan on June 30, 2021, which detailed upcoming projects comprised of a combination of areawide, public on-site, private incentives, stormwater recovery and reuse projects, as well as several other DEP-funded and non-DEP-funded green infrastructure projects. See Exhibit D for a list of these projects and current status.

DEP will continue to work towards the 1.67 BGY CSO reduction goal established by the PMR using the most efficient types of green infrastructure practices through publicly funded retrofits and enhanced stormwater regulations to maximize CSO reduction. DEP remains committed to expanding green infrastructure across the city towards the CSO reduction goal as well as green infrastructure implementation through other related initiatives for water quality and community improvement benefits. Table 3 reflects DEP's progress towards the next milestone.

DEP's publicly funded projects are those for which DEP is directly involved in the design and construction, and consist of the ROW area-wide projects, public property retrofit projects implemented jointly with our agency partners, and private property projects built through the Green Infrastructure Grant Program. Of the total green infrastructure assets and associated Greened Acres reported in Table 3, DEP's publicly funded projects encompass **10,269 assets** with an equivalent **1,413 Greened Acres**.

1 DEC # CO2-2000107-8, as modified.

WATERSHED GREENED ACRES BREAKDOWN

TABLE 3: GREEN INFRASTRUCTURE IMPLEMENATION, 2010-2021

Watershed	Total Assets	Total ROW Porous Pavement Area (SF)	Total Equivalent Greened Acres
Alley Creek	4	-	1
Bronx River	428	-	130
Coney Island Creek	55	-	13
Flushing Bay	814	24,580	99
Flushing Creek	2,071	-	264
Gowanus Canal	142	-	27
Hutchinson River	209	21,644	33
Jamaica Bay	4,599	14,176	770
Newtown Creek	1,515	17,508	189
Westchester Creek	230	-	30
Total Watershed	**10,067**	**77,908**	**1,555**
East River/Open Waters	1,486	-	539
Total Citywide[1]	**11,553**	**77,908**	**2,094**

Note: The Annual Report and its contents, including this table, provide yearly updates for public consumption and transparency for our stakeholder community. It should not be interpreted as a milestone compliance document. The Program's compliance with the Consent Order is based on milestone certifications submitted to DEC at five year intervals. For the milestone submittal schedule, see the Order at https://www1.nyc.gov/site/dep/water/combined-sewer-overflows.page. In addition, assets and Greened Acres may increase or decrease in any given year due to rejections during construction, termination of construction contracts or other unforeseen circumstances.

FIGURE 6: BREAKDOWN OF GREENED ACRES BY PROGRAM AREA[2]

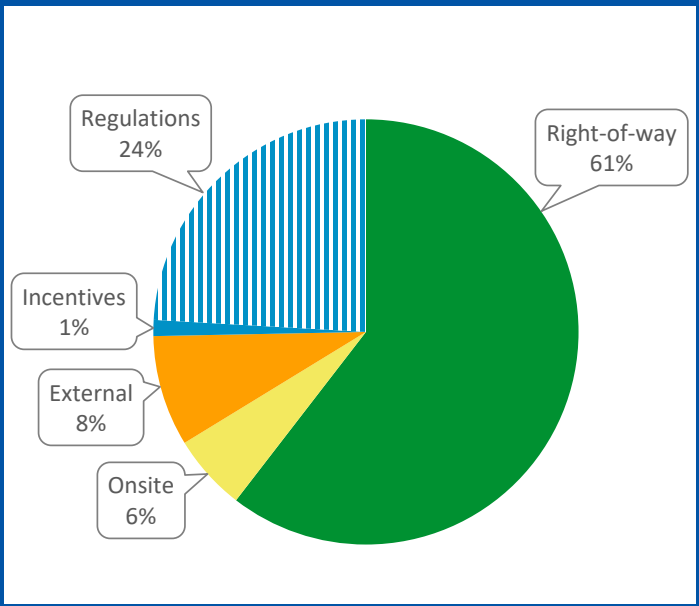
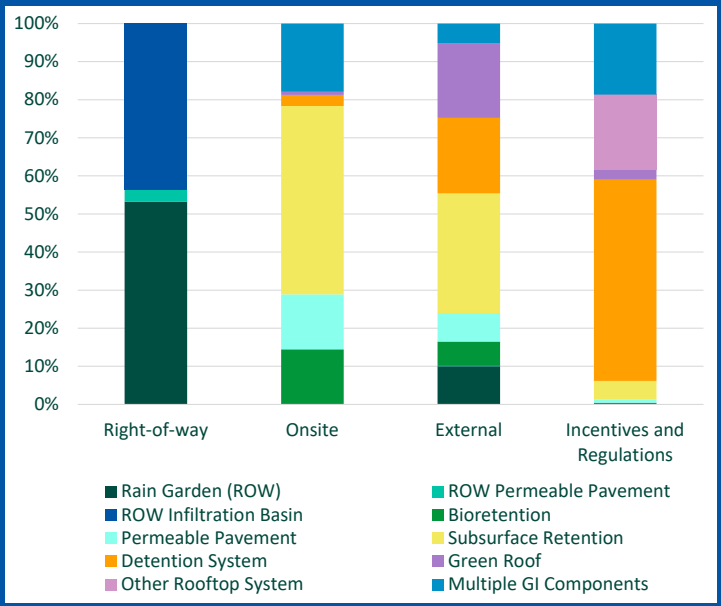


FIGURE 7: BREAKDOWN OF PROGRAM AREA GREENED ACRES BY GREEN INFRASTRUCTURE TYPE



1 Sum may not add up to total due to rounding.
2 See Exhibit F for descriptions of green infrastructure program implementation areas

Green Infrastructure Watershed Maps

DEP continues to present the green infrastructure implementation and planning updates at a watershed level in order to show stakeholders the magnitude and scale of the work completed and planned in each of the City's watersheds to reduce CSOs and provide the co-benefits resulting from green infrastructure projects.

HOW DOES DEP IDENTIFY POTENTIAL PROJECTS WITHIN A WATERSHED?

The watershed maps illustrate DEP's area-wide approach to evaluating green infrastructure opportunities block-by-block and site-by-site in each watershed, starting with the Priority CSO watersheds. Once this area-wide survey is completed, DEP implements green infrastructure at each feasible location through ROW and public property retrofits. DEP also does citywide assessments for additional opportunities on public properties as well as private property initiatives or other strategic partnerships. These maps also include green infrastructure and ecosystem restoration projects that DEP is undertaking in non-combined sewer areas as part of other City initiatives.

The 2021 accomplishments provide a quick visual representation of all the work in each watershed that "rolls up" to the Program-wide information presented in Table 3. Each page also includes a list of all upcoming projects that DEP is working hard to bring to reality. The result is a comprehensive, watershed-by-watershed snapshot of DEP's current and projected Program.

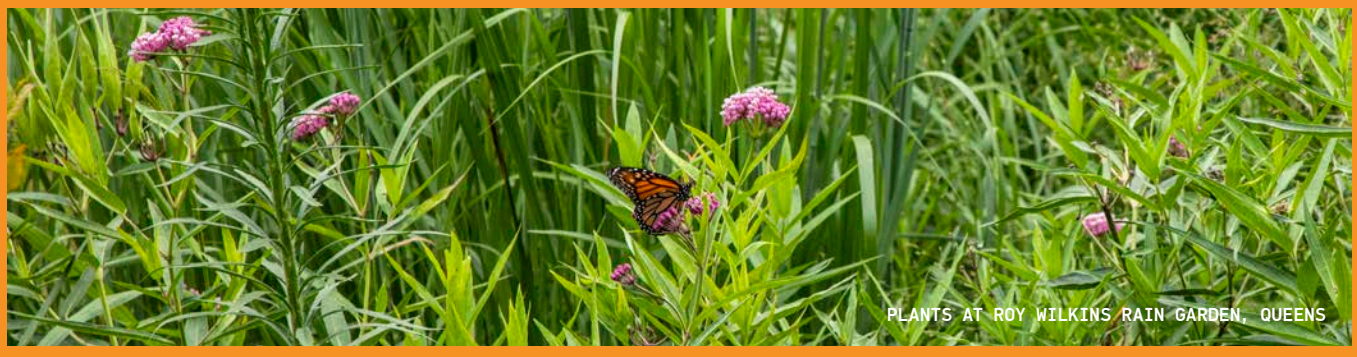
As previously described, all of the green infrastructure assets that are constructed and in construction are tracked and counted. Each asset contributes to the overarching goals of the Program to reduce CSO volume and provide co-benefits for New Yorkers. DEP expects to achieve 1.67 billion gallons of CSO volume reduction per year by 2030.

THE MAPS SHOW PROJECTS IN SEPARATELY SEWERED AREAS OF THE CITY. ARE THESE PROJECTS COUNTED IN TABLE 3 AND IN THE WATERSHED ACHIEVEMENTS?

The green infrastructure projects that DEP is installing in the separately sewered areas of the City are shown in the maps in order to provide a full picture of green infrastructure implementation in each of the watersheds. They are not counted toward CSO volume reduction and are not included in Table 3 (page 28) or the watershed achievement numbers.

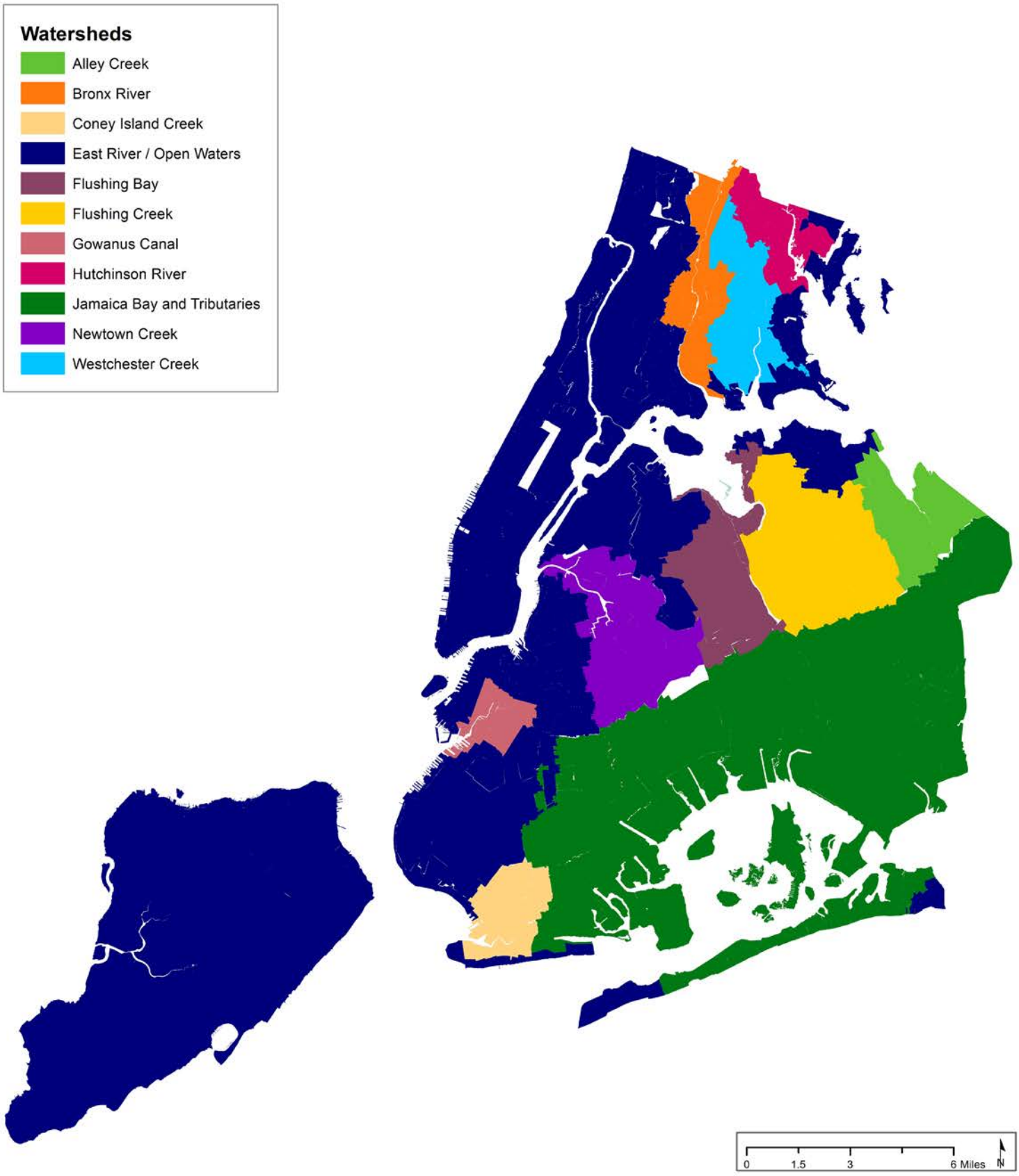
ARE PROJECTS CONSTRUCTED THROUGH STORMWATER REGULATIONS SHOWN IN THE MAPS?

Green infrastructure on private property that was not installed through the Green Infrastructure Grant Program, including SCPs, are not mapped at this time. However, the assets are counted in Table 3 and in the watershed achievements, as they are a part of DEP's efforts to achieve 1.67 billion gallons of CSO volume reduction per year by 2030.



