WATERSHED MANAGEMENT RECOMMENDATIONS TO ACHIEVE GOALS AND OBJECTIVES

1.1 Introduction

This chapter of the WQIP sets forth recommendations designed to protect and restore the lands and waters draining to Manhasset Bay. It is important to note that these are just recommendations and depend on funding and commitment. Nothing included here obligates the Committee or its municipal members to complete all these recommendations. This is a roadmap of all potential recommendation actions that work to improve water quality and habitat in Manhasset Bay.

The characterization of water resources within Manhasset Bay, input from the MBPC and the public, and regulatory considerations were all considered and factored into the development of recommendations in support of improvement of water quality. The overall intent of this document is to identify those measures that can be implemented to reduce existing water quality impacts and make meaningful strides toward water quality improvement. The recommendations provided herein will be incorporated into an Implementation Plan, which will further evaluate each recommendation as well as specific improvement projects, with respect to priority in scheduling and methods for implementation. It is recognized that this WQIP update is a long-term plan that will require funding and collective resources (i.e., MBPC and municipal staff assistance, data sharing efforts, joint grant applications and shared municipal, non-profit and private entity responsibilities) to achieve optimum benefits successful implementation and the greatest improvement of the Bay's water quality.

These recommended actions focus on measures to maintain and expand the availability of Manhasset Bay for recreational uses, while enriching the environmental and maritime quality of the Bay Ecosystem. Achieving the community's vision will require balancing multiple factors, including economic development, water quality and habitat protection, recreation, and building resilience to a changing climate. Implementing the recommendations will require a coordinated effort across multiple levels, including federal, state, and local governments, educational institutions, not-for-profit organizations, and community residents.

The recommendations reflect a watershed-specific analysis of the natural and built environment, current water quality conditions, key sources of pollution, and existing regulatory framework. Some recommendations address improving land conditions and water resources, while others are oriented toward long-term protection. Several high priority subwatersheds were identified in the process of developing this WQIP. They are the subwatersheds that were identified as having the highest pollutant loads per Table 6-2 of the Characterization Report. These subwatersheds include Kensington, Sheets Creek N, and Stannard's Brook.

Recommendations are organized into seven distinct categories, each identified by a unique letter code for easy reference:

B-#	**General Bay-Wide Recommendations**
S-#	**Stormwater Management**
M-#	**Municipal Facilities**
W-#	**Wastewater Management**
N-#	**Natural Resource Management**
R-#	**Water Quality Research & Monitoring**
P-#	**Watershed Planning and Management**
O-#	**Public Outreach and Stewardship**

Each recommendation is labeled with a category-specific letter followed by a number (e.g., B-1, S-3), for ease of reference in the Implementation Plan. These codes appear before the main description of each recommendation. For a full list of category codes, please refer to the section above.

1.2 General Bay Wide Recommendations (B)

This section details broad Bay-wide recommendations to improve water quality. These include systematic approaches to monitoring, controlling pollutant sources, and enhancing natural and engineered systems throughout Manhasset Bay. Recommendations address the need for frequent and comprehensive water quality testing, targeted investigations to trace inputs from stormwater, pesticides, and aging septic systems, as well as strategies for habitat restoration and infrastructure upgrades. The implementation of these actions will require coordinated efforts among local agencies, environmental organizations, and the community, ensuring that both current and emerging challenges to water quality are addressed efficiently and effectively as outlined in the recommendations that follow.

B-1:	**Comprehensive Water Quality Monitoring Program**

This recommendation is for a comprehensive water quality monitoring program to be established throughout the Bay. Currently, the Committee organizes the summer monitoring program with services offered by partners, but, in the future, a different partner may take the lead. Manhasset Bay and its tributary ponds and wetlands have been identified as impaired waterbodies under various regulatory frameworks, with existing water quality data often limited in frequency, spatial coverage, and parameters. To address these gaps, a comprehensive water quality monitoring program is recommended to be established and expanded to include regular,

systematic sampling throughout the Bay, its tributaries, ponds, and wetlands. Monitoring should occur at least 6–8 times per year, covering a range of field and laboratory parameters such as temperatures (ambient and water), clarity, salinity, dissolved oxygen, total and fecal coliform, pH chlorophyll-α, total nitrogen, total phosphorus, total dissolved solids (TDS), enterococcus, cyanobacteria counts, and other environmental conditions. Though the Committee, with the assistance of the Town of North Hempstead Bay Constables and the Nassau County Department of Health, already has an established summer monitoring program, this expanded monitoring program would go beyond the scope of this program and would likely need multiple partners, yet to be identified, to undertake. This recommendation should also incorporate climate change tracking, as called for in Recommendation **R-5**.

Ideally, sampling should be conducted at multiple locations, including high priority subwatersheds (i.e., Kensington, Sheets Creek N, and Stannard's Brook), stormwater outfalls, bathing beaches, and shellfish beds, with increased spatial coverage to include under-monitored areas. Real-time data collection and integration of continuous sensors for dissolved oxygen, temperature, and salinity are recommended to enhance the robustness of the dataset. DNA analysis of coliforms should be performed to identify sources of pathogens (e.g., human, waterfowl, pet, wildlife), and monitoring for harmful algal blooms (HABs; such as brown tide and red tide) is recommended to be included.

The expansion of water quality monitoring will provide a robust, up-to-date dataset for tracking and recognizing trends, identifying pollution hotspots, and evaluating the effectiveness of management actions. Enhanced monitoring will enable adaptive management and rapid response to water quality events (e.g., algal blooms, HABs, fish kills, pathogen spikes), support compliance with regulatory requirements, and strengthen grant applications. Data collected will also inform targeted restoration and management actions for tributary ponds and wetlands, which may act as either pollutant sources or sinks for Manhasset Bay. Recommendation **R-6**is to utilize a centralized portal for all data collected to be organized and evaluated (see).

This program should be coordinated with municipal mapping and maintenance efforts, as identified in Recommendation **M-1**, and should incorporate citizen science and community-based monitoring initiatives, as Recommended in **R-4**, to expand coverage and community engagement. Seeking funding or expansion of volunteer efforts will further assist in identification of remedial actions and reduce environmental stress on the ecosystem.

B-2:	**Expand Water Quality Sampling to Include Pesticides**

It is recommended that a new program to monitor for pesticides in stormwater runoff entering the Bay be explored as community concerns have been raised regarding pesticide runoff from residential and landscaped properties surrounding Manhasset Bay and the impact to human health through primary recreation. Additional work is needed to identify lead and supporting partners for this project. Pesticide use for lawn care, mosquito control, and tick management may contribute to water quality degradation, especially in residential areas, golf courses, and parks. Initial pesticide screenings should be conducted at key stormwater outfalls, particularly in areas with dense residential development or proximity to golf courses and parks. Sampling locations should be selected based on upland land use and runoff potential. Based on these results, public education efforts and municipal management practices can be targeted.

B-3:	**Investigate Septic System Contributions to Pollution**

The exact contributions and hot spot locations of pollution from on-site wastewater systems are unknown, so this recommendation aims to address that, though the exact partners have not yet been identified for this undertaking. Certain shoreline neighborhoods around Manhasset Bay rely on aging or failing septic systems, especially in areas with shallow groundwater and poorly drained soils. Sewering of unsewered areas is recommended, particularly areas of highest density including Kings Point (which incorporates three subwatersheds), - Sands Point (in the North East Shore and Sheets Creek East subwatersheds), Manhasset (in the Whitney Pond subwatershed), the Plandomes (in the Leeds Pond and Plandome Heights subwatersheds), and portions of Port Washington (in the Mill/Baxter Ponds subwatersheds) - are unsewered and consist primarily of older homes on aging cesspools and septic systems.

To prioritize areas, microbial source tracking (MST) studies (also recommended in **R-1** and **B-1**) and targeted inspections of areas identified as high-priority are recommended to identify human-sourced pathogens. Outfalls and culverts in vulnerable neighborhoods should be evaluated for direct sanitary inputs, particularly the highest density areas with high groundwater conditions. Sampling during peak usage and significant storm events to capture “first flush” conditions may help identify overflow conditions. Additionally dry weather monitoring can also help identify significant issues for areas of shallow groundwater and high-density residential uses. Recommendations for system upgrades or connections to sewer infrastructure should be encouraged and developed based on findings, including prioritization of the most vulnerable areas and applying for grant funding based on documented water quality issues. This investigation could help prioritize areas for sewer expansion and legacy on-site wastewater elimination as called for in Recommendations **W-1, W-2,** and **W-3**.

B-4:	Feasibility Study to Evaluate Use of Aeration Systems in Stagnant Areas of the Bay

It is recommended that a partner or partners undertake a feasibility study to investigate the possible use of aeration systems around the Bay. Stagnant zones within Manhasset Bay, particularly near enclosed coves or marinas, may benefit from aeration systems to improve circulation and oxygen levels. Aeration can promote aerobic bacterial activity and reduce anaerobic pathogen persistence. A feasibility study should be conducted to assess potential locations and system types to determine feasibility and prioritization of areas in greatest need. Case studies from other regions (e.g., Shinnecock Bay, New Jersey estuaries) may provide useful models.

