



NYC GREEN INFRASTRUCTURE

2022 Annual Report



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GREEN INFRASTRUCTURE PROGRAM OVERVIEW



PROGRAM GOAL



1.67 Billion Gallons per Year CSO volume reduction by 2030

The **New York City (NYC) Green Infrastructure (GI) Program** was launched in 2011 and was incorporated into the 2012 modified Consent Order¹ (the 2012 CSO Order) between the NYC Department of Environmental Protection (DEP) and New York State (NYS) Department of Environmental Conservation. The goal of the Program is to manage stormwater and reduce combined sewer overflows (CSOs). The 2012 CSO 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). In 2021, DEP achieved the 1.5% green infrastructure application rate milestone with 1,181 Greened Acres.

¹https://www.dec.ny.gov/docs/water_pdf/csomod2012.pdf

GREEN INFRASTRUCTURE IMPLEMENTATION 2010-2022

COMBINED SEWER SYSTEM ONLY

Watershed	Total Assets	Total Equivalent Greened Acres ²
Alley Creek	4	1
Bronx River	438	134
Coney Island Creek	55	13
Flushing Bay	848	103
Flushing Creek	2,186	278
Gowanus Canal	149	29
Hutchinson River	209	33
Jamaica Bay	4,670	787
Newtown Creek	1,650	213
Westchester Creek	235	31
Total Watershed	10,444	1,621
East River/Open Waters	2,337	678
Total Citywide¹	12,781	2,299

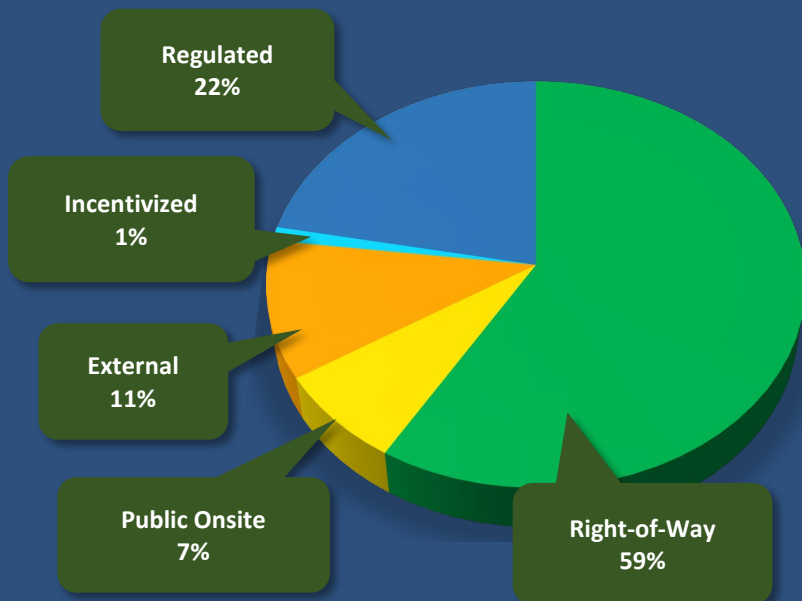
¹ Sum may not add up to total due to rounding.

² "Greened Acre" is an area equivalent to one acre of impervious surface covered by one inch of stormwater.

GREEN INFRASTRUCTURE PROGRAM OVERVIEW



BREAKDOWN OF GREENED ACRES BY PROGRAM AREA



Right-of-Way: primarily funded by DEP and implemented within city streets and sidewalks

Public Onsite: primarily funded by DEP and implemented within publicly owned property, such as schools, parks, and public housing

Incentivized: implemented on private property (private onsite) through incentives provided by DEP

External: not funded by DEP, may be implemented in the right-of-way (ROW), or public or private onsite

Regulated: implemented through DEP stormwater regulations (2012 Stormwater Rule or 2022 Unified Stormwater Rule)

PROGRAM HIGHLIGHTS

2,299 Greened Acres

12,781 Assets

80%+ of Assets Constructed in Environmental Justice Areas¹

¹Based on the Environmental Justice Area Census Tract Designation data published by the Mayor's Office of Climate & Environmental Justice, last updated March 2021.