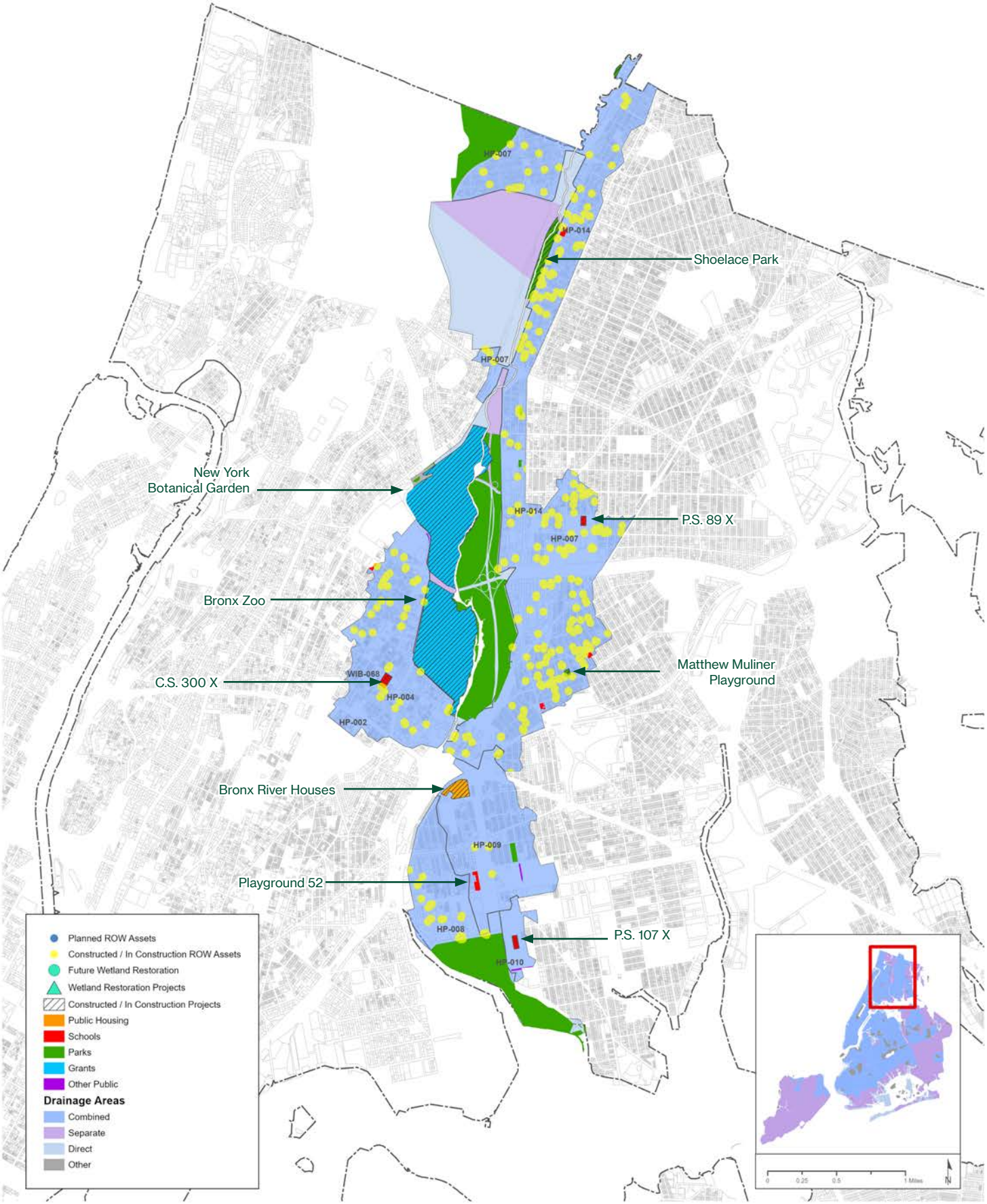
PLANTS AT ROY WILKINS RAIN GARDEN, QUEENS

WATERSHED MAP KEY



BRONX RIVER WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



BRONX RIVER WATERSHED

2010-2021 ACCOMPLISHMENTS

428 Assets Constructed

469,868 SF Total Asset Area

130 Equivalent Greened Acres

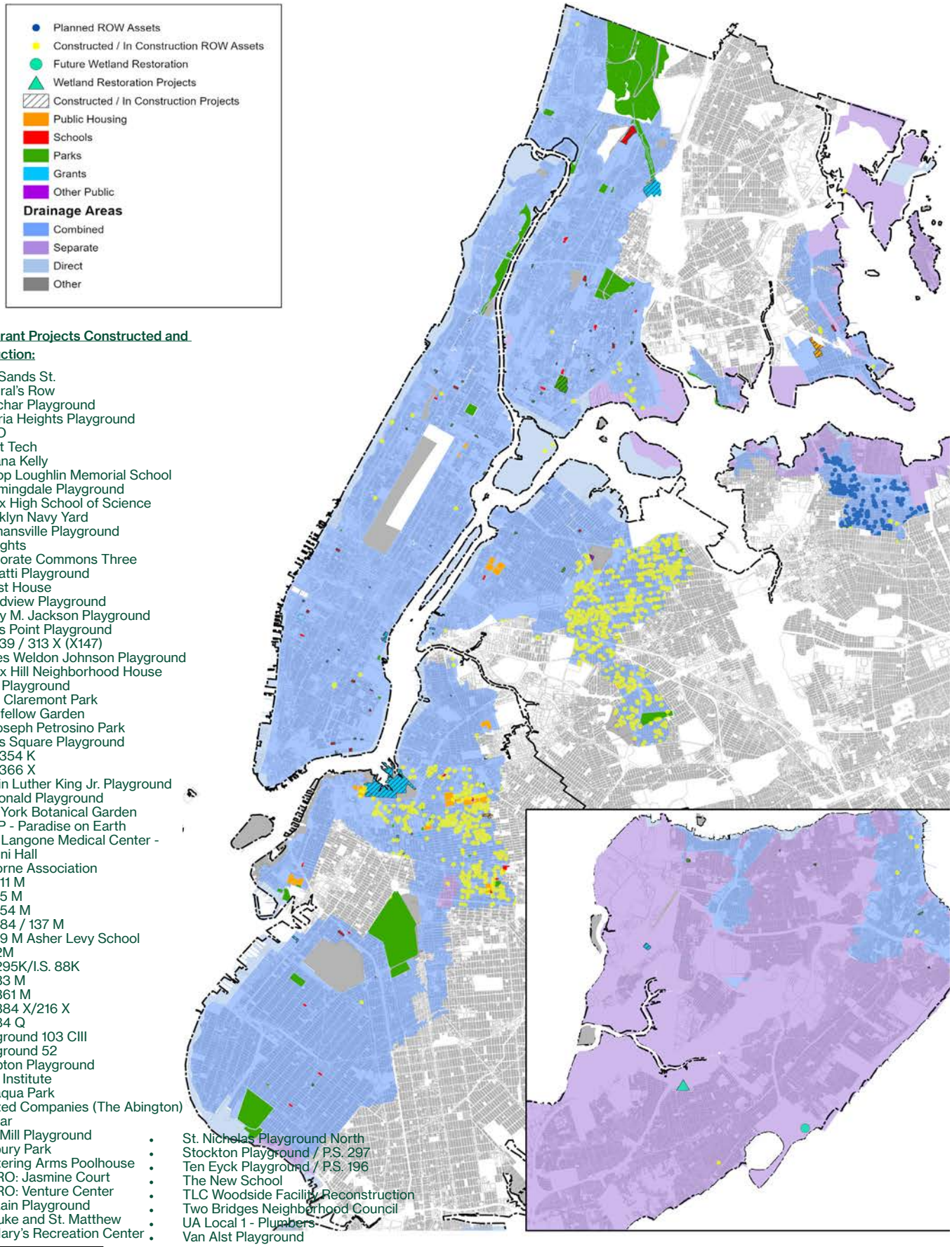
UPCOMING PUBLIC & GRANT PROJECTS**

- Bronx Park
- I.S. 123 X
- I.S. 45 Annex
- Magenta Playground
- Parkside Playground
- P.S. 64 X
- P.S. 83 X
- P.S. 103 X
- Soundview Park
- Watson Gleason Playground

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

EAST RIVER / OPEN WATERS

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



Public & Grant Projects Constructed and In Construction:

- 399 Sands St.
- Admiral's Row
- Arrochar Playground
- Astoria Heights Playground
- ATCO
- Ballet Tech
- Banana Kelly
- Bishop Loughlin Memorial School
- Bloomingdale Playground
- Bronx High School of Science
- Brooklyn Navy Yard
- Carmansville Playground
- Citylights
- Corporate Commons Three
- DeMatti Playground
- Forest House
- Grandview Playground
- Henry M. Jackson Playground
- Hunts Point Playground
- I.S. 339 / 313 X (X147)
- James Weldon Johnson Playground
- Lenox Hill Neighborhood House
- Levy Playground
- Little Claremont Park
- Longfellow Garden
- Lt. Joseph Petrosino Park
- Lyons Square Playground
- M.S. 354 K
- M.S. 366 X
- Martin Luther King Jr. Playground
- McDonald Playground
- New York Botanical Garden
- NYRP - Paradise on Earth
- NYU Langone Medical Center - Alumni Hall
- Osborne Association
- P.S. 111 M
- P.S. 15 M
- P.S. 154 M
- P.S. 184 / 137 M
- P.S. 19 M Asher Levy School
- P.S. 2M
- P.S. 295K/I.S. 88K
- P.S. 33 M
- P.S. 361 M
- P.S. 384 X/216 X
- P.S. 84 Q
- Playground 103 CIII
- Playground 52
- Plimpton Playground
- Pratt Institute
- Ranaqua Park
- Related Companies (The Abington)
- Salmar
- Saw Mill Playground
- Seabury Park
- Sheltering Arms Poolhouse
- SoBRO: Jasmine Court
- SoBRO: Venture Center
- Sol Lain Playground
- St. Luke and St. Matthew
- St. Mary's Recreation Center
- St. Nicholas Playground North
- Stockton Playground / P.S. 297
- Ten Eyck Playground / P.S. 196
- The New School
- TLC Woodside Facility Reconstruction
- Two Bridges Neighborhood Council
- UA Local 1 - Plumbers
- Van Alst Playground

EAST RIVER / OPEN WATERS

2010-2021 ACCOMPLISHMENTS

1,486 Assets Constructed

5,106,511 SF Total Asset Area

539 Equivalent Greened Acres

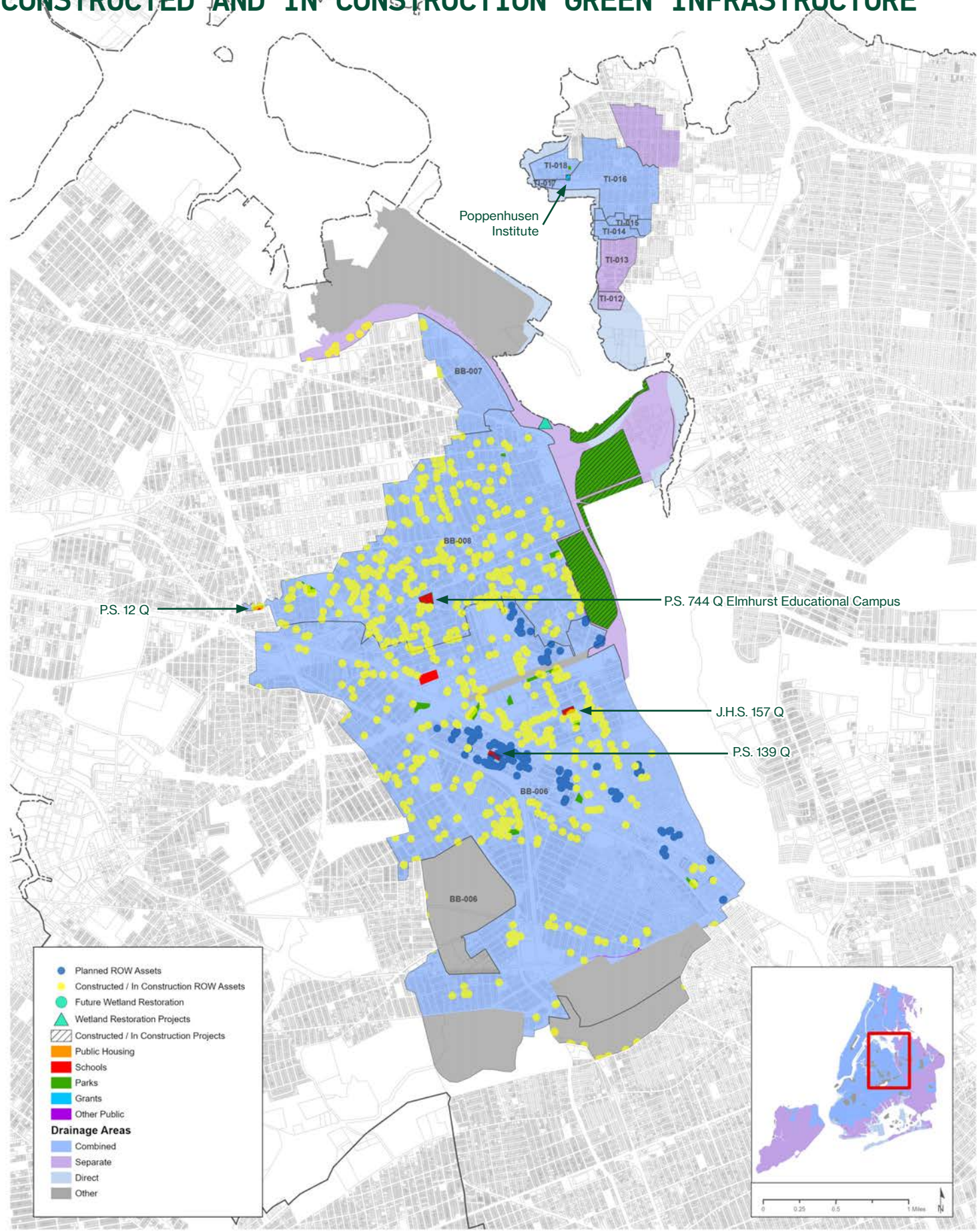
UPCOMING PUBLIC & GRANT PROJECTS**

- 40th Precinct
- Albany
- Albert J. Parham Playground
- Arrow Community Center
- Asser Levy Recreation Center and Pool
- Aurum Condominum
- Bedford Stuyvesant Restoration
- Classon Playground
- Oracle Playground
- Bushwick Pool Building
- Chelsea Recreation Center
- Clinton Houses
- Cooper Park
- Crotona Park Boathouse
- Dry Dock Pool Building
- Dyker Playground
- Epiphany Playground
- Farragut
- Gertrude Ederle Recreation Center
- Hansborough Recreation Center
- Highbridge Recreation Center
- I.S. 220 K
- I.S. 390 - The School of Integrated Learning
- J.H.S. 227 K
- Juniper Valley Park Field House
- Kingsbridge Heights Community Center
- Lafayette
- Laguardia Landing Lights
- London Terrace Towers
- M.S. 224 X (X139)
- M.S. 267 X (X158)
- M.S. 306 X
- M.S. 584 X (X162)
- Marcy Houses
- Metropolitan Pool and Fitness Center
- Montefiore (Moses)
- Mosholu Parkway
- NYC Lab School
- P.S. 10 K
- P.S. 111 Q
- P.S. 146 Brooklyn New School, Brooklyn Collaborative Studies
- P.S. 180 M
- P.S. 204 K
- P.S. 243 K - Weeksville School
- P.S. 297 K - Abraham Stockton
- P.S. 59 K - William Floyd
- P.S. 66 X
- P.S. 71 K
- Parade Grounds Recreation Center
- Patrick O'Rourke Playground
- Pelham Fritz Recreation Center
- Poe Park Visitors Center
- Potomac Playground
- Prospect Park (Litchfield)
- Prospect Park Shops
- East Elmhurst Playground
- Ravenswood
- Recreation Center 54
- Redhook East & West
- Sedgewick & Dickenson
- Seton Park
- St. James Recreation Center
- St. John's Recreation Center
- Star Spangled Playground
- Sumner Houses
- Sunset Park Recreation Center
- Taaffe Playground
- Tibbetts Daylighting
- Tompkins
- Tony Dapolito Recreation Center
- Van Cortlandt Park Green Infrastructure Construction
- Van Cortlandt Park