B-5:	Support Shellfish Restoration Programs

Through the Committee, Town of North Hempstead, and other partners, it is recommended that shellfish restoration programs be continued and, where feasible, expanded in the Bay. Shellfish restoration offers a nature-based solution to improve water quality through filtration. Though it can take decades to see results, expansion of already existing shellfish seeding programs as well as introducing new programs in Manhasset Bay should be prioritized, in coordination with NYSDEC and local hatcheries. Funding and partnerships with academic institutions (including State University of New York, Stonybrook) and environmental organizations can help sustain these efforts. Similar programs have been successful in the Town of Islip and Southampton that can be consulted for process and lessons learned.

B-6:	Manage Waterfowl Populations and Pet Waste to Reduce Pathogen Inputs

It is recommended that the Committee partners work to manage waterfowl populations and public feeding practices and offer public education and programs for proper pet waste disposal throughout the watershed. Waterfowl, particularly geese, are known contributors of pathogens to surface waters. Therefore, managing nuisance waterfowl populations by reducing favorable conditions for waterfowl to congregate near surface water on private and public lands can assist in improving water quality. Management strategies should include habitat modifications (e.g., vegetated buffers, fencing), public education, and coordination with existing MS4 programs.

Local ordinances prohibiting feeding of waterfowl and outreach to homeowners can help reduce congregation and associated water quality impacts. Teaming with local municipalities, the MBPC and other resources may be a good resource for training and implementation of goose and waterfowl management programs for municipal parks, golf courses and waterfront open spaces and to assist in reducing the costs for implementing such programs. Additionally, goose/waterfowl management can be accomplished through volunteer efforts and reaching out directly to large local landowners (particularly golf courses and properties with large open lawns) with educational materials and training. Adoption of local laws prohibiting the feeding of waterfowl on public lands, as called out in Recommendation **O-1**, and providing educational material and signage regarding the issues associated with feeding of waterfowl can also help the public gather greater understanding of the issue.

Similarly, educating the general population on the importance of cleaning up and properly disposing of pet waste is also important to reduce pathogen inputs to surface waters. Leaving pet waste on lawns allows for increased nutrients and pathogens to enter surface waters either by stormwater runoff or via groundwater (particularly in areas with shallow depths to groundwater). Educational material could also be developed for local homeowners/property owners regarding the importance of pet waste management and methods to control goose/waterfowl on their properties. Such materials can be distributed through partners, municipalities, local schools, markets, and pet food stores. Additionally, installation of pet waste bag stations at parks, waterfront trails and public places with educational signage is a low-cost approach to reach a larger population of residents and provide easy access to bags to clean up and dispose of waste on the spot.

B-7:	**Conduct a Tidal Flushing and Circulation Study for Manhasset Bay**

This recommendation is for the Committee to conduct a tidal flushing and circulation (hydrodynamic) study of Manhasset Bay. Understanding circulation patterns and residence times within Manhasset Bay is critical to addressing pollutant retention and water quality impairments. A hydrodynamic study should be conducted to map tidal flushing, identify stagnant zones, and model pollutant transport. This information will inform future restoration and infrastructure planning, including stormwater retrofits and habitat enhancements.

B-8:	Investigate Areas for Removal of Sediment from Manhasset Bay

The extent, composition, and water quality impacts of accumulated sediments throughout Manhasset Bay are not fully understood, particularly outside of areas that have been recently investigated for navigation-related dredging. Sediment accumulation can contribute to degraded water quality by reducing water depth and circulation, increasing residence time, promoting resuspension of fine sediments and associated nutrients or contaminants, and impairing benthic and marsh habitats. This recommendation focuses on advancing a more comprehensive understanding of sediment conditions and their relationship to water quality, habitat function, and long-term Bay resilience, while acknowledging that full-scale sediment removal is constrained by funding and disposal limitations.

Field investigations should be expanded in the northeastern and lower portions of the Bay, building on work already completed near Town Dock and northward, to include updated bathymetric surveys, sediment sampling, and biota and species diversity assessments. These investigations should evaluate sediment grain size, organic content, and potential nutrient or contaminant associations, with the goal of identifying areas where sediment accumulation is contributing to poor water quality, reduced dissolved oxygen, or loss of ecological function. Linking sediment characteristics to water quality conditions will be critical to supporting future management and funding decisions.

A dredging and sediment management feasibility assessment should be revisited and updated, recognizing that prior feasibility studies were completed many years ago and may no longer reflect current conditions, regulatory requirements, or disposal options. While the cost of dredge spoil disposal has historically limited dredging activities in Manhasset Bay (particularly beyond navigation channels) and the Bay no longer benefits from USACE federal channel maintenance, an updated assessment could evaluate alternative sediment management approaches. These may include beneficial reuse of suitable sediments for marsh restoration or shoreline resilience projects, thin-layer placement, or targeted removal in areas where sediment accumulation is directly linked to water quality impairments.

Environmental permitting efforts with NYSDEC and USACE are currently underway for dredging near Town Dock and adjacent areas, supported by FEMA Sandy recovery funds and Town of North Hempstead capital funding. Additional permitting and planning efforts should be informed by updated field data and coordinated with ongoing and future projects to maximize environmental benefit and avoid piecemeal implementation. Although DOS does not fund sediment removal

directly, sediment investigations and planning efforts that clearly demonstrate water quality benefits may support complementary funding applications and interagency coordination.

Potential funding sources should be identified to support the development and implementation of a comprehensive sediment and water quality sampling plan, including state and federal resilience, habitat restoration, or climate adaptation programs. Securing funding for data collection and analysis is a critical first step toward understanding the role of sediment accumulation in bay-wide water quality trends and prioritizing future actions.

B-9:	**Identify Areas for Open Space Preservation**

It is recommended that areas of open space be preserved when feasible. Preservation of open space allows for stormwater infiltration, reductions in impervious surface cover, nitrogen attenuation, and natural stormwater filtration. Once areas for conservation are identified, municipalities and other entities can coordinate with the NYSDEC for potential land conservation easements.

1.3 Stormwater Management

This section outlines targeted recommendations to address stormwater impacts through the implementation of green infrastructure techniques, outfall retrofits, pre-treatment practices, and maintenance of existing stormwater infrastructure. These recommendations are designed to reduce pollutant loads, enhance infiltration, and promote sustainable watershed practices. Recommendations **S-1** through **S-7** are general recommendations, meant both to explain the practices and for consideration for implementation throughout the watershed. Project recommendations **S-8** through **S-19** are site-specific, targeted recommendations to improve water quality in their respective watersheds. These projects have been identified to have the most impact on the water quality of Manhasset Bay.

S-1:	**Green Infrastructure: Install Rain Gardens Throughout the Watershed**

It is recommended that rain gardens be installed at strategic locations throughout the watershed, prioritizing areas with high impervious surface, direct stormwater discharges to surface waters, and proximity to sensitive waterbodies. Green infrastructure is recommended to be designed to capture and treat at least the "first flush[1]" of stormwater runoff of regularly occurring storms (which are defined by the *2024 NYSDEC Stormwater Management Design Manual* as a 1.5 inch rainfall event or less from contributing impervious areas. Design elements including the following are recommended for green infrastructure installations:

- Use of native, deep-rooted plants tolerant of both wet and dry conditions to maximize infiltration and pollutant uptake.
- Incorporate engineered soils and underdrains as needed to ensure adequate drainage, especially in areas with compacted or poorly draining soils.
- Include pretreatment features (e.g., grass filter strips, stone aprons, designed forebays) to trap sediment and debris before water enters the practice.
- Include maintenance plans and allocated budget for watering during the initial establishment of vegetation and upkeep for a minimum of three years (after which plants are typically mature enough to reduce maintenance requirements).

[1] At the beginning of a storm, the first rainfall that hits an impervious surface carries the most pollutants because it picks up the accumulated litter, hydrocarbons, chemicals, debris, and other pollutants as it travels, untreated, towards Manhasset Bay.

Green Infrastructure practices are beneficial because they reduce stormwater runoff volumes and pollutant loads, improve water quality, provide habitat for pollinators, enhance neighborhood aesthetics, and support climate resilience. They are a cost-effective, community-friendly solution that can be integrated into both public and private landscapes. Rain gardens will require periodic maintenance in order to sustain their ecological and stormwater benefits. Maintenance includes mulching as needed, inspection of practice every six months for erosion and clogged inlets and outlets; and removal of invasive species and weeds. Typically, a watering program for the first establishment year as well as monitoring for plants that need to be replaced is encouraged for long-term success.