ADDITIONAL READING & RESOURCES

Access more information about the NYC DEP Green Infrastructure Program, including previous Annual Reports and the Green Infrastructure Plan, at:



<https://www.nyc.gov/site/dep/water/green-infrastructure.page>

RIGHT-OF-WAY



RAIN GARDENS, STORMWATER GREENSTREETS, AND INFILTRATION BASINS

In 2022, DEP continued widescale implementation of green infrastructure in the public right-of-way (ROW), reaching functionality by year end of over 1,000 practices across four construction contracts in the Flushing Creek and Jamaica Bay watersheds. Two additional construction contracts, with over 900 rain gardens and infiltration basins combined, commenced work in 2022. DEP also initiated procurement on two additional construction contracts comprising of over 1,000 rain gardens and infiltration basins combined in Jamaica Bay CSO tributary areas, anticipated to register in 2023.

POROUS PAVEMENT

To date, DEP has constructed 77,908 SF of permeable pavement within NYC streets through previous pilot projects. Procurement has been initiated for over 100,000 SF of permeable pavement in East River/Open Waters (EROW) watersheds and is anticipated to register in 2023. Procurement also began on a pilot permeable pavement design-build contract of 90,000 SF in Brooklyn, as well as a traditional permeable pavement design contract in the Bronx aiming to implement 150,000 SF of permeable pavement, both anticipated to register in 2023.

DEP published updated Standard Designs in May 2022, incorporating major updates for permeable pavement in the roadway in preparation for the upcoming areawide permeable pavement installation work. Revisions to the permeable pavement designs included increasing storage area and structural stability, as well as minor updates for the other ROW green infrastructure practice types based on constructability, maintenance, and performance feedback. DEP also worked with NYC Department of Design and Construction (DDC) to create Standard Green Infrastructure Specifications for Permeable Pavement, which have been shared across all NYC agencies working on permeable pavement designs and will be incorporated into DDC's public website in 2023. This effort is anticipated to streamline the procurement and construction of permeable pavement by eliminating the need for project specific contract documents as had been done previously for the other green infrastructure typologies.

CONSTRUCTION MANAGEMENT AND ENFORCEMENT

In 2022, DEP continued to have a strong field presence for maintaining quality control over the thousands of ROW green infrastructure assets constructed and being constructed through the in-house inspection team. DEP will continue to work on updating quality control procedures and construction and inspection checklists to incorporate key components required for the first permeable pavement areawide contract entering construction in 2023.

PUBLIC PROPERTY RETROFITS



STATUS OF GREEN INFRASTRUCTURE PROJECTS ON PUBLIC PROPERTY



**Parks and
Playgrounds**

91

constructed or in
construction

64

in design



**Public
Schools**

63

constructed or in
construction

38

in design



**NYCHA
Housing**

28

constructed or in
construction

19

in design



**Other
Public**

8

constructed or in
construction

5

in design

These projects consist of different types of practices including surface, subsurface, or **green roof** practices, with surface and subsurface practice types being further categorizable into infiltrating **retention** practices or slow-release **detention** practices depending on the underlying soil properties. The practice types are selected and designed to fit existing site constraints and align with owner agency programming needs.

PUBLIC AGENCY PARTNERSHIPS

DEP has been working with key public agency partners to implement green infrastructure retrofits on publicly owned properties. This program area is typically referred to as public onsite. DEP's core public onsite partners are NYC Departments of Parks and Recreation (Parks), Education (DOE), School Construction Authority (SCA), and NYC Housing Authority (NYCHA). Other partners include Trust for Public Land (TPL), Department of Design and Construction (DDC), NYC Economic Development Corporation (EDC), and other public agency landowners and their project delivery partners.

Photos of constructed projects can be seen on DEP's Flickr webpage at <https://www.flickr.com/photos/nycwater>

PUBLIC ONSITE UPDATES

In 2022, DEP continued construction of public onsite projects through contracts with EDC for parks and NYCHA properties, and DOE for schools. Most of this construction was completed in 2022 and the remainder will be completed in 2023.

As previously reported, DEP expanded its public onsite program in 2017 with new agency-focused design contracts for parks, schools and NYCHA sites. Many of these designs have been completed, and DEP initiated construction on the first package which included 31 sites in 2022 (GI-CONS-01) and bid a second construction package with 19 sites (GI-CONS-02). Three additional public onsite construction contracts managed by DEP and three construction contracts managed by NYCHA are anticipated to bid in 2023. These contracts include green infrastructure retrofits at 45 public properties and are bundled by geographic proximity and number of sites to achieve cost efficiencies. Design is ongoing for 126 additional public onsite projects.

LARGE-SCALE MEDIANS



DEP's in-house design team is tasked with identifying opportunities for large-scale green infrastructure practices within City-owned medians and other spaces 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 right-of-way 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.