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

FLUSHING BAY WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



FLUSHING BAY WATERSHED

2010-2021 ACCOMPLISHMENTS

814 Assets Constructed

294,781 SF Total Asset Area

99 Equivalent Greened Acres

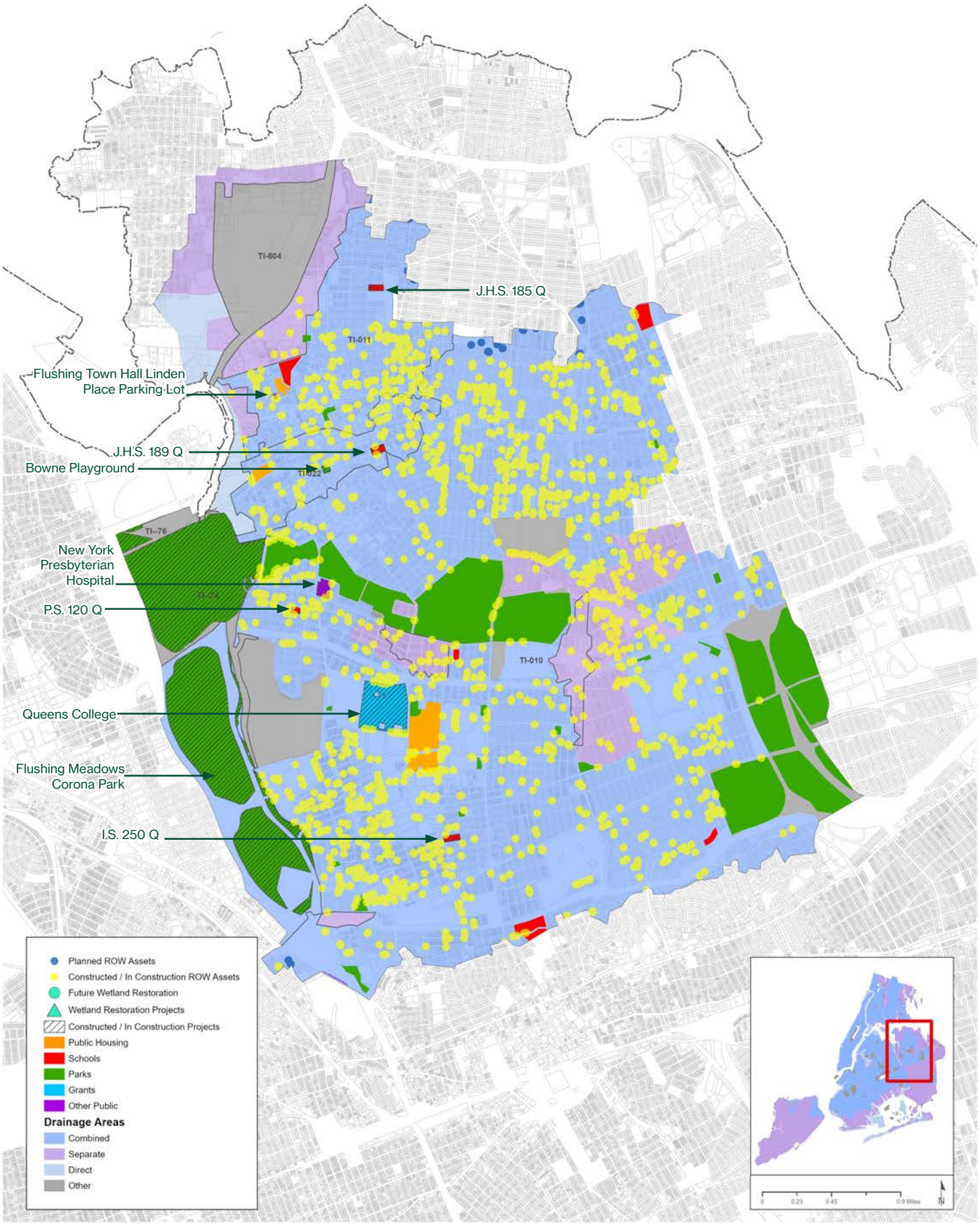
UPCOMING PUBLIC & GRANT PROJECTS**

- Annadale Playground/PS 175
- Barrier Playground
- Corona Golf Playground
- Ehrenreich-Austin Playground
- Frank D. O'Connor Playground
- Hoffman Park
- Horace Harding Playground
- Lost Battalion Hall Recreation Center
- Louis Armstrong Community Center
- Newtown H.S. Athletic Field
- Playground 115
- Real Good Park
- Russell Sage Playground/JHS 190Q
- The Painter's Playground/PS 174

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

FLUSHING CREEK WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



FLUSHING CREEK WATERSHED

2010-2021 ACCOMPLISHMENTS

2,071 Assets Constructed

667,281 SF Total Asset Area

264 Equivalent Greened Acres

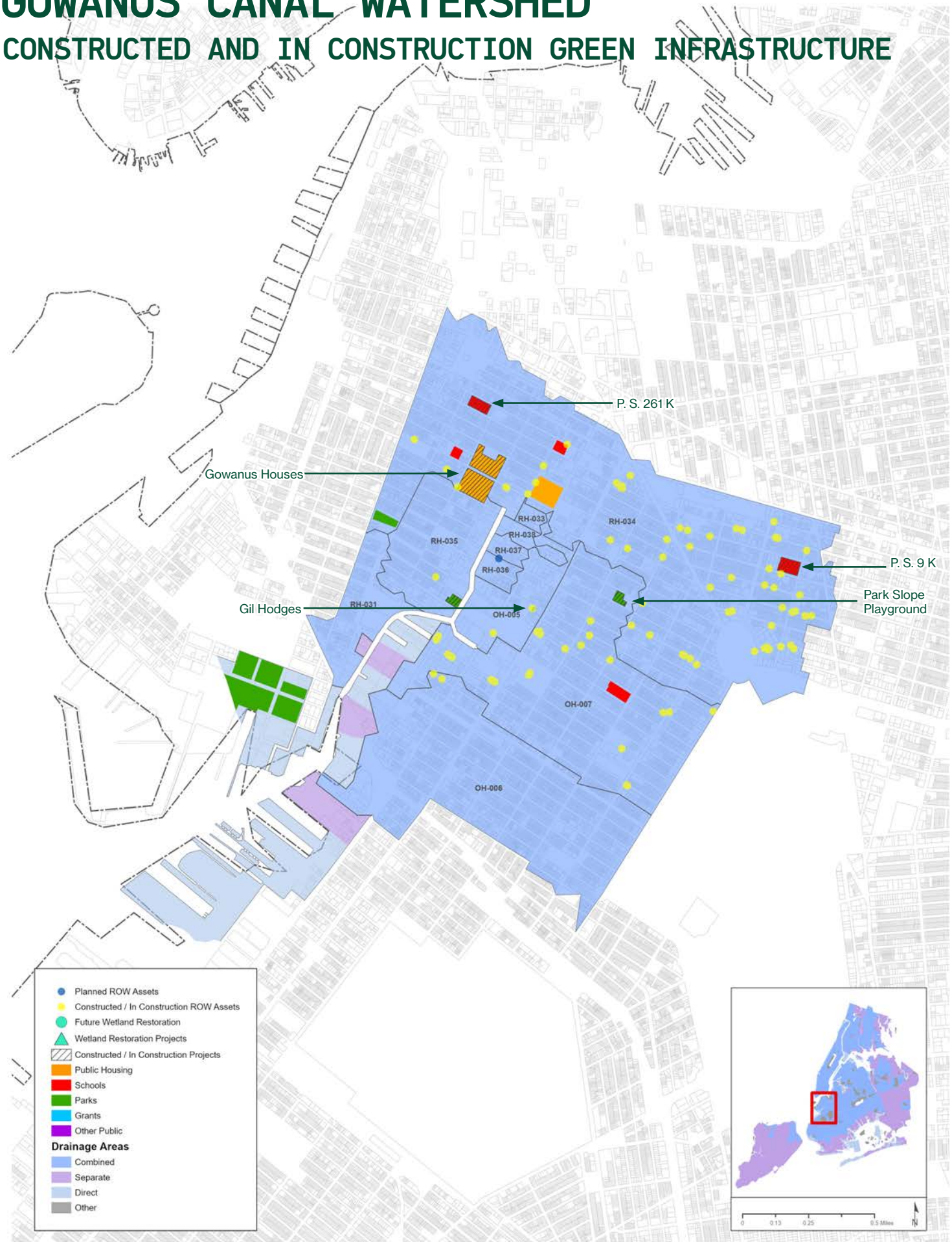
UPCOMING PUBLIC & GRANT PROJECTS**

- Bayside H.S. Athletic Field
- Bland Houses
- Cedar Grove Playground
- Colden Playground
- Cunningham Park
- Electric Playground
- Emerald Playground
- Flushing H.S. Athletic Field (Levitts Field)
- Francis Lewis Playground
- Fresh Meadows Park
- Fresh Meadows Playground
- Holy Cow Playground
- Hoover - Manton Playgrounds
- Jamaica H.S.
- Joseph Austin Playground
- Judge Moses Weinstein Playground
- Kissena Corridor Park
- Kissena Park
- Kissena Park-Phase 2
- Latimer Gardens
- Margaret I. Carman Green - Weeping Beech
- P.S. 163 Q
- P.S. 178 Q
- Playground Seventy Five
- Pomonok Houses
- Pomonok Playground
- Queens College Dining Hall
- Queens Valley Playground
- Saul Weprin Playground
- Thomas A. Edison Voc H.S.
- Utopia Playground

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

GOWANUS CANAL WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



GOWANUS CANAL WATERSHED

2010-2021 ACCOMPLISHMENTS

142 Assets Constructed

292,146 SF Total Asset Area

27 Equivalent Greened Acres

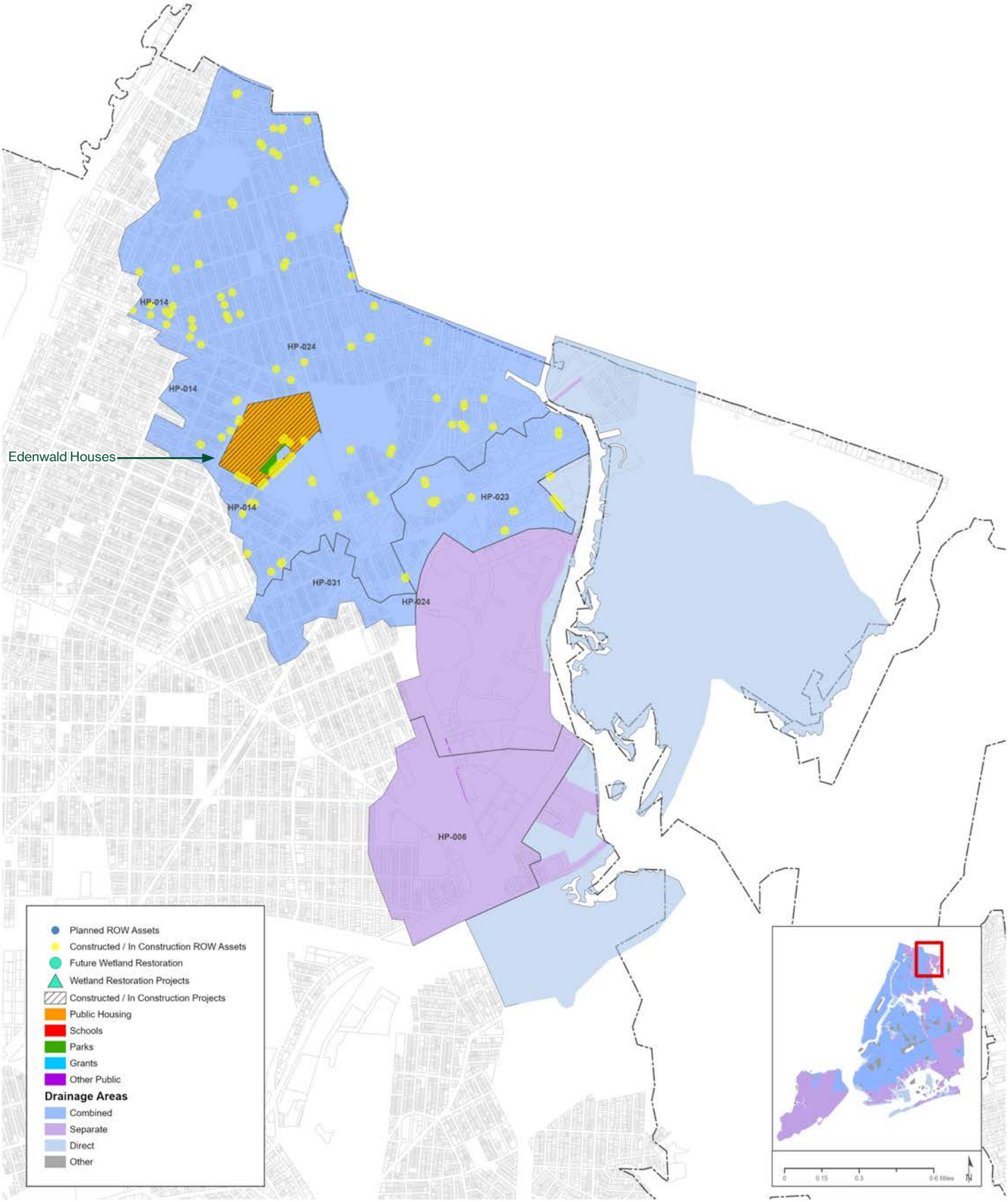
UPCOMING PUBLIC & GRANT PROJECTS**

- Boerum Park
- Carroll Park
- P.S. 321 K
- P.S. 38 K
- Red Hook Recreation Center
- Wyckoff Gardens