S-2:	**Green Infrastructure: Streambank Stabilization**

It is recommended for streambank stabilization as it helps prevent erosion by reinforcing stream edges, especially where vegetation is sparse, slopes are steep, or high volumes of runoff occur from surrounding upland land-uses. Stabilization aids in intercepting runoff, reducing stormwater velocity, and trapping sediment before it reaches waterbodies. Key locations such as Whitney Pond Park (Whitney Pond subwatershed), Stannards Brook (Stannards Brook subwatershed), and Leeds Pond (Leeds Pond subwatershed) tributaries would benefit from such measures.
Stabilization methods fall into two main categories:

- Bioengineering techniques – use of combined living plant material and other natural materials (e.g., live stakes, coconut fiber rolls)
- Vegetative stabilization techniques – use of predominantly living plant and their root structures for stabilization(e.g., planting buffers)

Combining these approaches—such as using vegetated slopes with strategic placement of whole trees in channels—may enhance long-term streambank resilience and ecological health. Typical maintenance will include monitoring and repairing erosion throughout the stabilized area, especially during major storm events during it's first establishment year. Vegetative management will include control of invasive / weedy species and addressing gaps in vegetative cover over time.

S-3:	**Green Infrastructure: Bioswales Along Right-of-Ways**

It is recommended that bioswales be installed along right-of-ways. Bioswales, like rain gardens, are effective strategies for capturing and treating the "first flush" of stormwater runoff from roads and other impervious surfaces. These systems help intercept pollutants before they reach surface waters or overwhelm storm drains during heavy rain events.

Bioswales are particularly well-suited for areas with limited space due to slope, narrow rights-of-way (ROW), or other physical constraints. Incorporating rain guardians[2], an inlet pretreatment solution, can further enhance the bioswales performance by simplifying sediment and debris removal to a centralized location within the guardian and preventing sediment and debris from entering sensitive ecosystems. The efficiency of the pretreatment solution is contingent upon regularly scheduled cleanings of the rain guardians throughout the year. Maintenance for rain guardians should be routinely done at least every six months to ensure proper functioning of the bioswales. Regularly inspect all inlets / outlets for blockages, and remove debris, organic material and trash from guardians. Bioswale vegetative maintenance will be similar to rain garden management, by removing invasive / weedy vegetation; watering during the first establishment year; and inspecting for erosion throughout the practice.

Pretreatment Rain Guardian Models include:

- **Bunker:** This model is ideal for residential streets. Its rectangular design makes cleanout and maintenance easy and quick. Designed for garden depths of 12" but can be modified for bioretention practices deeper or shallower (as shown in **Fig 9-1**).
- **Turret:** With a larger internal storage capacity, the Turret is ideal for high traffic uses, such as commercial parking lots or industrial application (as shown in **Fig 9-2**).
- **Foxhole:** This model is ideal for re-routing runoff underneath walkways, bike paths and boulevards, without obstructing traffic-flow (as shown in **Fig 9-3**).

Fig 9-1 Bunker green infrastructure practice, Fig 9-2 Turret green infrastructure practice, Fig 9-3 Artist rendering of a Foxhole green infrastructure practice. All image sources: Rain Guardian

S-4:	**Green Infrastructure: Permeable Pavement**

[2] A Rain Guardian is a precast stormwater pretreatment chamber designed to intercept sediment, debris, and trash before runoff enters the stormwater practice. The chamber can be retrofit or installed into new practices, while allowing for centralized maintenance of debris collection to improve the functionality of stormwater practices.

It is recommended that permeable pavement is a type of green infrastructure that manages stormwater runoff by allowing rainwater to infiltrate through the surface into underlying layers of soil and gravel. These alternative pavements come in multitudes of options that can fit different municipal maintenance requirements, ADA-compliance and infiltration needs. In addition to reducing runoff, permeable pavers can aid in pollutant filtration, reduce the need for road salt, and alleviate construction costs related to conventional drainage improvements. Public permeable pavement installations should be considered within parking lots, walkways and trails, street parking, roadways and overflow parking locations. Installation can also be considered for private driveways. Routine maintenance should be done one to four times a year depending on need and pavement type. Maintenance includes weeding as necessary and vacuum sweeping to prevent clogging, especially in the fall/winter months. In the winter, sand should be avoided as to not clog pervious joints.

Fig 9-4 Interlocking permeable pavers, Source: NPV

Permeable pavement options include, but are not limited to:

- Pervious Concrete
- Interlocking Pavers (As shown in Fig 9-4)
- Plastic Grid Pavers
- Pervious Asphalt

S-5:	**Outfall Retrofits**

It is recommended that outfall retrofits include modifying existing stormwater infrastructure to accommodate new stormwater treatment practices to reduce rainwater velocity, improve infiltration, reduce pollutant and debris loading, control flooding from large rain events, and reduce erosion along banks. Incorporating stormwater treatment practices increases the health of aquatic life, streams and other receiving waterbodies by addressing issues directly at the point of discharge. Several nature-based practices can be constructed but are widely dependent on space available for the practice, level of erosion, and treatment needed.

Nature-Based Stormwater Treatment Practices include:

- **Channel Reshaping**: This solution is ideal if there is enough space to widen the channel for vegetation and there is a need for additional stormwater storage space. Excavate the channel from a “V” to “U” shape with vegetative floodplain benches to provide additional stormwater storage (as shown in **Fig 9-7**).

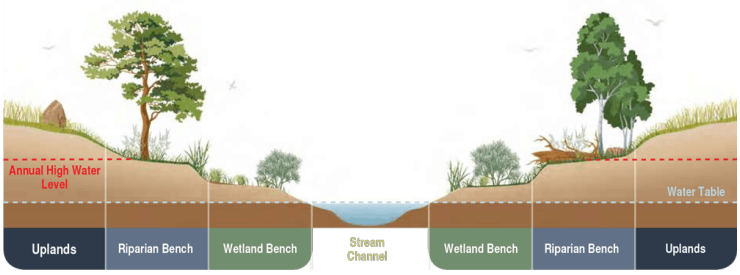


Fig 9-7, Source: Streamhandbook.org

- **Stepped Pool Conveyance System**: This system is ideal for large open areas with steep slopes and high erosion. Engineering a constructed channel reduces high-energy surface flow to low-energy rainwater that can percolate through a series of pools within boulder steps (as shown in **Fig 9-5**).
- **Constructed Wetland**: This solution is ideal for locations where there is standing water and a need for high pollutant removal, especially suspended solids and nitrogen. The subwatersheds of Kensington and Sheets Creek North can benefit from utilizing this practice throughout their subwatersheds. This system utilizes wet-tolerant species to uptake pollutants within a gravel-filled basin before it overflows into the waterbody (as shown in **Fig 9-6**). Specific maintenance includes checking pipes for proper water flow into the vegetative treatment area. Routine inspections of inlets/outlets, banks and sediment forebays are crucial for the performance of the constructed wetland. Vegetative management will include mowing and monitoring for woody, weedy and invasive vegetation within the practice.

Fig 9-5 Stepped Pool Conveyance System: NPV

Fig 9-6 Constructed Wetland ,Source: NPV

It is recommended that outfall stabilization is constructed to protect receiving waterbodies from erosion. Concentrated discharge flows at an outfall can generate high velocities and turbulence that erode channel beds, banks, undermine structures and transport sediment downstream. The following strategies restore reduce stormwater flow and minimizes ongoing erosion.

Outfall Stabilization and Erosion Control include:

- **Rock Revetments:** This solution is ideal for outfalls experiencing erosion at the base with limited space for retrofits.
- **Plunge Pool**: This solution is ideal for reducing high-velocity water discharging from pipe to prevent scouring. It should be utilized with other practices, such as swales, wetland or bioretention areas to increase water quality improvement.
- **Level Spreader**: This solution is ideal for diverting flows into a stable, gentle-to-moderately sloped area. Converts concentrated flows by distributing runoff into a vegetative non-erosive sheet flow.

All outfall retrofits and erosion control measures should be monitored, especially if flooding upstream occurs. During the first year establishment period, the practices should be monitored for erosion and structural integrity of any earthwork, especially after a heavy storm event. Natural erosion control measures, such as jute mesh for vegetative improvements are encouraged as they biodegrade as plant roots are being established. Where bare areas are found, hydroseed or reseed as necessary. Monitor outfall pipes and ensure the structures are clear of debris and properly armored by riprap to dissipate energy.

S-6:	**Pre-Treatment Proprietary Practices**

Proprietary practices are recommended for integration with existing grey practices. These are manufactured systems designed to capture stormwater runoff and remove debris, sediment, and pollutants to provide water quality control before they enter a larger treatment practice downstream. These practices can often be utilized in urban settings with small spaces or as retrofit options for sites that lack the space for green infrastructure practices. All proprietary practices will require regular inspections for sediment removal, filter replacement and debris clearing. Maintenance is dependent on the device type and severity of site conditions, however manufacturer's manuals should be the primary source for maintenance schedules.

NYSDEC Approved Proprietary Practices include:

- **Hydrodynamic systems:** This system incorporates gravity or vortex separators that are ideal for removal of course particles, small drainage areas, and effective in offline configurations.
- **Wet Vaults:** This system utilizes permanent pools that promote settling of particulates. It can be manufactured to fit a variety of water quality volumes or flow rate, sediment capacity, and incorporate bypass.