In 2022, DEP completed construction of its first large-scale median project located within the traffic median on Beach 67th Street between Almeda and Thursby Avenues in Rockaways, Queens. As of Spring 2023, 15 additional projects are in design, and four additional projects are at final design and or pending construction start or procurement. Additionally, in 2022 DEP submitted grant proposals to the NYS Environmental Facilities Corporation and was awarded \$5,000,000 to retrofit three existing street medians with large-scale green infrastructure practices in Queens to help reduce localized flooding and combined sewer overflows.



Rendering of large-scale green infrastructure implementation for Winchester Blvd., Queens.

STORMWATER REUSE



DEP is embarking on stormwater reduction and reuse projects in the East River/Open Waters waterbodies that provide a synergistic approach to demand management and combined sewer overflows (CSO) reduction goals. In addition to reducing potable demand, these projects also reduce discharge to the combined sewer system, contributing to the Green Infrastructure Program's goal to reduce CSOs by 1.67 billion gallons per year.

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

DEP has partnered with Parks and the Central Park Conservancy to construct a system to recirculate water in Central Park's northern waterbodies. These waterbodies, the Pool, Loch, and Harlem Meer, are currently fed by City water which flows into the Pool. Then, it moves by gravity to the Loch and Meer and finally overflows to the City's combined sewer system at the outflow of the Meer. Instead of utilizing potable water, the Central Park project will recirculate stormwater between the park's northern waterbodies. Recirculating this stormwater will **save up to an estimated 0.83 million gallons per day (MGD) of potable water**. In addition to the potable water reduction, other benefits include CSO reduction to the East River, and improved water quality in the Park's northern waterbodies. It is anticipated that this project will **reduce CSO discharge by up to 3 million gallons per year (MGY)**, addressing capacity constraints on the wastewater and stormwater infrastructure. This project is currently in the design phase and design will continue through 2023.



Harlem Meer in Central Park



DEP staff inspecting service line valve in Prospect Park

Prospect Park

Since 2020, DEP has been 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 combined sewer system 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 also expected to **reduce CSOs during rain events to Gravesend Bay and the Upper Bay by 12 MGY**. Design for this project is complete and bid procurement is currently underway with construction anticipated to begin in late 2023.

PRIVATE PROPERTY INITIATIVES



GREEN INFRASTRUCTURE GRANT PROGRAM

DEP has committed more than **\$14 million for 34 private property owners** to build green infrastructure through the **Green Infrastructure Grant Program (GIGP)**. As of 2019, the GIGP funds green roof retrofits and funding level is determined by a sliding scale based on green roof soil depth and vegetated area.

In 2022, DEP hosted four webinars covering funding eligibility requirements and application tips. Additionally, construction began on four rain gardens at a Bedford Stuyvesant Restoration senior housing complex located in Brooklyn. The four rain gardens total 10,741 SF and will manage nearly 500,000 gallons of stormwater annually. Looking ahead, three additional projects are expected to begin construction in 2023.

Photos of planned and constructed projects can be found on DEP's Green Infrastructure Grant Program webpage at: <https://www.nyc.gov/dep/gigantprogram>



Rain Garden constructed at Bedford Stuyvesant Restoration, Brooklyn

RESILIENT NYC PARTNERS

Through **Resilient NYC Partners**, DEP seeks to retrofit large and highly impervious private properties with green infrastructure. In 2022, the first project was announced, which will fund green infrastructure at **Green-Wood Cemetery** in Brooklyn. To date, 130 private properties citywide have been identified through an improved screening process for strategic outreach, and more than 70 properties have received direct outreach. The program continues to pursue discussions with property owners, conduct site visits to evaluate potential projects, and develop concept plans to present to property owners.

Four more private properties are expected to construct green infrastructure projects in 2023 through the program.

For more information on Resilient NYC Partners, visit: <https://www.nyc.gov/site/dep/whats-new/resilient-nyc-partners.page>

STORMWATER REGULATIONS



Establishing and updating stormwater regulations is a core part of DEP's work to improve water quality and enhance sewer operations. Since 2012, projects that require certification in the combined sewer areas have been complying with an enhanced stormwater performance standard (2012 Stormwater Rule).

In February of 2022, DEP promulgated the Unified Stormwater Rule (USWR), which included amendments to Chapter 31 and 19.1 of Title 15 of the Rules of the City of New York to update DEP's site and house connection requirements and Stormwater Construction and Maintenance Permitting Program. The USWR enhanced and unified citywide sewer operations requirements and water quality objectives, ensuring that new development in NYC is helping the City achieve critical goals. The USWR superseded the 2012 Stormwater Rule.