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

HUTCHINSON RIVER WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



HUTCHINSON RIVER WATERSHED

2010-2021 ACCOMPLISHMENTS

209 Assets Constructed

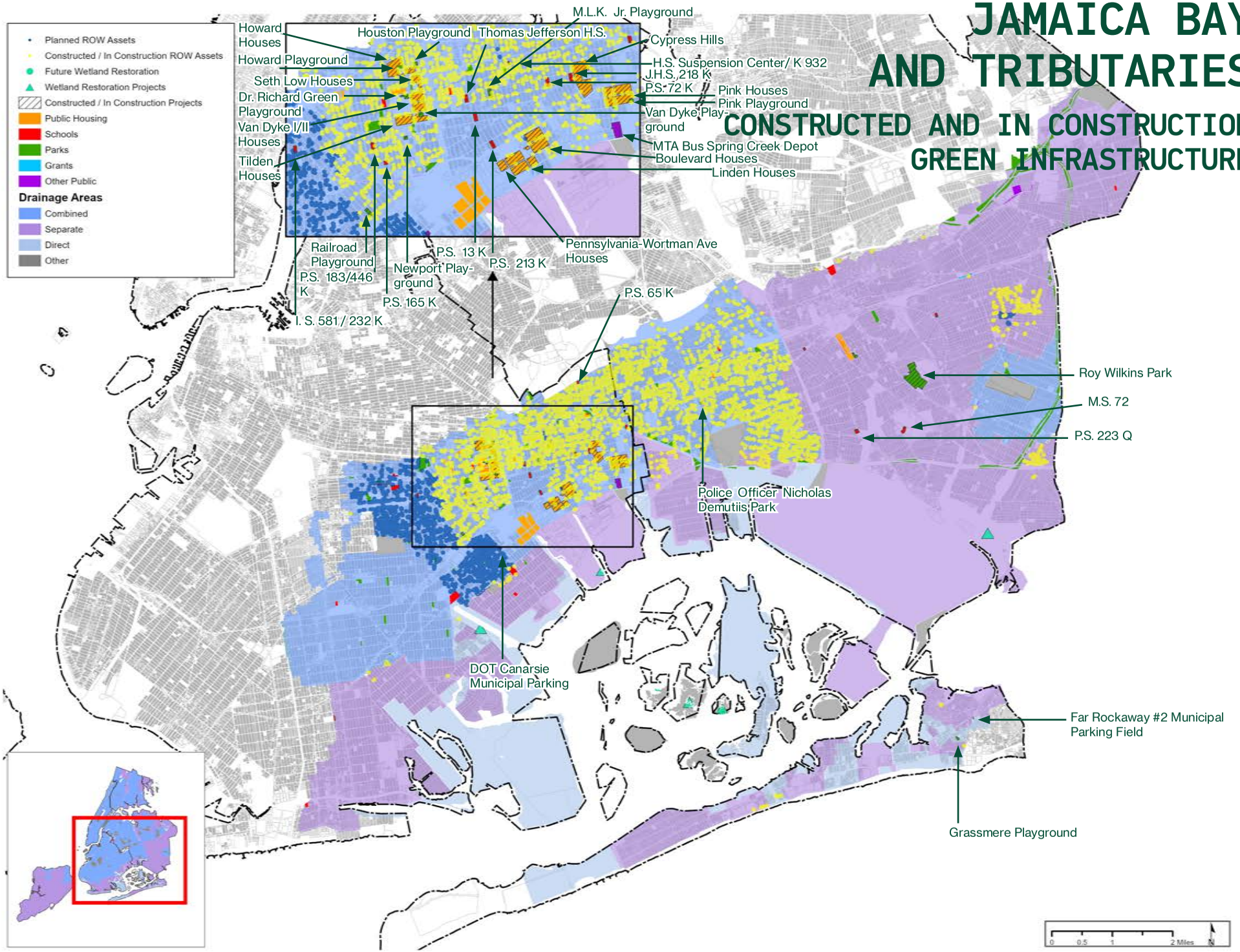
225,621 SF Total Asset Area

33 Equivalent Greened Acres

UPCOMING PUBLIC & GRANT PROJECTS**

- Edenwald Playground

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.


JAMAICA BAY AND TRIBUTARIES
CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE
Planned ROW Assets
Constructed / In Construction ROW Assets
Future Wetland Restoration
Wetland Restoration Projects
Constructed / In Construction Projects
Public Housing
Schools
Parks
Grants
Other Public
Drainage Areas
Combined
Separate
Direct
Other
Howard Houses
Howard Playground
Seth Low Houses
Dr. Richard Green Playground
Van Dyke I/II Houses
Tilden Houses
Houston Playground
Thomas Jefferson H.S.
M.L.K. Jr. Playground
Cypress Hills
H.S. Suspension Center/ K 932
J.H.S. 218 K
P.S. 72 K
Pink Houses
Pink Playground
Van Dyke Play-ground
MTA Bus Spring Creek Depot
Boulevard Houses
Linden Houses
Railroad Playground
P.S. 183/446 K
I. S. 581 / 232 K
Newport Play-ground
P.S. 165 K
P.S. 13 K
P.S. 213 K
Pennsylvania-Wortman Ave Houses
P.S. 65 K
Roy Wilkins Park
M.S. 72
P.S. 223 Q
Police Officer Nicholas Demutiis Park
DOT Canarsie Municipal Parking
Far Rockaway #2 Municipal Parking Field
Grassmere Playground
0
0.5
1
2 Miles
N

JAMAICA BAY AND TRIBUTARIES

2010-2021 ACCOMPLISHMENTS

4,599 Assets Constructed

1,248,988 SF Total Asset Area

770 Equivalent Greened Acres

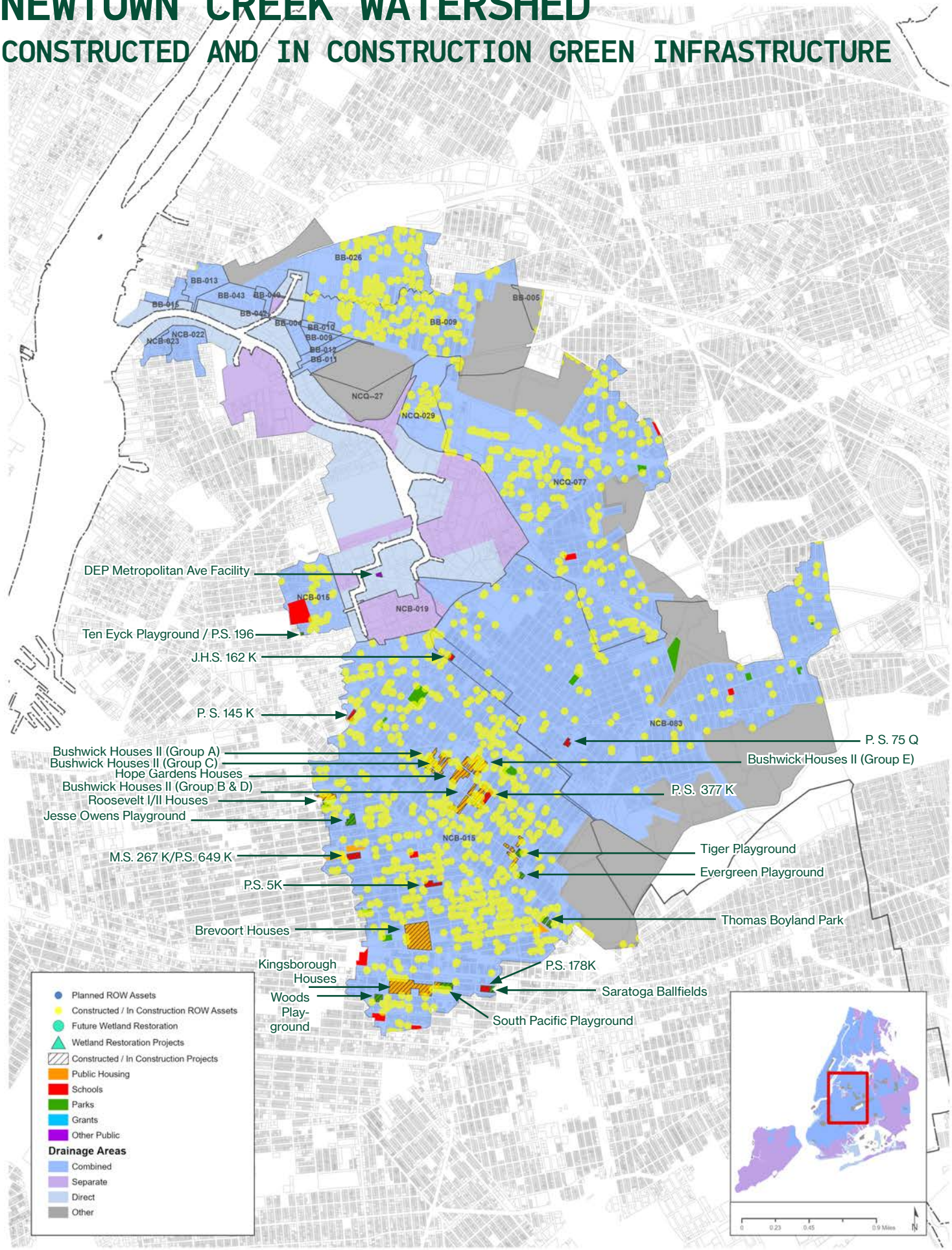
UPCOMING PUBLIC & GRANT PROJECTS**

- Amersfort Park
- Andries Playground
- Betsy Head Park Building
- Boys and Girls H.S. Athletic Field (Old)
- Boys and Girls H.S. Athletic Field
- Breukelen
- Brownsville Playground
- Brownsville Recreation Center
- Cambria Playground
- Canarsie H.S.
- Carter G. Woodson Children's Park (JOP)
- Chester Playground
- City Line Park
- Cynthia Jenkins School (Q37)
- Detective Keith Williams Park
- East NY Voc. H.S. of Transit Tech K
- Fox Playground (Brooklyn)
- Grace Playground
- Hamilton Metz Field
- Highland Park (Brooklyn)
- Howard Avenue
- Howard Pool Building
- Hughes Apartments
- I.S. 323 K
- London Planetree Playground
- Marc And Jason's Playground
- Maurice A Fitzgerald Playground
- Nehemiah Park
- P.S. 221 K
- P.S. 328 K
- P.S. 62 Q
- P.S. 91 K
- Paerdegat Park
- Phil "Scooter" Rizzuto Park
- Railroad Park
- Reid Apartments
- Remsen Playground
- Richmond Hill H.S.
- Roy Wilkins Recreation Center
- South Jamaica Houses I & II
- South Shore Educational Campus
- Sutter Ballfields
- Tudor Park
- Vito Locascio Field
- Wilson Playground
- Wingate Park (JOP)
- Woodruff Playground

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

NEWTOWN CREEK WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



NEWTOWN CREEK WATERSHED

2010-2021 ACCOMPLISHMENTS

1,515 Assets Constructed

749,448 SF Total Asset Area

189 Equivalent Greened Acres

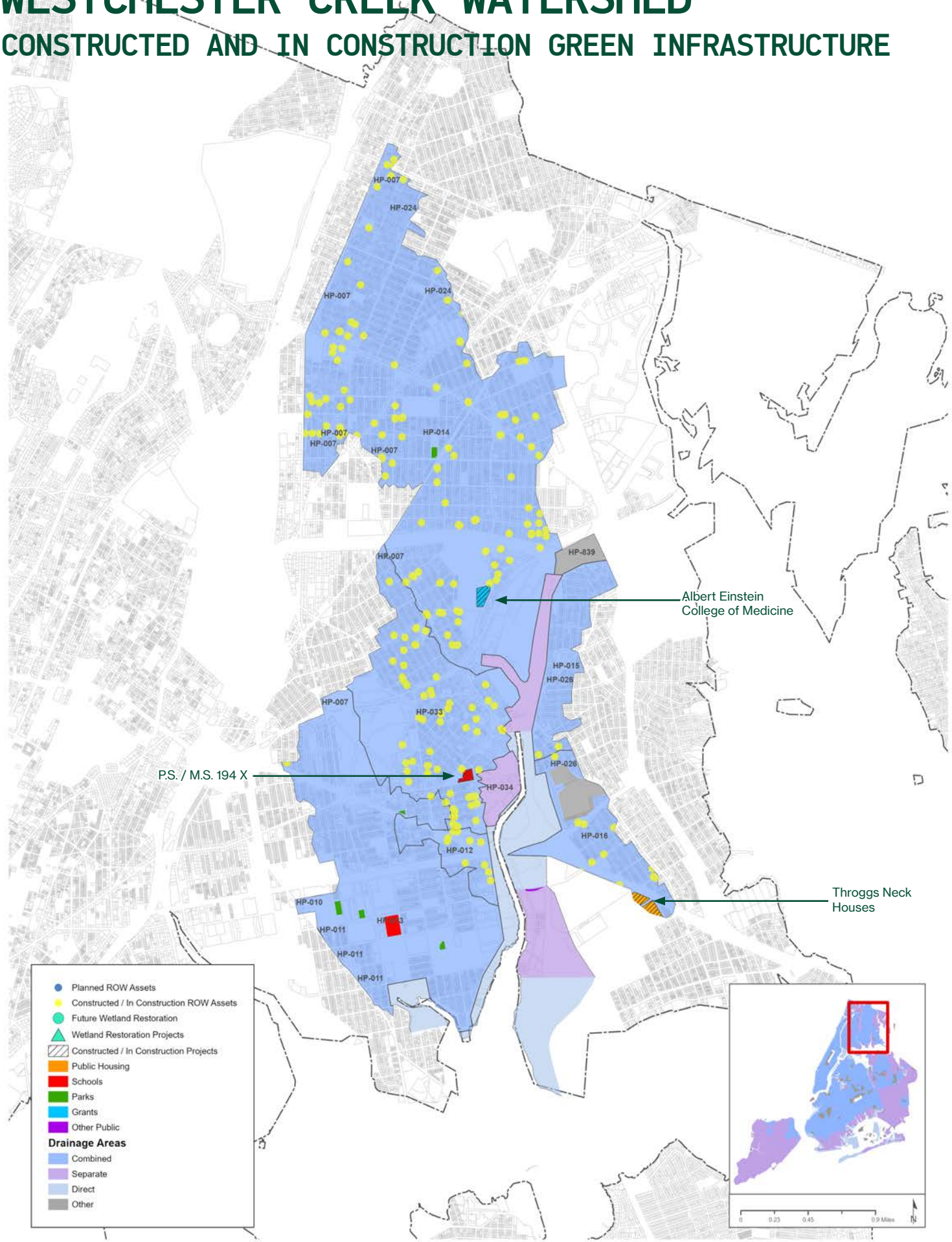
UPCOMING PUBLIC & GRANT PROJECTS**

- Boys and Girls H.S.
- Bushwick Playground
- El Shabazz Playground
- Eleanor Roosevelt Playground
- Fermi Playground
- Frontera Park
- Grand Street Campus
- Grand Street Campus
- I.S. 394 K
- I.S. 73 Q
- IS 119/Pinocchio Playground
- Jackie Robinson Playground
- Mafera Park
- Maria Hernandez Park
- Middle Village Playground
- Ocean Hill Apartments
- P.S. 153 Q
- P.S. 191 K
- P.S. 309 K
- P.S. 91 Q
- Rosemarys Playground
- Stuyvesant Gardens I
- "Uncle" Vito E. Maranzano Glendale Playground