- **Median Filters:** This system utilizes surface or subsurface practices containing filter beds for the absorption and adsorption of pollutants. A range of media are available for the filter beds to combat specific pollutants from stormwater runoff.
- **Underground Infiltration Systems:** This system incorporates prefabricated pipes and vaults to capture and infiltrate runoff. It is ideal for sites that prioritize space saving.

S-7:	Culvert & Drainage Maintenance

It is recommended that culvert and stormwater drainage systems be regularly inspected, repaired and cleaned to ensure proper drainage and prevent flooding in the event inlets or outlets get blocked. This task should be added to municipal DPW operations who own the culvert or drainage system. Potential environmental concerns of damaged or clogged culverts include discharge of sediment and debris into storm drainage systems or streams. This could alter flows, causing flooding or wash out in roads. Additionally, fish passage can be blocked from debris within inlets.

Maintenance can be done in all weather and should include:

- Removing debris, trash and vegetation from inlets, outlets, and culverts (also recommended in **S-8**)
- Clearing sediment from swales
- Checking for damages, cracks or offset joints
- Repairing damaged passing devices (culverts, siphons, box culverts, catch basins, drop inlets)
- Using backhoe or high-pressured hoses and/or vacuums to clear blockages.

SITE SPECIFIC STORMWATER IMPROVEMENT PROJECTS - SELECTION METHODOLOGY

The overall watershed area was assessed to identify specific stormwater management improvement opportunities utilizing the above described stormwater management techniques. Site-specific projects were identified, and green infrastructure solutions and/or stormwater retrofits were assessed based on various site specific conditions and opportunities to capture stormwater runoff, increase infiltration and provide pollutant load removal from stormwater runoff to key locations within the watershed. Priority was given to areas that included potential point sources of stormwater pollutants (as shown in **Fig 5-4a-c**), coastal risk areas (as shown in **Fig 7-2**), areas vulnerable to sea level rise (as shown in **Fig 7-1**), and areas that were identified as having the highest pollutant loads per **Table 6-2** of the Watershed Characterization Report. Based

on these factors, the analysis of priority stormwater improvement areas identified but were not limited to four key quadrants to focus site-specific stormwater management projects:

1. **Northeastern portion of the watershed** encompassing Sheets Creek N, Sheets Creek E, Mill/Baxter Ponds, and the northern portion of the Stannard's Brook subwatersheds
2. **Eastern portion of the watershed** surrounding Leeds Pond within the Leeds Pond subwatershed
3. **Southern portion of the watershed**, primarily within the Plandome Heights and Whitney Pond subwatersheds, in addition to the southeast portion of Kings Point Creek subwatershed and eastern portion of Kensington subwatershed.
4. **Northwest portion of the watershed**, primarily within the Mitchell Creek subwatershed and surrounding Kings Point Pond.

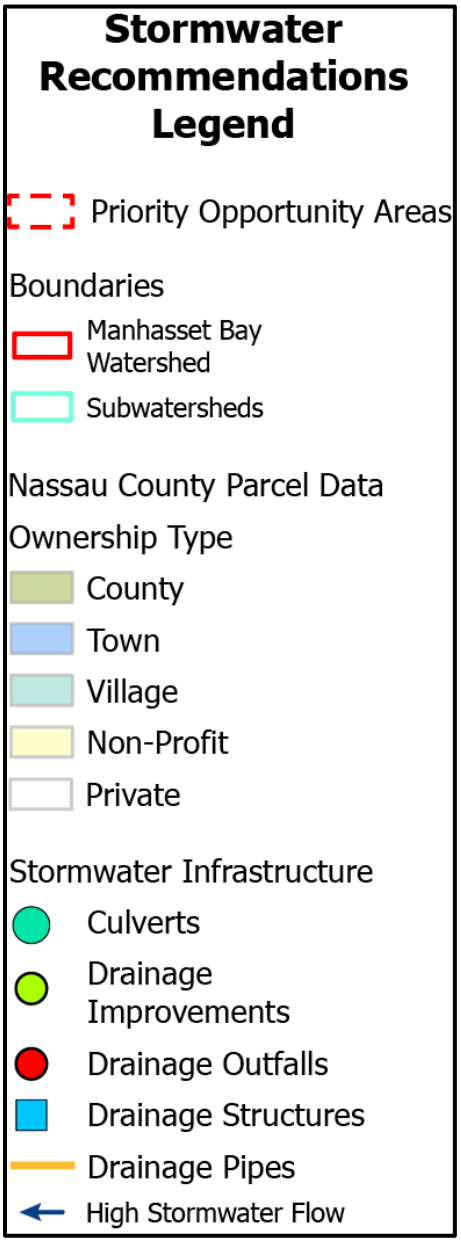
Once the four quadrant focus areas were identified, project areas within these quadrants were selected based on public and the Protection Committee input, a stormwater flow accumulation assessment model, field reconnaissance, and availability of land area to install various potential stormwater management improvements options. The stormwater flow accumulation model is a Geographic Information System (GIS) based modeling software that uses the 1 -foot Digital Elevation Model (DEM) mapping and land use data from NY State GIS data[3] to model stormwater contributing areas, direction and the amount of stormwater runoff generated and the peak stormwater discharge locations to areas/surface waters within the various subwatersheds. The flow accumulation model then maps a hierarchy of the stormwater tributary flows using the stream order function[4]. The model identifies the most significant areas of stormwater accumulation and flow, which was then used to prioritize areas in greatest need of stormwater management improvements. The stormflow accumulation analysis was completed for the entire watershed, which ensures that key stormwater improvement areas (areas with the greatest potential to capture significant quantities of stormwater runoff) are targeted, as these represent the greatest opportunities for pollution load reduction to the Bay and its contributing surface waters. The flow accumulation model is provided in **Appendix G**. This information was utilized in conjunction with mapping of existing stormwater drainage infrastructure to determine what areas were most suitable for potential green infrastructure or retrofit improvement projects. Potential improvement projects were also focused in locations based on the availability of publicly owned land and public road or drainage right of ways. Maintenance of existing structures and green infrastructure practices are encouraged as primary recommendation types, although

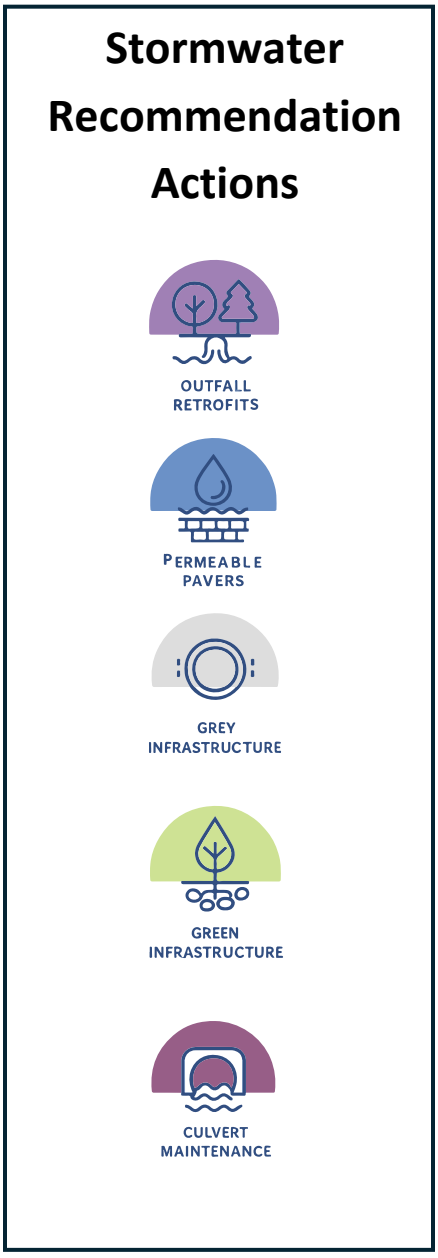
[3] NPV completed a flow accumulation analysis using the land use, LiDAR topography, and stormwater outfall data (outlined in the Watershed Characterization Section of this report).

[4] Stream order creates a hierarchy of stormwater flow by assigning a numeric value to the stormwater flow paths and classifies the stormwater flows based on the amount of accumulation from the surrounding contributing areas.