As of 2022, DEP is tracking **1,277 assets** and **584 Greened Acres** resulting from the 2012 Stormwater Rule. Starting next year, DEP will include projects implemented to meet the USWR requirements.

Summary of Stormwater Performance Standard Assets and Greened Acres in GreenHUB¹

GI Type	Asset Count	Greened Acres
Subsurface Retention	27	14
Green Roof	2	1
Blue Roof	428	115
Detention Tank	582	316
Drywell	107	18
Multiple GI Components	128	119
Rain Garden	3	1
Total	1,277	584

The published Unified Stormwater Rule and NYC Stormwater Manual can be found on DEP's website at <https://www.nyc.gov/site/dep/water/unified-stormwater-rule.page>

¹ GreenHUB is an internal application through which DEP tracks green infrastructure projects and assets. DEP regularly updates the GI Program Map to reflect GreenHUB data (see more on page 13)

DAYLIGHTING



TIBBETTS BROOK & LAKE IMPROVEMENTS



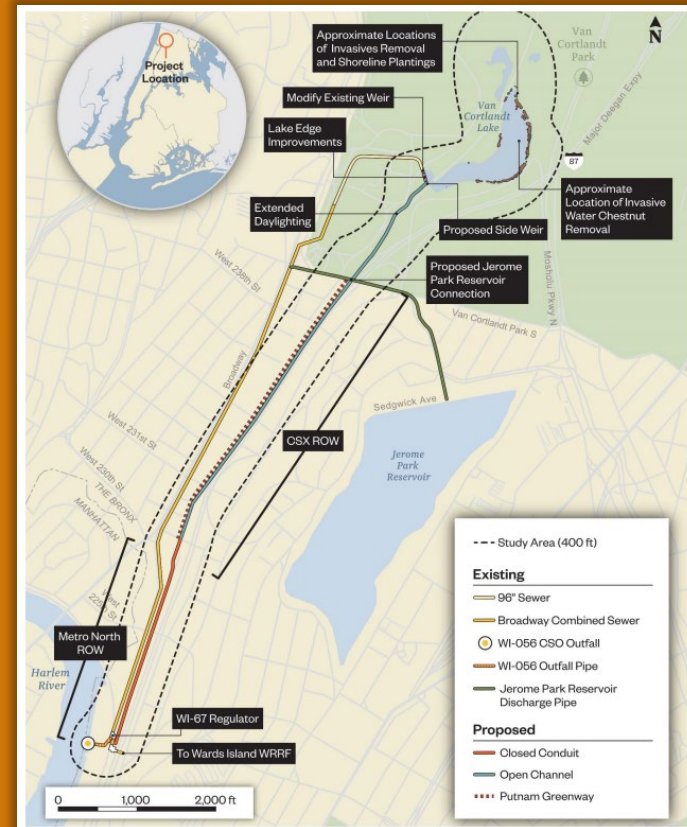
Rendering of future daylighted Tibbetts Brook and greenway along CSX Corridor; view from W. 236th St. looking North

In 2022, DEP made several key achievements:

- Established Tibbetts Advisory Group (TAG) comprised of key stakeholders and conducted robust outreach at critical project stages
- Finalized Advanced Conceptual Design
- Signed final agreement with railroad freight company CSX Transportation to purchase a piece of property critical to the project for \$11.2 million
- Initiated procurement for contract work to begin on lake restoration – anticipated start date Summer 2023

Upon completion, this project is anticipated to reduce combined sewer overflows to the Harlem River at **215-220 Million Gallons per Year (MGY)**.

Design development for the Tibbetts Brook Daylighting project is underway. Daylighting would restore the historical connection of Tibbetts Brook from Hester and Pierro’s Mill Pond in Van Cortlandt Park to the Harlem River via a new water conveyance system consisting of an open channel stream in Van Cortlandt Park and the former railroad right-of-way (CSX) and a closed conduit through the Metro North property, reducing flows to the combined sewer system. On a parallel path, DEP is also collaborating with Parks to build a new public greenway between Van Cortlandt Park and W. 230th St, intended to be part of the Empire State Trail.



GREEN INFRASTRUCTURE MAINTENANCE



RIGHT-OF-WAY MAINTENANCE



Maintenance staff landscaping outside the new Brooklyn satellite facility

DEP continued to provide maintenance in 2022 for the thousands of right-of-way green infrastructure assets through an in-house maintenance team consisting of field crews and leaders, project managers and administrative staff.