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

WESTCHESTER CREEK WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



WESTCHESTER CREEK WATERSHED

2010-2021 ACCOMPLISHMENTS

230 Assets Constructed

86,600 SF Total Asset Area

30 Equivalent Greened Acres

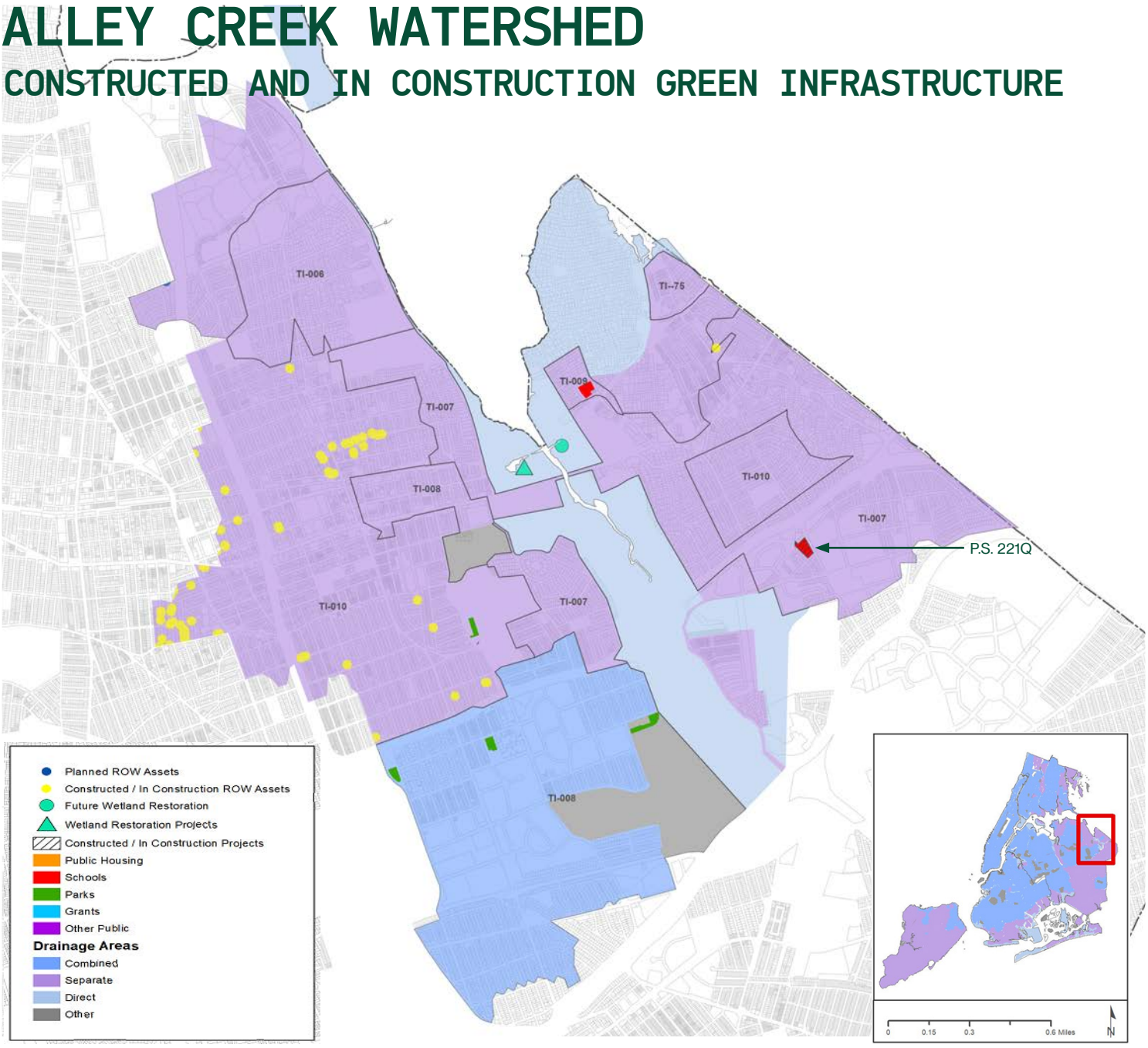
UPCOMING PUBLIC & GRANT PROJECTS**

- Adlai E. Stevenson Educational Campus
- Allerton Playground
- Chief Dennis L. Devlin Park
- Randall Playground
- Story Playground
- Space Time Playground

** Not counted toward stormwater managed or greened acres above. Subject to change based on feasibility and/or other project constraints.

ALLEY CREEK WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE

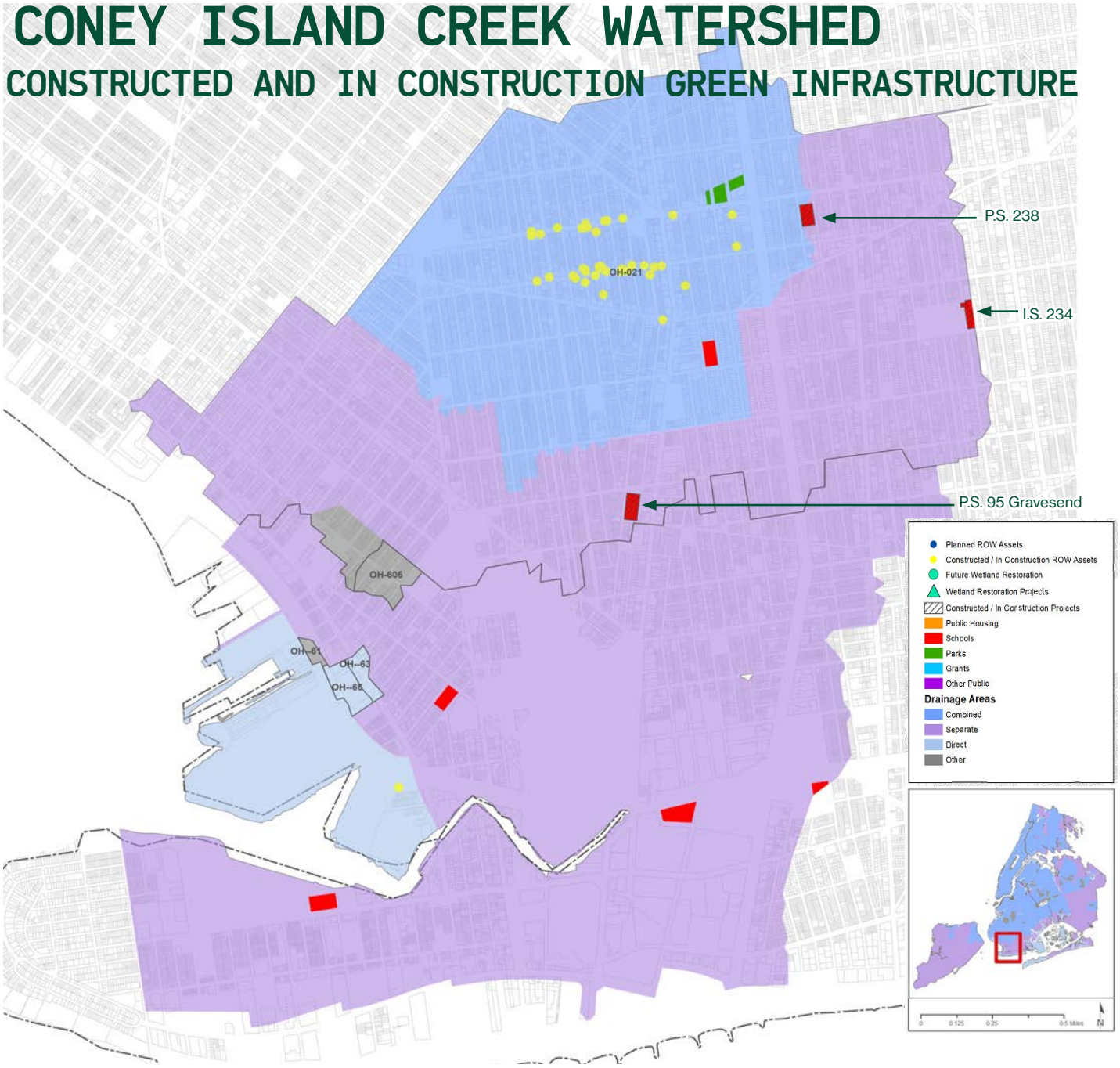


The Alley Creek and Little Neck Bay watershed is served by the Tallman Island WRRF and contains a complex wastewater and stormwater system comprised of combined and separately sewered areas as well as direct drainage. The annual wet weather discharge volume to the watershed is predominately stormwater and direct drainage runoff. The 5 million gallon Alley Creek CSO retention facility has been in operation since 2011, reducing overflows by 132 MGY. Accordingly, the watershed has not been considered a priority for ROW green infrastructure implementation in the combined sewer areas. However, DEP is pursuing retrofit opportunities on several public properties for green infrastructure implementation. Through DEP's partnership with TPL, green infrastructure was constructed in the separate sewer area of the watershed, at P.S. 221. There are 9 upcoming projects - 5 are in design: Alley Park, Oakland Gardens, Seven Gables Playground , Tall Oak Playground and P.S. 098; and 4 are in the planning phase: 53rd Ave & 221 St. median, 56th Ave & 221 St. median, 58th Ave & 221 St. median and 56th Ave & Springfield Blvd median.

In addition, there have been efforts to restore and build wetlands in Alley Creek for water quality improvements and ecological habitat benefits. The Alley Creek wetland is an enormous natural resource in northern Queens, and DEP expanded it by adding 1.5 acres. DEP also designed a "treatment wetland" in Alley Creek to target pollutant load reductions and to better quantify water quality and environmental improvements of wetland expansions in the receiving waters.

CONEY ISLAND CREEK WATERSHED

CONSTRUCTED AND IN CONSTRUCTION GREEN INFRASTRUCTURE



The Coney Island Creek watershed is an urban tributary to Gravesend Bay, which itself is tributary to the Lower New York Bay. Water quality in Coney Island Creek is influenced by multiple sources, including stormwater discharges, dry-weather sources and CSOs. The annual wet weather discharge volume to the watershed is predominately stormwater and direct drainage runoff.

DEP has completed pump station upgrades which have been operational since 2014, reducing overflows by 68% from 245 MGY to 75 MGY. Accordingly, the watershed had not been considered a priority for ROW green infrastructure implementation in the combined sewer areas in the early years of the program. However, DEP is continuing efforts to apply an integrated approach for stormwater management. DEP is currently investigating green infrastructure opportunities at public schools in the combined sewer areas, and a few public properties as part of the City's MS4 Stormwater Management Program. There are 9 upcoming projects, 3 in construction: P.S. 95 (Gravesend), I.S. 234, and P.S. 238; 3 in design: P.S. 215, P.S. 212, and Col. David Marcus Playground; and 3 in planning: Mark Twain Intermediate School, I.S. 303 (Rachel Carson H.S.), and William E. Grady CTE H.S. There are also green infrastructure projects funded through the New York Rising program (see RELATED INITIATIVES).

GREEN INFRASTRUCTURE MAINTENANCE

DEP STAFF REPLANTING A RAIN GARDEN

RIGHT-OF-WAY MAINTENANCE

Maintenance for the thousands of ROW green infrastructure assets is primarily carried out through an in-house maintenance team consisting of field crews and leaders, project managers and administrative staff. In 2021, DEP continued to face resource limitations attributable to the pandemic but was able to continue providing regular maintenance visits to the ROW practices. Table 4 below shows the total headcount dedicated to in-house green infrastructure maintenance since 2014.

Typical routine activities done by the field staff include inspections, removal of trash and sediments, watering and weeding vegetation as needed, and cutting back perennials and grasses throughout the growing season. Non-routine maintenance activities are done through a combination of field staff and supplemental contracts, and include gravel cleaning, cleaning of pretreatment structures, soil replacement, mulch replenishment, supplemental planting, pest control, clearing screens and subsurface pipes of debris, tree plantings and concrete repair.

As described in the implementation section, various types of green infrastructure practices have different design features, which require differing maintenance activities. As part of the onboarding for new and seasonal staff, DEP utilizes a maintenance manual which all staff receive as part of their training and can use as a reference. In 2021, DEP worked to update the maintenance manual to incorporate the new maintenance activities necessary to keep the newly constructed infiltration basins and rain gardens with Type D inlets functioning properly. The updated manual also includes references to design features of the large-scale street medians that are currently in the

TABLE 4: DEP ROW GREEN INFRASTRUCTURE MAINTENANCE STAFFING BY YEAR

Total Headcount Per Calendar Year*							
2014	2015	2016	2017	2018	2019	2020	2021
15	23	25	62	103	104	49**	89**

* Total Headcount includes both full-time and seasonal titles.
** Hiring was affected by the pandemic

design and construction phase, so that the maintenance team will be able to expand their activities when the median construction is complete.

At the end of 2021, DEP went through a substantial reorganization, bringing the maintenance staff from the Bureau of Water and Sewer Operations to the Bureau of Environmental Planning and Analysis. Unifying the maintenance team under the same bureau with the green infrastructure planning, design and construction staff is anticipated to streamline communication and coordination efforts across all stages of green infrastructure implementation. The unification also presents an opportunity for a fresh look in 2022 at DEP's green infrastructure maintenance framework and opportunities for diversifying DEP's maintenance approach and exploring opportunities for incorporating workforce development for green infrastructure maintenance.