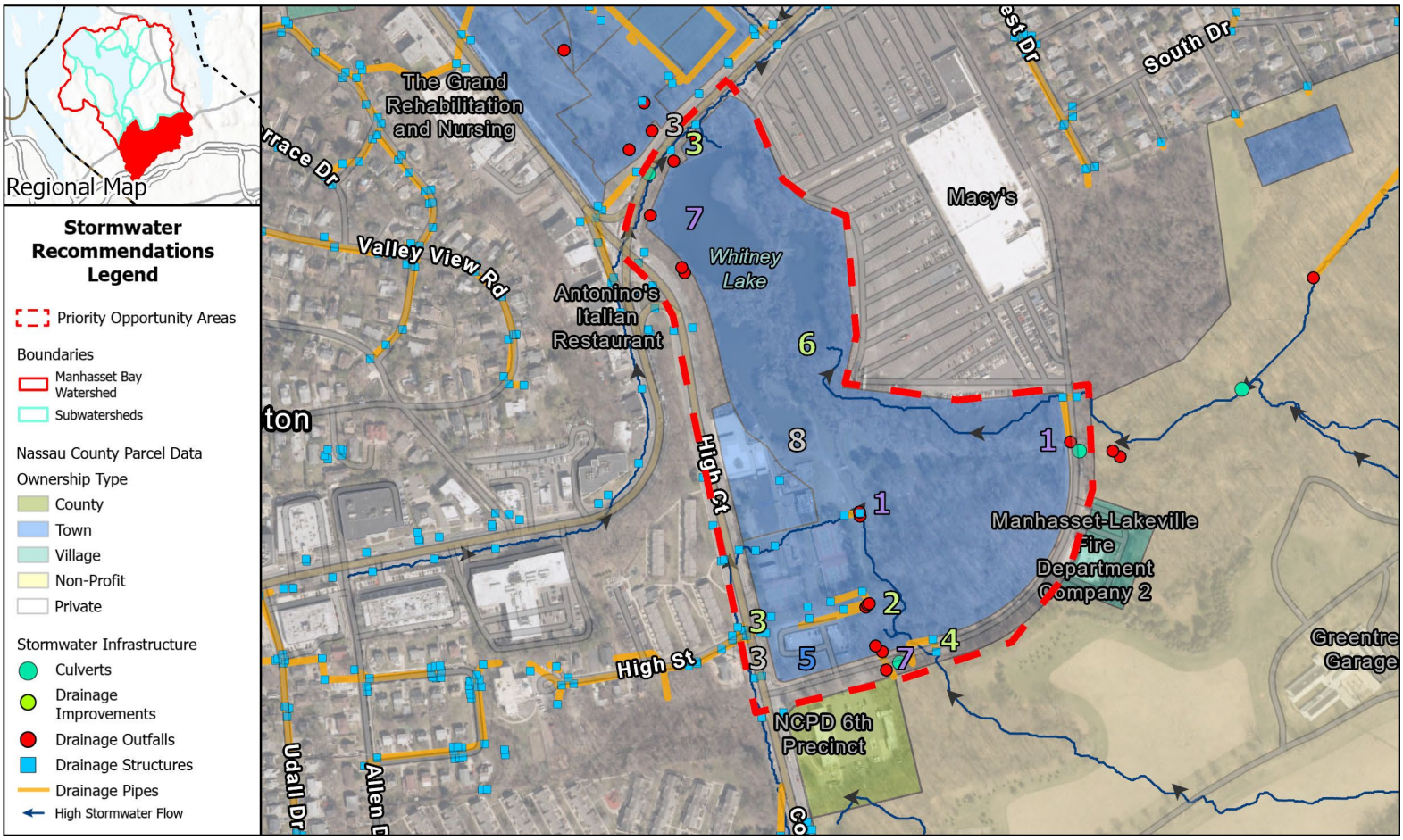
grey infrastructure is recommended where green infrastructure is not appropriate due to space availability constraints within public land and right-of-ways.

The identified specific stormwater improvement project locations are described below. Each opportunity area is described below, including the key issues for the area, specific stormwater improvement project opportunities (both short term and long term), project benefits and the estimated costs associated with the specific project recommendations. Symbols representing the types of potential stormwater management opportunities (described in detail above) are provided for each location for easy reference. A key map is provided for each location, and a project specific figure is provided for each location that identifies the publicly owned lands, existing drainage infrastructure, tax parcel outlines and stormwater flow accumulation directional arrows. The legend below is applicable to all the site-specific projects presented below:





Project ID: S-8	Priority: High	Cost: $, $$
Subwatershed: Whitney Pond	**Location:** Whitney Pond/Whitney Pond Park	



Key Issues:

Stormwater runoff from roadways, commercial buildings and parking areas contributing pollutants either directly to Whitney Pond from outfall(s) or via overland flow, minimal stormwater pre-treatment or buffers around the Pond. Large commercial land-uses such as Macy's are in close proximity to the Pond with little stormwater management.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

OUTFALL RETROFITS

1. Install native vegetative buffers by converting lawn to unfertilized native meadows within the Whitney Pond Park to reduce nitrogen/pathogen inputs from geese/waterfowl and improve pollutant removal before entering the waterbody. $ (Installation, Short-term). See **S-2** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

GREEN INFRASTRUCTURE

2. Install rain gardens/bioswales within Whitney Pond Park and around the parking lot, roadsides, and buildings that outfall to Whitney Pond. $$ (Installation, Short-term). See **S-1/S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

GREY INFRASTRUCTURE

3. Install bioretention basins and additional leaching structures along right-of-ways to intercept stormwater runoff from commercial land uses and large parking lots $$ (Installation, Short-term). See **S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
4. Install bioswales along Community Drive E to intercept and treat stormwater prior to storm drains that connect to outfalls to Whitney Pond. $$ (Installation, Short-term). See **S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

PERMEABLE PAVERS

5. Install permeable pavement or green infrastructure/infiltration practices for nearby parking lots. $$ (Construction, Mid-term). See **S-4** for maintenance guidance. $/Year (Maintenance, Long-term).
6. Evaluate the need for streambank stabilization and additional shade tree installation. $$ (Construction, Mid-term)

7. Regularly repair and clean out outfalls into Whitney Pond (sediment and vegetation removal). $/Year (Initial maintenance, Short-term), See **S-7** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
8. Evaluate feasibility of in-stream solutions through a subwatershed/engineering study of the Whitney Pond subwatershed. $ (Feasibility, Mid-term), $$$ (Implementation, Long-term)

Benefits:

- Increase infiltration and reduce pollutant loading (nitrogen, pathogens, sediment, chlorides, metals) from stormwater
- Improve buffers and shading around the Pond, reducing temperature, sediment inputs and summer algal blooms.
- Reduce flood risks and extend life of infrastructure through regular maintenance

Project ID: S-9	Priority: High	Cost: $, $$
Subwatershed: Leeds Pond	**Location:** Science Museum of LI and governing municipalities	

Key Issues:
Clogged stormwater drainage systems, invasive phragmites along the perimeter of Leeds Pond, direct stormwater discharges from a N. Hempstead Golf Course outfall. Surface runoff from nearby streets, especially Stonytown Road.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