In 2022, DEP opened a new satellite office in Brooklyn and continued working to open one in Queens, in order to more efficiently station field crews in the parts of the city that have a significant concentration of constructed assets. DEP is also looking to address the magnitude of green infrastructure maintenance tasks through supplemental contracts, which kicked off in 2023.

As the Green Infrastructure Program continues to grow and expand, DEP is researching various technologies and workforce development frameworks to adapt to the varying conditions and maintenance needs observed throughout the city and anticipates making progress on these fronts in 2023.

STEWARDSHIP AND PUBLIC ENGAGEMENT

In 2022, DEP hosted 11 rain garden community engagement events, interacting with nearly 350 members of the public across these events. Through the DEP Rain Garden Stewardship Program, over 50 rain gardens were stewarded by local residents and community groups at the end of 2022.

DEP encourages the public to be engaged in the green infrastructure program by signing up for stewardship activities or reporting through 311 for any rain garden-related issues or requests.

PUBLIC ONSITE MAINTENANCE

DEP works closely with agency partners to ensure that green infrastructure practices built on public properties will function over the long-term by continually assessing designs for maintenance and supporting agency partners through budgeting and contracting services.

PROGRAM SPENDING AND BUDGET



CAPITAL ENCUMBRANCE, 10-YEAR BUDGET AND EXPENSE BUDGET

Encumbered Capital Funding

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	\$203,035,478
FY20	\$160,754,308
FY21	\$169,294,738
FY22	\$58,929,787
FY23 ¹	\$24,078,651
Total	\$1,154,190,252

Capital Improvement Program Budget: FY 24-33

Fiscal Year	Approved FY23 Preliminary Capital Improvement Program
FY23 ²	\$157,230,349
FY24-FY33	\$956,478,000
Total	\$1,113,708,349

Program Grand Total – Encumbered and Budgeted Capital Funding

Grand Total	\$2,267,898,601
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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
FY22	\$3,878,877
FY12-FY22	\$30,782,106

Fiscal Year	OTPS Budget, as of FY24 Preliminary Plan
FY23	\$24,620,758
FY24	\$23,476,665
Grand Total	\$78,879,529

¹FY23 encumbered as of 3/16/2023

²FY23 remaining as of 3/16/2023

4% CONTINGENCY PLAN



STATUS OF GREEN INFRASTRUCTURE 4% CONTINGENCY PLAN PROJECTS

DEP submitted a Contingency Plan for the 4% Green Infrastructure milestone on June 30, 2021 (4% Contingency Plan). DEC conditionally approved the 4% Contingency Plan on August 23, 2021 (DEC Determination). In 2022, DEP continued to advance these projects, which are anticipated to help DEP achieve a cumulative 668 million gallons per year program-wide upon completion in 2025.

The table below provides the status of the projects included in the 4% Contingency Plan.

2020 Contingency Plan Projects

Priority Waterbody	Project	Current Status	Anticipated Construction Completion Date
EROW	OH-015 Areawide ROW – Phase 1	Preliminary design	December 31, 2025
EROW	OH-015 Areawide ROW – Phase 3	Preliminary design	December 31, 2025
EROW	TI-03/23 Areawide ROW	In construction	December 31, 2025
Jamaica Bay	CI-005 Areawide ROW – Phase 1	In construction	December 31, 2025
Coney Island Creek, EROW, Gowanus, Jamaica Bay	Expanded Public Onsite – GI-CONS-01	In construction	December 31, 2025
Alley Creek, EROW, Gowanus, Jamaica Bay	Expanded Public Onsite – GI-CONS-02	Bid	December 31, 2025
Various	Private Incentives Retrofit Program – “Resilient NYC Partners” – Phase 1	Ongoing	December 31, 2025
EROW	Central Park Stormwater Recovery and Reuse	50% design	December 31, 2025
EROW	Prospect Park Stormwater Recovery and Reuse	In construction procurement	December 31, 2025

GREEN INFRASTRUCTURE PROGRAM MAP



MEET THE NEW GI PROGRAM MAP

The Green Infrastructure Map is an interactive tool that allows users to find green infrastructure practices in NYC neighborhoods.

Explore the **new, redesigned** GI Program Map here:
nyc.gov/dep/gimap

The updated map is hosted on a new, more interactive platform that allows users to tailor how information is displayed. The map displays green infrastructure practices by program area, as well as by status, so users can now view constructed or upcoming projects based on GI Program initiatives as well as asset location. Constructed right-of-way porous pavement assets are now displayed as polygon features to reflect the shape and size of these assets. Additionally, users can now easily filter through the datasets to reveal specific green infrastructure practices, such as rain gardens and green roofs.