RAIN GARDEN REPLANTING COMMUNITY STEWARDSHIP EVENT

PUBLIC PROPERTY RETROFITS MAINTENANCE

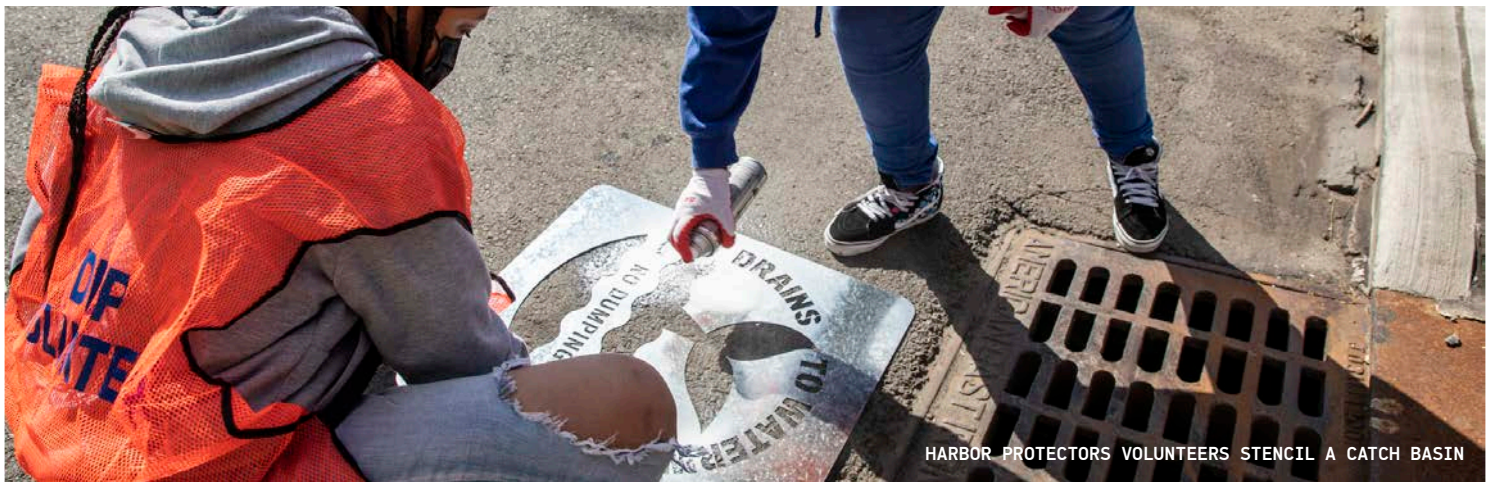
DEP and its partners have ensured that all other green infrastructure will be maintained over the long term. DEP has accepted maintenance responsibility for green infrastructure implemented within developments owned by NYCHA and performs the work through a maintenance contract. DOE DSF has agreed to incorporate the maintenance of green infrastructure practices into their typical schoolyard tasks. Similarly, Parks has incorporated green infrastructure maintenance into the borough maintenance and operations crew responsibilities.

STEWARDSHIP

Rain garden stewardship was re-introduced as part of the newly launched Harbor Protectors program in 2021. Harbor Protectors are DEP volunteers who sign up to do stewardship activities in their neighborhoods. The stewardship program recruits volunteers to partake in activities such as cleaning catch basins, stenciling educational/informational messages on the sidewalks near catch basins, caring for rain gardens and participating in shoreline cleanups. These stewardship actions simultaneously beautify communities while keeping pollution out of New York City's waterways, aiding DEP in its critical mission to protect and improve water quality across the city.

The program launch featured the unveiling of a new Harbor Protectors website which includes training/informational videos, the new program logo and creative assets, online registration form, and calendar of 2021 events. Community trainings for rain garden care occurred in eight neighborhoods across Brooklyn, Bronx and Queens, where rain gardens are present within New York City. In 2021, there was also further development for a rain garden education program, with plans for in-school demonstrations set to occur in 2022.

RELATED INITIATIVES



HARBOR PROTECTORS VOLUNTEERS STENCIL A CATCH BASIN

NYC STORMWATER MANAGEMENT PROGRAM (SWMP)

The NYC Stormwater Management Program (SWMP) consists of the City's measures to reduce the pollution potential of stormwater discharging into and from the MS4. The City developed and implements the SWMP in compliance with its MS4 permit. Fourteen City agencies are responsible for implementing the SWMP in the MS4 area, which comprises approximately 30% of NYC. There are three SWMP programs that include green infrastructure requirements: Construction and Post-Construction, Pollution Prevention/Good Housekeeping for Municipal Facilities and Operations (PPGH), and Special Conditions for Impaired Waters.

As described earlier, the Construction and Post-Construction program requires certain new and redevelopment projects to apply for permits. Projects required to implement post-construction stormwater management practices must follow NYC's preferred hierarchy, which prioritizes on-site vegetated infiltration options such as rain gardens. In 2021, DEP worked toward amending the rules governing this program. These updated rules are expected to increase the number of projects required to implement post-construction stormwater management practices. More information on MS4 Construction Permits is available on DEP's website.

As part of the PPGH program, agencies use standardized criteria to evaluate the feasibility of implementing green infrastructure during planned municipal upgrades in the MS4 area. An agency will include green infrastructure in any planned municipal upgrade project (defined as per internal guidance as a capital project in excess of $2 million) for which the agency determines that installation of green infrastructure is feasible and cost-effective.

The "Special Conditions for Impaired Waters" section of the permit requires the City to evaluate green infrastructure opportunities in MS4 areas that meet certain criteria. Presently, only Coney Island Creek meets those criteria. DEP evaluated school and park sites in the Coney Island Creek MS4 area for green infrastructure feasibility and is proceeding with the design of green infrastructure practices at four schools and one park. The green infrastructure practices will be designed to accommodate a 90th percentile storm (1.5" of rainfall). More information on the City's SWMP activities is provided in the MS4 Annual Report.

In 2021, as part of the PPGH program, the City evaluated 18 planned municipal upgrade projects for potential GI opportunities and constructed GI projects including rain gardens, synthetic turf fields, and permeable pavement

SOUTHEAST QUEENS

In the neighborhood of Southeast Queens (SEQ), flooding has been a chronic issue for over 70 years and has been exacerbated by increasing rainfall, loss of permeable surfaces, and reduced groundwater. DEP's 10 Year Capital Budget allocates $2.5 billion over the next decade to plan and begin full sewer build-out and to provide short term relief wherever possible. To supplement ongoing sewer buildouts, DEP is implanting green infrastructure, cloudburst pilots and other innovative stormwater management techniques, like median retrofits, to provide near-term solutions for flooding relief in SEQ. Figure 8 provides the locations of the constructed, planned and potential projects discussed below.

Consistent with the approach launched for the CSO GI Program, DEP identified public ROW and public on-site opportunities to implement near term green infrastructure in SEQ. Completed projects include:

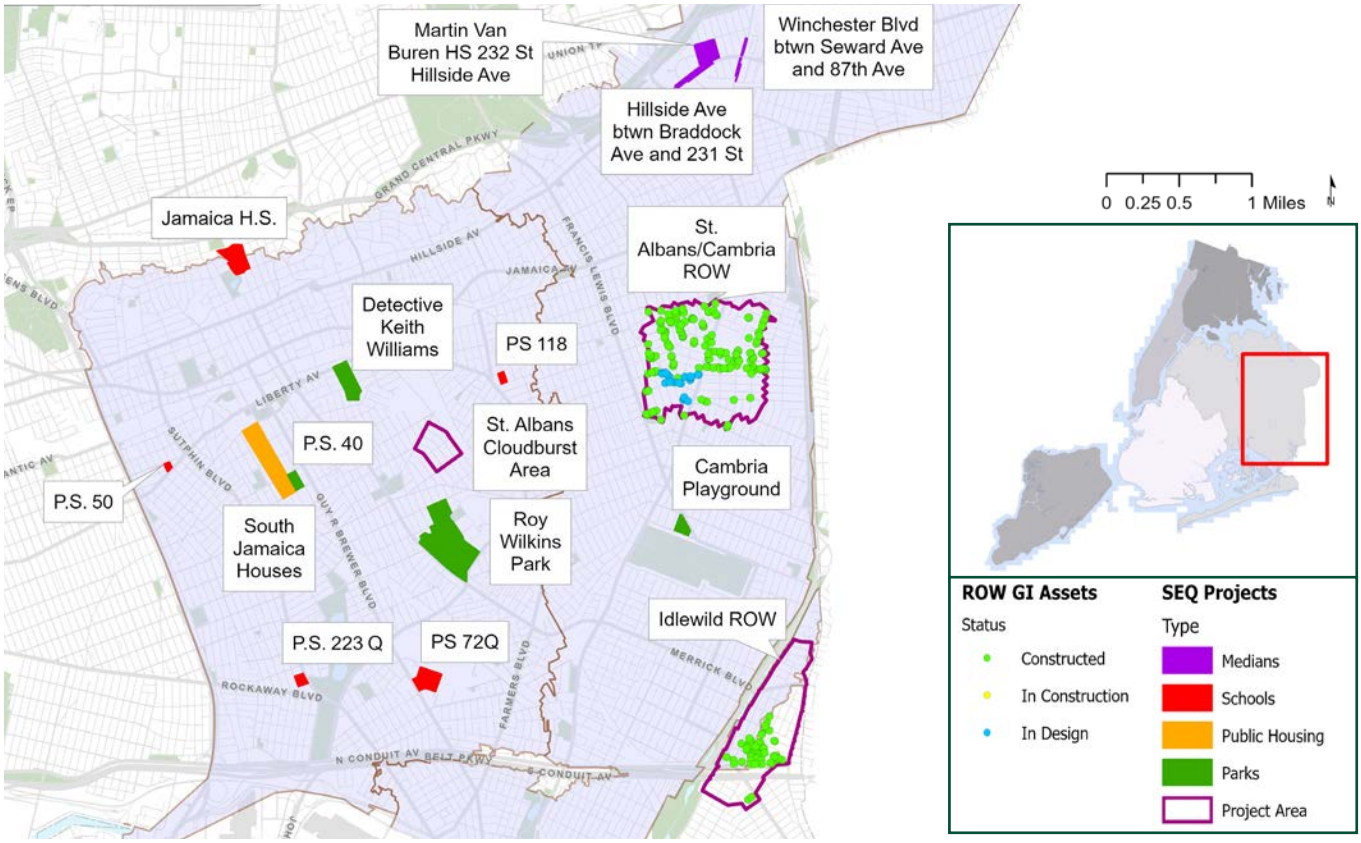
- 170 ROW rain gardens and infiltration basins around the St. Albans and Cambria Heights neighborhoods
- 53 ROW rain gardens and infiltration basins implemented in the Idlewild neighborhood in partnership with the Governor's Office of Storm Recovery (GOSR)
- Three rain gardens in side yard and curb/sidewalk upgrades at M.S. 72 also in partnership with GOSR
- Two rain gardens and synthetic turf field storage at P.S. 50
- Three rain gardens within schoolyard at P.S. 40
- A blue and green roof at P.S. 118
- Synthetic turf field storage and permeable pavers at P.S. 223 in partnership with the Trust for Public Land
- New stormwater drain on Merrick Blvd to divert stormwater to bioretention within park, pond dredging and installation of an aeration fountain at Roy Wilkins Park

Upcoming green infrastructure projects include:

- Athletic field retrofit at Jamaica High School
- Subsurface storage under tennis court at Detective Keith Williams Park
- Subsurface storage within yard at Cambria Playground
- Large capture median at Hillside Avenue, Winchester Boulevard and Martin Van Buren

Cloudburst pilots are another key strategy in SEQ and are discussed in the next section.

FIGURE 8: GREEN INFRASTRUCTURE IN SOUTHEAST QUEENS



CLOUDBURST PILOT PROJECTS AND THE NEW NORMAL REPORT

New York City has already seen flooding events caused by extreme rain and anticipates that flooding will worsen with climate change. After the devastation caused by Hurricane Ida, the City issued a report called The New Normal Report: Combating Storm-Related Extreme Weather in New York City which can be read at https://www1.nyc.gov/assets/orr/pdf/publications/WeatherReport.pdf.

The report prioritized stormwater resilience initiatives, including bringing Cloudburst Management projects into neighborhoods vulnerable to flooding from heavy rain. To identify initial cloudburst neighborhoods and carry out a multi-year approach to cloudburst neighborhood planning, the City formed an Inter-Agency Cloudburst Task Force, led by DEP and the Mayor's Office of Climate Resiliency (MOCR). In 2022, the City will conduct cloudburst feasibility studies considering physical vulnerability, social and economic factors, and below-ground conditions, and will begin a public engagement process to incorporate community input into the planning process. The results of this work will be to implement Cloudburst Management in four neighborhoods by 2025, with more neighborhoods to come as funding is secured.

To complement storm sewer and green infrastructure work in Southeast Queens, DEP is also implementing pilot projects identified as part of a study to assess risks, prioritize responses, develop neighborhood-based solutions, and assess costs and benefits for managing extreme rain events, or "cloudbursts." The 2017 Cloudburst Resiliency Planning Study adapted an approach developed in Copenhagen to manage large volumes of stormwater using streets and open space and has created a unique learning exchange between Copenhagen and New York City. By modeling the flow of floodwater over the local topography, the study determines opportunities to slow and safely convey water to minimize damages and maximize co-benefits to the community. (See next section for more information on the cloudburst projects.)

As a result of the Cloudburst Resiliency Planning Study two pilot projects were identified in the neighborhood of Southeast Queens to help demonstrate the feasibility of implementing the cloudburst approach. These projects aim to supplement ongoing sewer buildouts and act as a buffer for storms that are not captured by sewers due to the size of the storm or the lack of fully built-out storm sewer infrastructure. This would reduce flooding in areas where grey infrastructure takes longer to implement and alleviate chronic flooding of upstream areas.

DEP is currently in design phases for two cloudburst pilot projects in Southeast Queens. One of these projects, in the St. Albans neighborhood, is to design and construct a stormwater management system in the right-of-way using green infrastructure and cloudburst streets to mitigate flooding. A second project is located at the South Jamaica Houses, which is a NYCHA campus including eight city blocks in South Jamaica, Queens and is home to approximately 2,600 residents. South Jamaica Houses were chosen to provide relief upstream in order to allow for more flow to enter the sewer system downstream and reduce flooding. This project will maximize stormwater capture for up to 2.3 inches of rainfall per hour for climate resiliency. Aside from flood mitigation, another focus of this pilot is to show how cloudburst infrastructure can go beyond just managing stormwater and offer many co-benefits by reimagining the urban fabric of communities. DEP anticipates beginning construction at South Jamaica houses in late 2023.