CULVERT MAINTENANCE

GREEN INFRASTRUCTURE

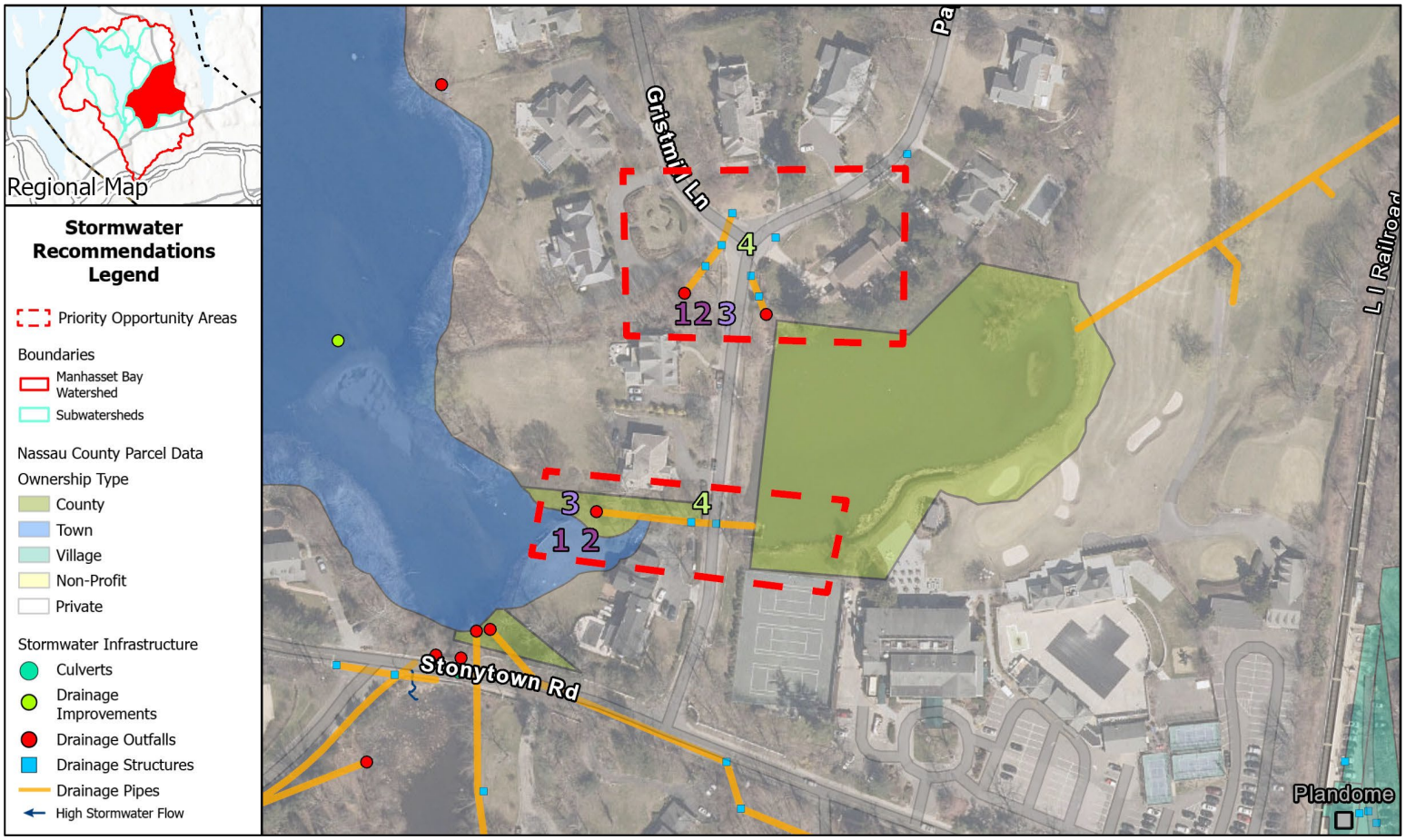
1. Clean out stormwater drains and culverts (sediment and vegetation removal). $/Year (Initial maintenance, Short-term), See **S-7** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
2. Removal of phragmites / invasive vegetation along the streambank and replant with native vegetation to restore vistas, enhanced habitat function, stabilize shorelines from erosion and reduce sedimentation of the stream, and provide shade. $ (Installation, Short-term). See **S-2** for maintenance/monitoring guidance. $/Year (Maintenance, Short-term)
3. Increase the width/vegetation density of the buffer at the southwest corner of Plandome Country Club, along the pond's edge. $ (Installation, Short-term). See **S-2** for maintenance / monitoring guidance. $/Year (Maintenance, Short-term)
4. Add bioretention practices along the roadsides at Plandome Rd, Stonytown Rd., and Rockhollow Rd. to provide pollutant load removal prior to discharges (marked in Purple). $$ (Installation, Mid-term). See **S-3** for maintenance/monitoring guidance. $/Year (M -Long-term).
5. Conduct a subwatershed/engineering study of the Leeds Pond watershed. $ (Feasibility, Mid-term), $$$ (Implementation, Long-term)

Benefits:

6. Increase infiltration and reduce pollutant loading from stormwater, particularly nitrogen/pathogens from fertilizers and waterfowl and sediment/chlorides/metals from roadways and parking lots.

- Improve buffers and shading around the Pond, reducing temperature, sediment inputs and summer algal blooms.

Project ID: S-10	Priority: High	Cost: $, $$
Subwatershed: Leeds Pond	**Location:** Gristmill Ln & Papermill Dr	



Key Issues:
Blocked culvert, causing flooding and limiting proper waterflow and flushing of Leeds Pond to the Bay.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

CULVERT MAINTENANCE

OUTFALL RETROFITS

GREEN INFRASTRUCTURE

1. Clean culvert's inlet and outlet as well as Gristmill ln and Papermill Rd outfalls to restore function and check for damages along drainage pipe. Repair as necessary and install a more substantial filtration system, as the current system is a chain link fence. $ (Initial maintenance, Short-term). See **S-7** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
2. Evaluate the extent of floatables and debris clogging inlet, and install culvert sediment traps or debris deflector inlet, dependent on debris type, to prevent build-up and prioritize regular maintenance/debris removal. $ (Construction, Short-term). See **S-7** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
3. Install stabilized rock revetment to prevent erosion. $ (Construction, Short-term). See **S-5** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
4. Install bioswales/rain gardens/infiltration practices or proprietary filter inserts along ROW/public lands prior to existing directly discharging drainage infrastructure. $$ (Construction, Mid-term). See **S-1/3/6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term

Benefits:

- Reduce stormwater backup and flooding occurring to the east.
- Prevent future debris/vegetation build-up with proper inlet retrofit options and regular maintenance.
- Improve water quality through improved water flow and removal of debris/trash/sediment within Leed's Pond.
- Capture excess rainwater and debris/trash improves drainage system functionality and reduces the amount of debris and trash entering drainage systems, the Pond and ultimately the Bay.

Project ID: S-11	Priority: High	Cost: $, $$
Subwatershed: Mill/Baxter Ponds	**Location:** Main Street, Sunset Park	

Key Issues:
Plastic litter being carried through stormwater conveyance systems, resulting in discharges to the Bay and surrounding waterfronts.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

GREY INFRASTRUCTURE

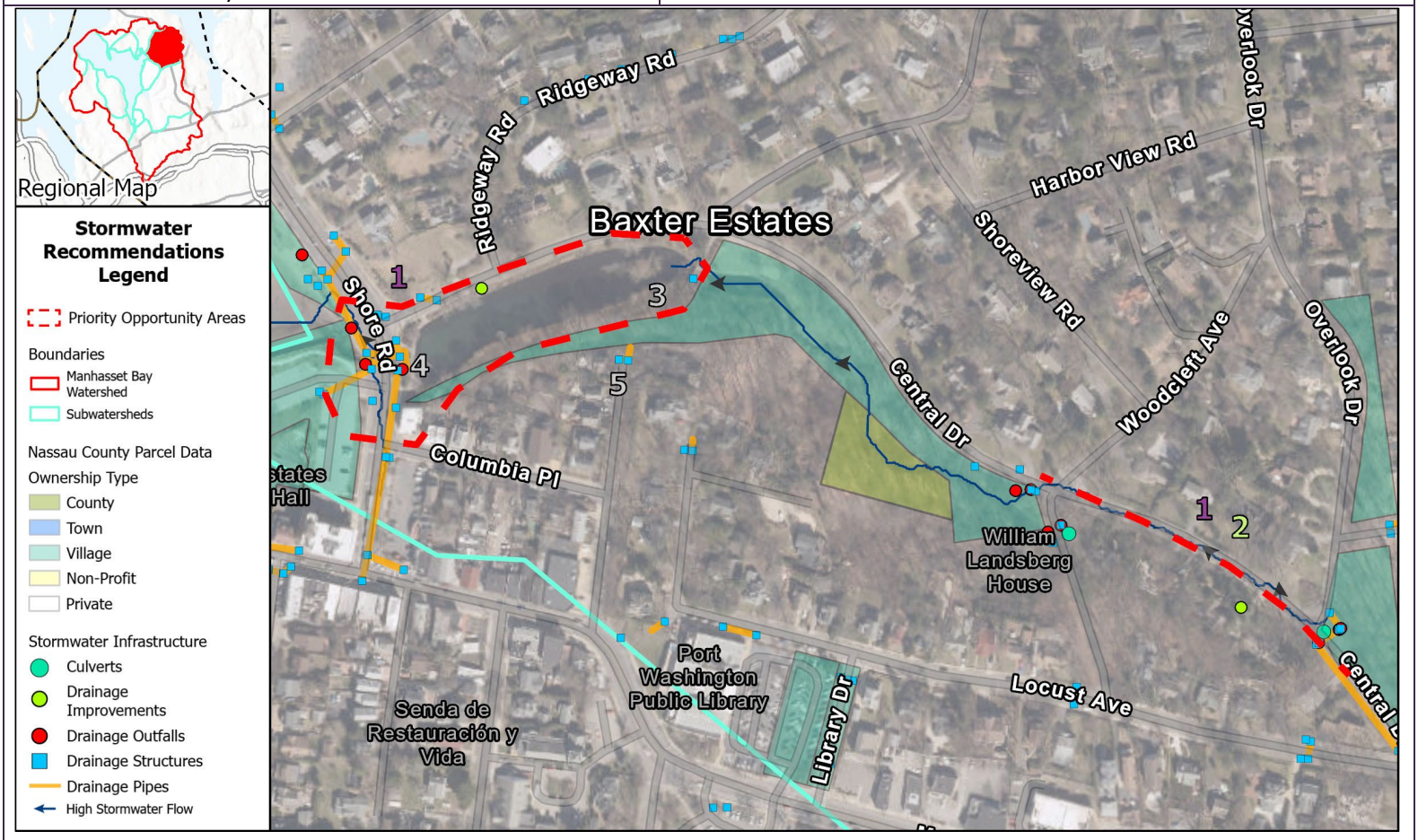
GREEN INFRASTRUCTURE

1. Install Bandalong-style litter traps, new trash receptacles that better secure trash, maintain and regularly empty the receptacles, and launch a signage/public education campaign. $ (Construction, Short-term), $/Year (Maintenance, Long-term)
2. Install hydrodynamic separators in stormwater drainage system connected to outfalls. $$ (Construction, Mid-term). See **S-6** for maintenance guidance. $/Year (Maintenance, Long-term)
3. Install green infrastructure practices within Sunset Park along Main Street to divert runoff from catch basins attached to outfall. $$ (Construction, Mid-term). See **S-1** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

Benefits:

- Provide public awareness to the issue of litter collection within the bay and public spaces.
- Improve water quality through the utilization of systems that can be retrofit into existing drainage systems.
- Prevent future debris/vegetation build-up with proper inlet retrofit options and regular maintenance.
- Improve water quality through improved water flow and removal of debris/trash/sediment from Ponds.
- Capture excess rainwater and debris/trash improves drainage system functionality and reduces the amount of debris and trash entering drainage systems, the Pond and ultimately the Bay.