A third project to identify potential opportunities to implement stormwater management solutions to reduce flood risk from cloudburst type events is currently underway at the Clinton House NYCHA campus. DEP and NYCHA collaborated with input from community stakeholders to develop an innovative multi-functional stormwater flood risk reduction solution that utilizes existing spaces within Clinton Houses development. This project's intent is to utilize available community spaces to implement feasible stormwater management solutions to delay, store and discharge the runoff within and outside of the Clinton House campus; thereby reducing flood risk from cloudburst events within the area. DEP has initiated the design for Clinton Houses and anticipates construction to begin in late 2023.

Hurricane Ida was the most catastrophic climate event in NYC since Hurricane Sandy

NEW YORK RISING

DEP, in partnership with the Mayor's Office, worked with the New York Rising Community Reconstruction Program (NYRCR) and the Governor's Office of Storm Recovery (GOSR) on a series of projects in neighborhoods heavily impacted by Hurricane Sandy and Irene. NYRCR's role is to facilitate rebuilding and revitalization assistance and work with local agencies to help implement projects. The projects included the planning and design of green infrastructure within the boundaries of six NYRCR Planning Areas:

- Gravesend / Bensonhurst
- Southeast Brooklyn Waterfront
- Canarsie
- Rockaway West
- Idlewild Watershed

Construction of 120 ROW green infrastructure assets was completed over the Spring and Summer of 2021. Feedback from residents in the Idlewild community has been largely positive as they were pleased with how the flowers and plants looked.

Three rain gardens were constructed at M.S. 72. The school yard retrofit also included rehabilitation of the community garden space with new concrete pavement and ADA compliant seating, installation of a prefabricated wooden shade structure with rainwater collection system, and installation of raised wooden planters. The construction team has received positive feedback. The school staff were pleased with the shade structure and planter beds and look forward to conducting classes outside.

RENDERING OF GREEN INFRASTRUCTURE AT M.S. 72, QUEENS

ECOLOGICAL SERVICES AND WETLAND RESTORATION

Wetlands, which are transitional lands between aquatic and terrestrial ecosystems, provide many ecological, economic, and cultural benefits. They attenuate flooding, help maintain stream flow, provide erosion control, and are important natural habitats for fish and other wildlife. Communities also benefit from wetlands through opportunities for recreation, aesthetic appreciation, and environmental education.

Attention has recently been focused on the ability of wetlands to improve water quality through mechanisms such as pathogen sequestering and reducing nutrient levels. The presence of vegetation within wetlands provides a source of oxygen into surface waters to help improve water quality within coastal ecosystems. For these benefits, natural and constructed wetlands have been widely utilized for water quality enhancement.

Within a tidal environment, marshes are able to dissipate tidal flow energies approximately one order of magnitude when the flows encounter vegetated marsh surface and flow velocity continues to decrease, as vegetation density increases. These tidal patterns have important implications concerning the assessment of water quality parameters associated with Fecal Indicator Bacteria (FIB) because they may provide a method to remove suspended bacteria and deposit them within marshes. This flooding and ebbing of salt marsh habitats can increase the mortality, and subsequently decrease negative impacts, of FIB by sequestering these bacteria within the marsh sediments and increasing the ultraviolet light exposure, which kills FIB. Table 5 summarizes the total acres of tidal wetland restoration resulting from DEP funded or cost shared projects to date.

From 2020-21, DEP added additional plantings in Alley Creek where DEP previously completed a 1-acre tidal marsh restoration. Additional plantings were added in 2020-21 and DEP will continue surveying work into 2022. The Alley Creek Pilot Wetland FIB sampling program is being planned to monitor various spatial configurations of wetland and tidal channels to achieve maximum water quality benefits.

Additionally, as part of the Jamaica Bay LTCP Recommend Plan, pending NYS DEC approval, DEP has included tidal wetland restoration as one of the key projects to help to build upon the water quality improvements for the waterbody through enhancement of fish and wildlife habitats, promoting filtering of direct drainage and other co-benefits. DEP, through a cost-share program with the United States Army Corps of Engineers, is planning a total of 181.5 acres of wetland restoration, of which DEP contributions will result in approximately 63 acres.

TABLE 5: TIDAL WETLANDS RESTORED OR FUNDED BY DEP

Sites Completed	Acres
Elders East (cost share)	38
Paerdegat	8
Idlewild	5
Powell's Cove	1
Hendrix Creek (cost share)	2
Elders West (cost share)	34
Yellow Bar (cost share)	42
Black Wall (cost share)	20.5
Ruler's Bar (cost share)	9.8
Brookfield	3.5
Flushing Bay	2
Alley Creek	8
Alley Creek Marsh	1.5
Total Installed	173.3
Future Sites	
Oakwood Beach (cost share)	35
Additional Jamaica Bay Marsh Islands (cost share)	63
Total Planned	98

ADAPTIVE MANAGEMENT


RAIN GARDEN PRETREATMENT FIELD TEST

RESEARCH AND DEVELOPMENT PROGRAM

DEP's comprehensive Research and Development (R&D) Program collects crucial performance and co-benefit data for a variety of green infrastructure practices. Work completed under the R&D Program supports the Green Infrastructure Program as well as the development and execution of LTCPs by reviewing performance over time, ensuring performance-based maintenance and operations, and by conducting cost-benefit analyses of various green infrastructure designs.

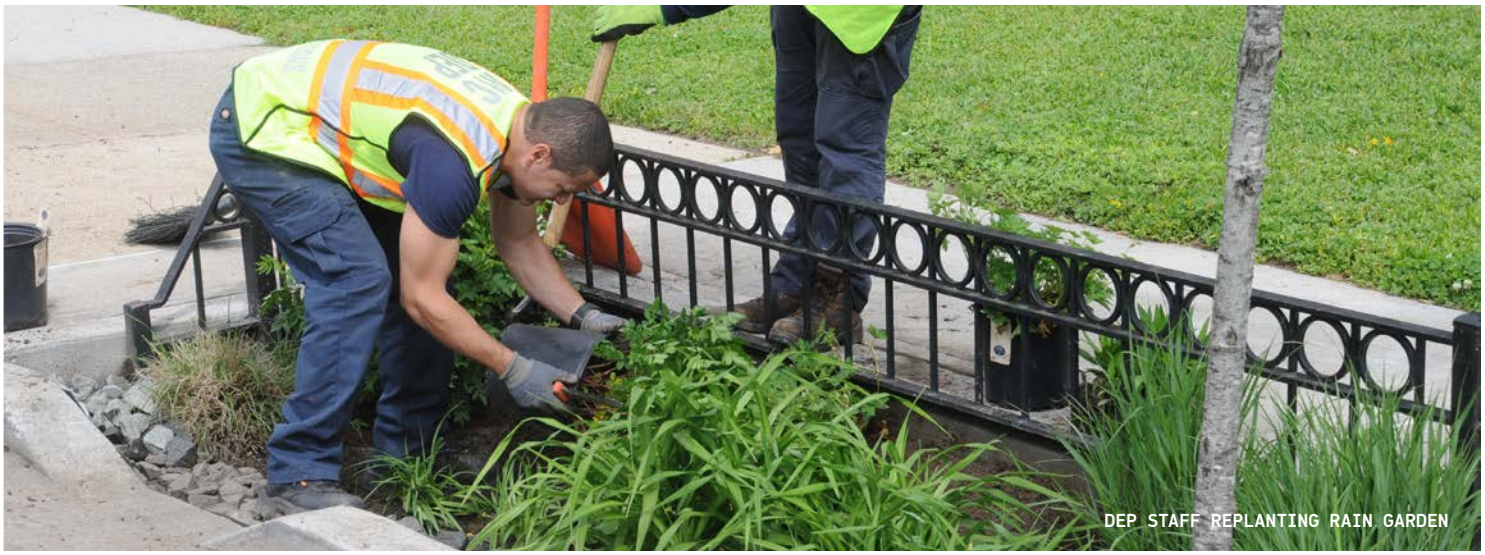
Through this effort and building upon previous monitoring studies, DEP has been collecting and analyzing data on rain gardens and other types of green infrastructure with support from industry professionals and experts. Findings from earlier studies have been presented at various conferences and is summarized in previous annual reports.

In 2021, DEP recommenced the field monitoring activities which were put on pause in the previous year. As described in the Right-of-Way Implementation section, evaluation of the permeable pavement pilots has been critical for the development of the upcoming areawide permeable pavement implementation. Throughout 2021, field staff conducted numerous surface infiltration tests to compare the effectiveness of different types of permeable pavement maintenance equipment and to observe how the permeable surfaces change over time across different locations where the permeable pavement is installed. To be able to evaluate the porous pavement at a larger scale rather than at the individual street level, DEP developed hydraulic models utilizing the pre- and post-construction in-sewer flow monitoring data that been collected previously in order to calibrate the models. DEP will continue to refine these models as more data is collected.

Other work in 2021 included continuation of testing different design options for the curbside rain gardens including an in-depth analysis of the pretreatment system and the shape of the outlet. Modeling efforts were also undertaken for the rain gardens, focusing on subsurface hydraulics through the base of the rain garden bottom and through stone columns.

DEP will continue collecting and analyzing data on green infrastructure with the team of professionals and experts and apply findings to improve implementation and operation of the Green Infrastructure Program. As part of these efforts, DEP is also supporting the development and understanding of green infrastructure in the context of the stormwater infrastructure field as whole, through collaboration with other municipalities and participation in larger research initiatives with organizations such as the Water Environment Federation. In line with this goal to advance the knowledge and understanding of green infrastructure, DEP is planning to explore other opportunities for green infrastructure monitoring with academic researchers, partner agencies, and local communities.

LOOKING AHEAD TO 2022



DEP STAFF REPLANTING RAIN GARDEN

01 MAINTENANCE STRATEGIES AND PARTNERSHIPS

The number of ROW practices entering full maintenance status in 2022 is nearly doubling as a result of the tremendous construction success achieved between 2020-2021. This scale-up, coupled with the integration of green infrastructure maintenance and operations with planning, design and construction, offers an opportunity to take a fresh look at how maintenance of green infrastructure is carried out across the city and opportunities for efficiencies. In 2022 DEP will be engaging community partners on green infrastructure maintenance and workforce development opportunities to strategize options for moving forward.

02 ROW POROUS PAVEMENT STANDARDS AND SPECIFICATIONS

In preparation for the upcoming large scale areawide implementation of porous pavement, DEP has been working on establishing design standards for porous pavement in the roadway. The standards and specifications incorporate lessons learned through the porous pavement pilots and will be published in 2022.

03 COMMUNITY STORMWATER RESILIENCY GRANT PROGRAM

DEP is advancing a new grant program that will fund small scale structural and non-structural BMPs. Eligible applicants include community groups, local organizations, and small property owners that want to increase community resiliency and awareness of stormwater management issues (see PRIVATE PROPERTY INITIATIVES for more details).

04 CLOUDBURST NEIGHBORHOODS

The 2021 New Normal Report prioritized stormwater resilience initiatives, including bringing cloudburst management projects into neighborhoods vulnerable to flooding from rain. In 2022 the City will conduct cloudburst feasibility studies considering physical vulnerability, social and economic factors, and below-ground conditions, and will begin a public engagement process to incorporate community input into the planning process.

05 AREA-WIDE BRONX POROUS PAVEMENT FEASIBILITY

DEP will continue street-level analyses for area-wide porous pavement implementation in the Bronx River and Westchester Creek watersheds through 2022. For some of these neighborhoods, rain gardens have already been installed or were considered for rain gardens but rejected for various reasons. Applying lessons learned through the design and construction of the permeable pavement pilots and incorporating data collected previously during the rain garden siting process, DEP will refine the projections for permeable pavement implementation in the Bronx.

06 RESILIENT NYC PARTNERS PROGRAM ADVANCEMENT

With Resilient NYC Partners officially launched, the program team has initiated strategic outreach to private property owners. To date, conceptual plans have been developed for three properties, which are anticipated to advance to the next phase of design in 2022 (see PRIVATE PROPERTY INITIATIVES for more details).

07 CITYWIDE FLOOD SENSOR DEPLOYMENT

In light of recent flooding events, and the increasing flood risks posed by climate change, DEP and the Mayor's Office are working to deploy a citywide network of flood sensors that will monitor key areas of the city throughout the 5 boroughs. These sensors will provide crucial real-time flood data to strengthen the City's response to flooding events, inform future stormwater management strategies, and help validate the citywide hydraulic and hydrologic models developed to release the 2021 NYC Stormwater Resiliency Plan and maps.

08 NEW OPPORTUNITIES FOR GREEN INFRASTRUCTURE MONITORING

DEP is also supporting the development and understanding of green infrastructure in the context of the stormwater infrastructure field as whole. DEP is planning to explore other opportunities for green infrastructure monitoring with academic researchers, partner agencies, and local communities.

EXHIBIT A - PROGRAM SPENDING AND BUDGET

CAPITAL ENCUMBRANCE, 10-YEAR BUDGET AND EXPENSE BUDGET

TABLE 6: ENCUMBERED CAPITAL FUNDING BY FISCAL YEAR

Fiscal Year	Encumbered Capital Funding
FY12	$9,015,345
FY13	$15,202,880
FY14	$152,935,548
FY15	$58,041,000
FY16	$114,976,273
FY17	$118,115,069
FY18	$69,811,175
FY19	$203,085,478
FY20	$160,754,308
FY21	$169,294,738
FY22[1]	$19,491,075
Total	**$1,090,722,889**

TABLE 7: CAPITAL IMPROVEMENT PROGRAM BUDGET, FY 23-32

Fiscal Year	Approved FY 2022 Preliminary Capital Improvement Program
FY22[2]	$109,142,096
FY23- FY32	$662,445,000
Total	**$771,587,096**
PROGRAM GRAND TOTAL[3]	**$1,862,259,985**

1 FY22 encumbered as of 3/25/2022.
2 FY22 remaining as of 3/25/2022.
3 Program Grand Total is based on the total encumbered and the Approved FY23 Preliminary January Capital Improvement Plan (FY22-32).

TABLE 8: EXPENSE BUDGET - OTHER THAN PERSONNEL SERVICES ONLY (OTPS)

Fiscal Year	OTPS Expenditures
FY12	$60,265
FY13	$2,039,773
FY14	$1,989,918
FY15	$2,006,620
FY16	$2,234,715
FY17	$4,134,828
FY18	$4,300,363
FY19	$4,752,478
FY20	$3,169,903
FY21	$2,214,366
Total	**$26,903,229**
Fiscal Year	**OTPS Budget, as of FY23 Preliminary Plan**
FY22	$19,228,758
FY23	$24,620,758
GRAND TOTAL	**$70,752,745**

EXHIBIT B - COMMUNITY OUTREACH

GREEN INFRASTRUCTURE PUBLIC OUTREACH MEETINGS

TABLE 9: 2021 PUBLIC GREEN INFRASTRUCTURE MEETINGS

Date	Community Member(s)	Type of Outreach	Attendees
February			
8	NYC Museum of Natural History-NYC's Green Infrastructure Program	Virtual	50
March			
11	American Council of Engineering Companies (ACEC) New York - NYC MS4 Construction Permit and Forthcoming Unified Stormwater Rule	Virtual	155
April			
15	NYC SBS GreenNYC Open House - Green Infrastructure and Energy Projects in NYC	Virtual	128
16	San Francisco Public Utilities Commission on Green Grey Infrastructure	Virtual	140
22	Harbor Protector's Kick-off Event	Clean-up Event	--
May			
17	New York Water Environment Association (NYWEA) NYC MS4 Construction Permit and Forthcoming Unified Stormwater Rule	Virtual	38
27	MS4 Program's Annual Report	Virtual	77
June			
9	Green Infrastructure Grant Program Spring Workshop	Virtual	32
July			
21	Green Infrastructure Stewardship Coalition - Newtown Creek Alliance Rain Garden Clean-up	Clean-up Event	--
August			
18	New York Water Environment Association (NYWEA) - NYWEA Webinar: NYC Stormwater Resiliency Plan	Virtual	--
September			
28	One Water Webinar: Los Angeles' Journey	Virtual	100
December			
8	NYC One Water Webinar: Exploring Cloudburst	Virtual	100
8	Green Infrastructure Grant Program Fall Workshop	Virtual	22
20	NYC DEP Unified Stormwater Rule Briefing #1	Virtual	150

EXHIBIT C - 1.5% CERTIFICATION

On December 30, 2021, DEP submitted the list of constructed assets totaling 1,181 greened acres and 507 million gallons per year (MGY) CSO volume reduction for the 1.5% green infrastructure application rate milestone certification, in accordance with Section IV.C.5 of the Order. The certification is pending completion of inspection and final acceptance by DEC.

TABLE 10: GREEN INFRASTRUCTURE CONSTRUCTED ASSETS FOR 1.5% MILESTONE

Waterbody	Outfalls	Greened Acres (ac-in)	Annual CSO Volume Reduction (MGY)
Bronx River	HP-004	11.9	5.1
	HP-007	52.1	22.3
	HP-008	3.4	1.4
	HP-009	1.8	0.8
Flushing Bay	BB-006	29.8	12.8
	BB-008	22.3	9.6
Flushing Creek	TI-010	185.9	79.8
	TI-011	19.6	8.4
	TI-022	5.8	2.5
Gowanus Canal	OH-005	0.1	0.0
	OH-007	3.1	1.3
	RH-034	3.7	1.6
Hutchinson River	HP-023	2.3	1.0
	HP-024	8.7	3.7
Jamaica Bay and Tributaries	26W-003	91.1	39.1
	26W-004	44.2	19.0
	26W-005	322.7	138.5
	CI-004	0.1	0.0
	JAM-003	130.4	55.9
	JAM-003a	15.6	6.7
	JAM-005	18.3	7.8
	JAM-006	0.1	0.0
Newtown Creek	BB-009	16.3	7.0
	BB-013	0.2	0.1
	BB-026	15.1	6.5
	NCB-015	67.4	28.9
	NCB-083	0.2	0.1
	NCQ-029	2.4	1.0
	NCQ-077	25.8	11.1
Westchester Creek	HP-012	1.0	0.4
	HP-014	10.0	4.3
	HP-015	0.1	0.0
	HP-016	1.6	0.7
	HP-033	5.2	2.2
Total Waterbody		1118.2	479.7

Waterbody	Outfalls	Greened Acres (ac-in)	Annual CSO Volume Reduction (MGY)
East River/Open Waters	HP-002	2.6	1.1
	NCB-013	0.7	0.3
	NCB-014	66.3	28.5
	NCB-027	0.3	0.1
	NCM-052	0.1	0.0
	RH-005	4.2	1.8
	WIM-012	0.1	0.0
Total[1]		1192.4	511.6

1 Due to rounding, values may show zero and sums may not add up to total

Summary table provided for informational purposes; greened acres and annual CSO volume reduction exceeding the 1.5% application rate milestone will be applied toward the 4% application rate milestone.

EXHIBIT D - 4% CONTINGENCY PLAN

TABLE 11: STATUS OF GREEN INFRASTRUCTURE 4% CONTINGENCY PLAN PROJECTS

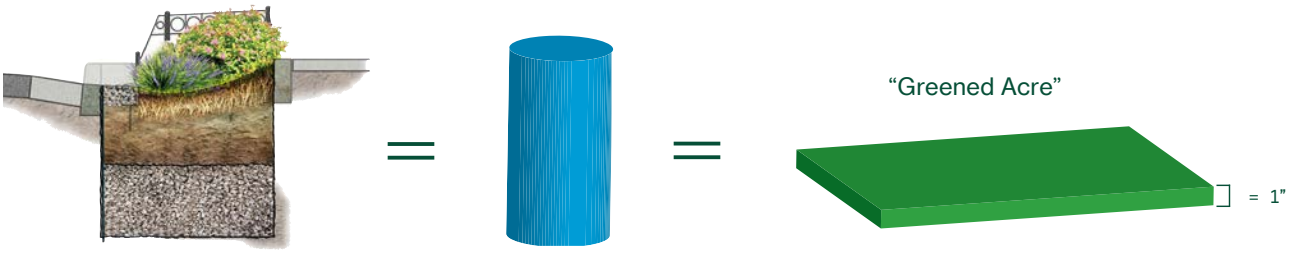
Priority Waterbody	Project	Current Status	Anticipated Construction Completion Date
EROW	OH-015 Areawide ROW – Phase 1	Geotech and survey	December 31, 2025
EROW	OH-015 Areawide ROW – Phase 3	Geotech and survey	December 31, 2025
EROW	TI-03/23 Areawide ROW	Final design	December 31, 2025
Jamaica Bay	CI-005 Areawide ROW – Phase 1	90% design	December 31, 2025
Coney Island Creek, EROW, Gowanus, Jamaica Bay	Expanded Public On-site – GI-CONS-01	Bid procurement	December 31, 2025
Alley Creek, EROW, Gowanus, Jamaica Bay	Expanded Public On-site – GI-CONS-02	90% design	December 31, 2025
Various	Private Incentives Retrofit Program – "Resilient NYC Partners"- Phase 1	Contract registered	December 31, 2025
EROW	Central Park Stormwater Recovery and Reuse	Design initiated	December 31, 2025
EROW	Prospect Park Stormwater Recovery and Reuse	MOU executed	December 31, 2025

EXHIBIT E - WHAT IS A “GREENED ACRE’?

A “greened acre” is another way of saying “equivalent impervious acre” but it’s easier to say and understand. It represents a volume of runoff managed by a green infrastructure practice. If you take that volume and spread it out evenly at a 1” depth over an impervious area – that area represents a “greened acre.” Here are some questions we think our stakeholders might ask:

HOW DO YOU CALCULATE A “GREENED ACRE”?

Let’s use a rain garden on the sidewalk as an example – a particular rain garden might hold 250 cubic feet of runoff. If you spread that volume over an area at 1” deep, its greened acres would be 3,000 square feet, or 0.07 greened acres (GA). Like many other U.S. cities, DEP starts with the water holding capacity of each green infrastructure practice and “backs out” the equivalent impervious area that would be managed if that volume was spread over an area at 1” depth.



WHY CHANGE THE TERMINOLOGY?

DEC approved DEP’s Performance Metrics Report (PMR) in the summer of 2017, thereby establishing the 2030 CSO volume reduction target for the Program. Because the PMR established a relationship between the green infrastructure projects to runoff reduction and actual CSO reduction, it is time to update and more accurately represent the metrics and targets in a volumetric unit. The “greened acre” metric is just that.

Additionally, updating the public and stormwater stakeholders on our CSO volume reduction progress will be much easier going forward. DEP works hard to measure the green infrastructure’s performance, or the volume of stormwater managed, in all types of rain events. Ultimately, that performance data is used to assess CSO volume reductions. Rain events can vary in a typical year – some are short and intense, some are long with less than a few inches over many hours. These variations in precipitation affect the way the green infrastructure practices perform and also dictate how much runoff during that particular rain event will be managed and ultimately the resulting CSO volume reduction.

WILL THE GREEN INFRASTRUCTURE PROGRAM REPORTING CHANGE?

Fundamentally, no. DEP will continue to report on greened acres, annual stormwater volume managed, and funding expended and budgeted (see Exhibit A) in each Annual Report, in accordance with the CSO Order. Additionally, at each milestone DEP will update the CSO volume reductions for all green infrastructure practices implemented by the milestone date.

EXHIBIT F - IMPLEMENTATION AREAS

GREEN INFRASTRUCTURE PROGRAM IMPLEMENTATION AREAS

The figures below are meant to help illustrate where the Greened Acres are being constructed and what the practices generating the Greened Acres are. Readers should note that these graphics represent a one-time snapshot and that actual numbers will change as the Green Infrastructure Program progresses.

The graphics cover these five primary Green Infrastructure Program implementation areas:

- **Right-of-Way –** primarily funded by DEP and implemented within City streets and sidewalks
- **Onsite –** primarily funded by DEP and implemented within publicly owned property, such as schools, parks, and public housing
- **External** – not funded by DEP and may be implemented in the ROW or within public or private property
- **Incentives** – implemented on private property through incentives provided by DEP
- **Regulations** – implemented through DEP stormwater regulations

Figure 6 shows how many Greened Acres have been implemented or are being implemented in each of the implementation areas. As shown, the majority of the Greened Acres, over 60% of those reported out, are being implemented through the ROW program. The number of Greened Acres generated through stormwater regulations will increase significantly over the years with the promulgation of the new Unified Stormwater Rule.

Figure 7 shows the breakdown of Greened Acres by green infrastructure type for each of the primary Program implementation areas. The figure shows that rain gardens make up over 50% of the green infrastructure assets constructed in the ROW, while a large portion of onsite implementation is subsurface retention. Table 2 in the STORMWATER REGULATIONS section gives a full breakdown of green infrastructure types implemented in private regulated sites, which are primarily detention practices.

FIGURE 6: BREAKDOWN OF GREENED ACRES BY PROGRAM AREA

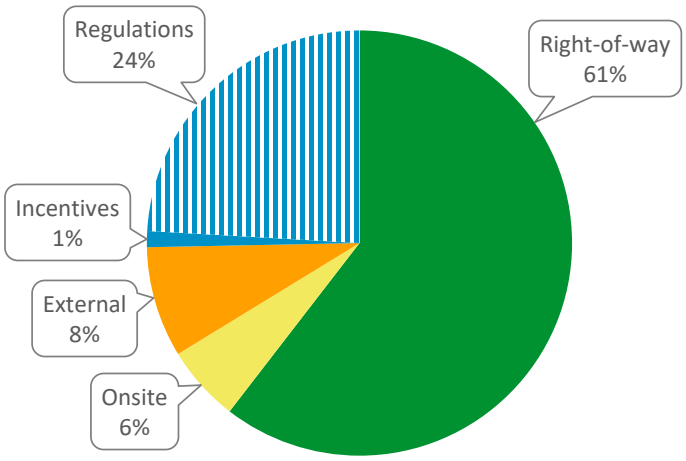
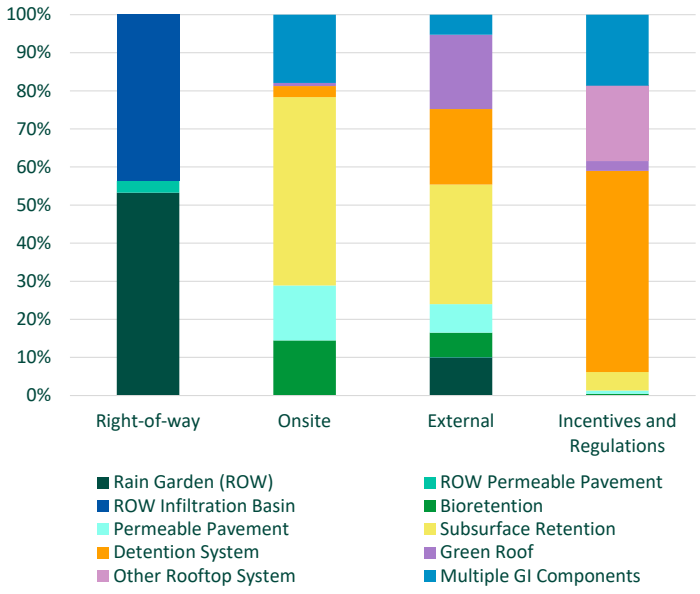


FIGURE 7: BREAKDOWN OF PROGRAM AREA GREENED ACRES BY GREEN INFRASTRUCTURE TYPE



ACRONYMS

BGY billion gallons per year

CFS cubic feet per second

CPC Central Park Conservancy

CSO combined sewer overflow

CSS combined sewer system

DDC Department of Design and Construction

DEC Department of Environmental Conservation

DOE Department of Education

DOT Department of Transportation

Department of Parks and Recreation/Parks

EDC Economic Development Corporation

EROW East River/Open Waters

FDNY New York Fire Department

FIB Fecal Indicator Bacteria

GOSR Governor's Office of Storm Recovery

HCP House Connection Proposal

HPD Department of Housing Preservation and Development

LTCP Long-Term Control Plan

MGD million gallons per day

MGY million gallons per year

MOCR Mayor's Office of Climate Resiliency

MOU memorandum of understanding

MS4 Municipal Separate Storm Sewer System

NTP Notice to Proceed

NYC New York City

NYCHA New York City Housing Authority

NYRCR New York Rising Community Reconstruction Program

NYPD New York Police Department

NYS New York State

PMR Performance Metrics Report

PPA Prospect Park Alliance

PPGH Pollution Prevention/Good Housekeeping for Municipal Facilities and Operations

R&D Research and Development

RFI Request for Information

RFP Request for Proposals

ROW right-of-way

SCA School Construction Authority

SCP Site Connection Proposal

SMP stormwater management practice

SRIJB Science and Resiliency Institute at Jamaica Bay

SWMP Stormwater Management Program

SWMPP Stormwater Management Program Plan

TBD to be determined

TPL Trust for Public Land

WQv Water Quality Volume

WRRF Wastewater Resource Recovery Facility

/nycwater

@nycwater

@nycwater

nyc.gov/dep/greeninfrastructure

NYC Environmental Protection