Project ID: S-12	Priority: High	Cost: $, $$
Subwatershed: Mill/Baxter Ponds	**Location:** Baxter Pond	



Key Issues:

Floatables on beaches and clogged stormwater inlet grates/collection systems discharging to both Mill and Baxter Ponds.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

CULVERT MAINTENANCE

1. Coordinate with Nassau County and the Village of Baxter Estates to remove sediment/trash/floatables and regularly maintain stormwater infrastructure. See **S-7** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

GREEN INFRASTRUCTURE

2. Green infrastructure with rain guardians along Central Drive, as space allows, to collect debris before reaching catch basins. $$ (Construction, Mid-term). See **S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
3. Retain debris dragged by stormwater from Baxter Creek, using methods such as an upstream dam. $$$ (Construction, Mid-term). $/Year (Maintenance, Long-term)

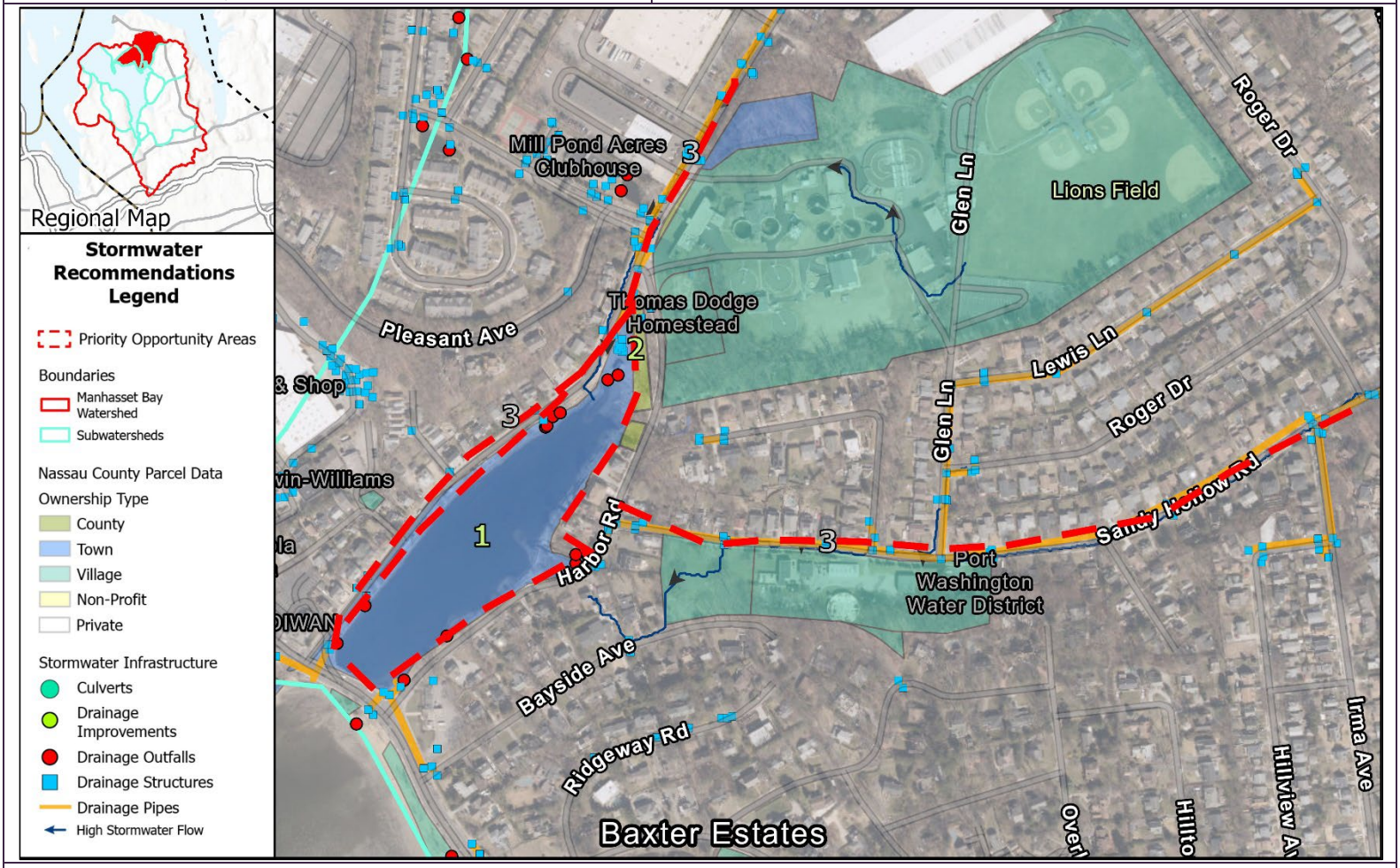
GREY INFRASTRUCTURE

4. Reshape the "stepped pool" Baxter Pond outfall to balance reducing stormwater erosion and minimizing low tide pools. $$ (Construction, Mid-term). $/Year (Maintenance, Long-term)
5. Replace the storm catch basin system at the north end of high street. $ (Construction, Short-term). See **S-7** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

Benefits:

- Improve water quality through the removal of debris and trash within Baxter Pond.
- Reduce the load of drainage systems and probability of debris and trash floating into inlets, by capturing excess rainwater and debris. of debris and trash entering drainage systems, the Pond and ultimately the Bay.
- Prevent future debris/vegetation build-up with proper retrofit options and regular maintenance.
- Create stable environments to reduce fish entrapment/kill during low tide pools in Baxter Pond's outfall.

Project ID: S-13	Priority: High	Cost: $, $$
Subwatershed: Mill/Baxter Pond	**Location:** Mill Pond Park	



Key Issues:
Large amounts of plastic and metal trash entering Mill Pond and invasive species surrounding the pond's edge.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

GREEN INFRASTRUCTURE

1. Remove invasive species and revegetate with native wetland species. $ (Installation, Short-term). See **S-2** for maintenance/monitoring guidance. $/Year (Maintenance, Short-term)
2. Divert stormwater from Sandy Hollow Rd. and Harbor Rd. into rain gardens/bioswales with rain guardians at the open space northeast/east side of Mill Pond. $$ (Construction, Mid-term). See **S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

GREY INFRASTRUCTURE

3. Retrofit stormwater systems within Harbor Rd. and Sandy Hollow Rd. with hydrodynamic separators or drainage inlet media filters to remove pollutants from upland residential, park and commercial land uses. $$ (Construction, Mid-term). See **S-6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

Benefits:

- Improve water quality through the removal of debris and trash within Mill Pond.
- Increased infiltration and reduction of pollutant loads in stormwater runoff from upland residential and commercial land uses and roadways.
- An outfall water quality study will provide data to support future projects related to nutrient and contamination inputs from stormwater runoff after storm events.

Project ID: S-14	Priority: High	Cost: $, $$, $$$
Subwatershed: Sheets Creek N/E	**Location:** Manorhaven Coastline / Sheets Creek	

Key Issues:

Foul odors, algal blooms, high bacteria counts, and loss of tidal wetlands vegetation (spartina) due to stormwater impacts, illicit discharges and shoreline erosion. High coastal risk in Sheets Creek.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

GREEN INFRASTRUCTURE

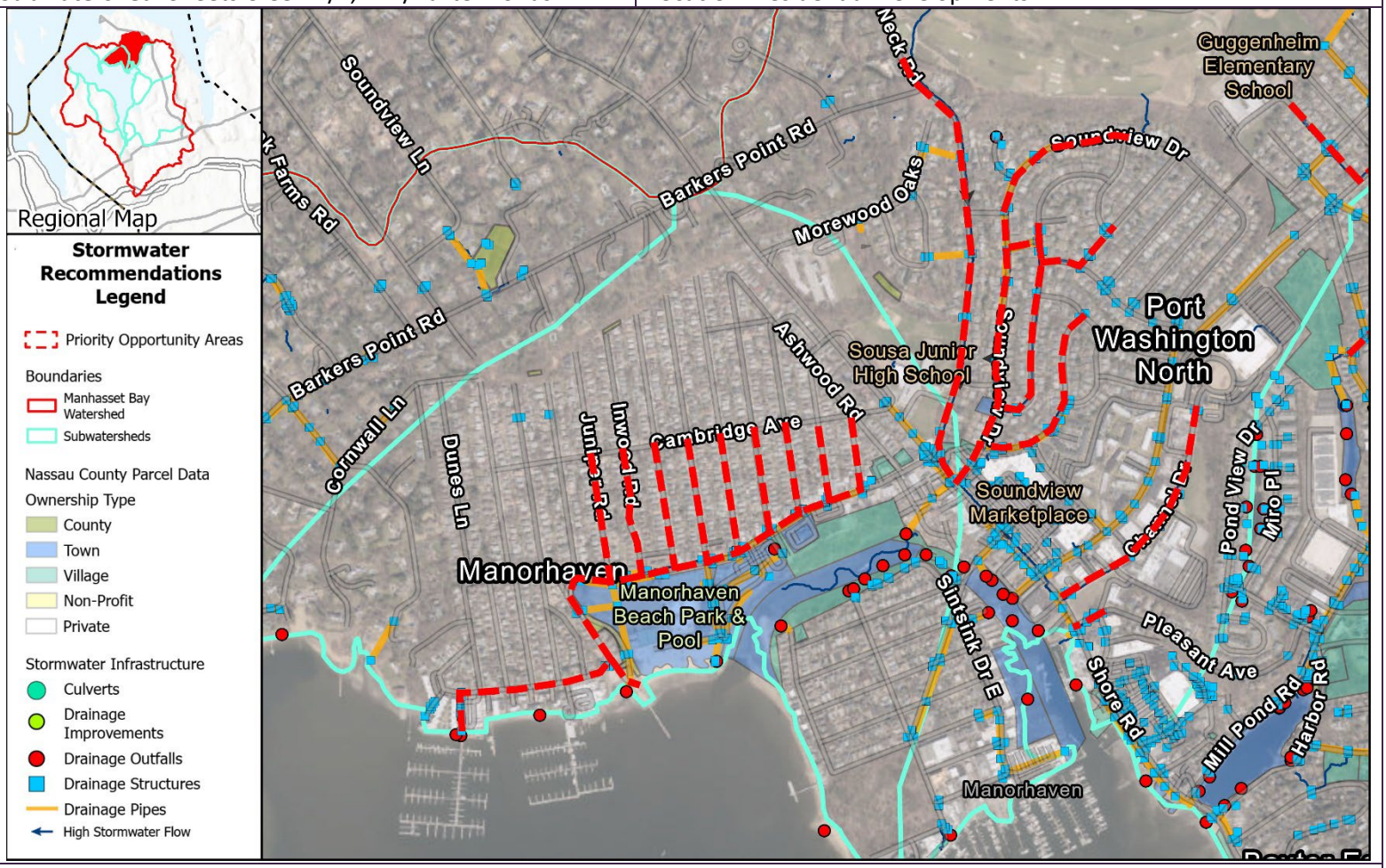
OUTFALL RETROFITS

1. Promote property owner/municipal best management practices (BMPs) (reducing fertilizer/pesticide use on lawn areas, educating the public on sustainable lawn maintenance and alternative landscapes, wetland buffers, native lawn alternatives; this connects with Recommendation O-1). $ (Short-term)
2. Complete regular outfall screening/illicit discharge detection; enhance enforcement of illicit discharges from adjacent/nearby commercial uses that directly discharge/overflow to municipal drainage systems. $ (Short-term)
3. Investigate the feasibility of mussel mats within Creek. $$ (Installation, Long-term), $/Year (Maintenance, Long-term)
4. Install end of street rain gardens, remove invasive phragmites from adjacent wetlands/sediment basin on the east end of Sheets Creek and revegetate/stabilize shoreline areas with spartina/native species. $$$ (Installation, Long-term). See **S-1/2** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
5. Install additional green infrastructure within parking lots adjacent to Sheets Creek. $-$$ (Installation, Long-term). See **S-1** for maintenance/monitoring guidance.
6. Wetland/shoreline restoration at Sagamore Hill Dr. and Sintsink Dr. E & W street ends. $-$$ (Installation, Long-term). See **S-2** for maintenance/monitoring guidance. $/Year (Maintenance, Short-term)
7. Conduct continuous water quality sampling at significant outfalls. $/Year (Long-term)

Benefits:

- Reduce pollutant loads, improve infiltration, and flood and erosion control.
- Increase climate resilience.
- Increase community engagement/stewardship.

Project ID: S-15	Priority: High	Cost: $$$
Subwatershed: Sheets Creek N/E, Mill/Baxter Ponds	**Location:** Residential Developments	



Key Issues:

Stormwater runoff, legacy high density/high impervious lot coverage, fertilizer/pesticide use, waterfowl/pet waste management, floatable debris, illicit discharges, and skeet shooting debris (associated with various clubs on the Bay).

Project Description/Action (Cost Per Recommendation): *The numbered project descriptions shown below apply to all priority opportunity areas shown on the map above.*

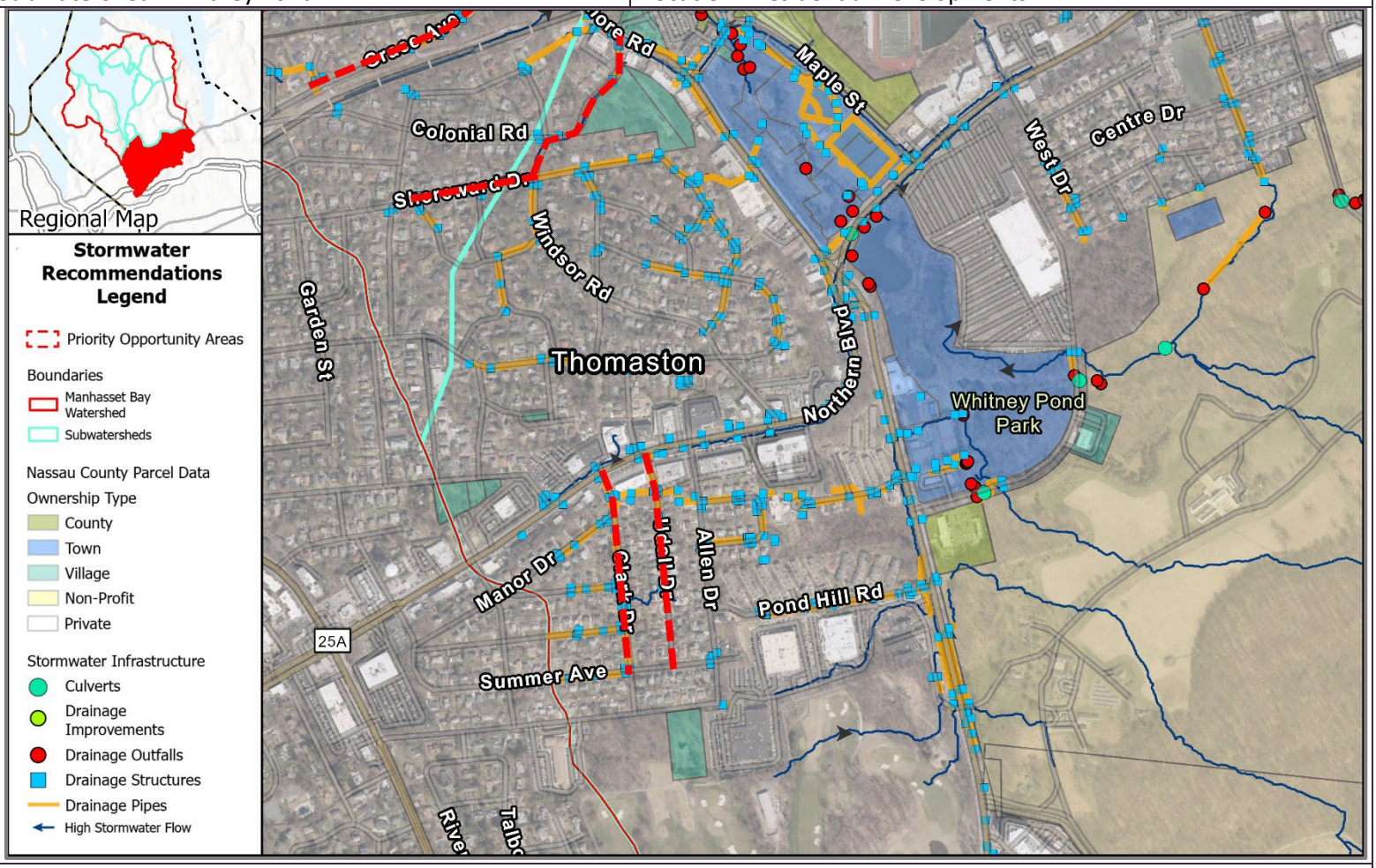
GREEN INFRASTRUCTURE

1. Create rain gardens and bioswales along rights-of-way where possible, or retrofit existing drainage systems with off-line hydrodynamic separators/media filter inlet inserts in above identified commercial and residential areas that directly discharge into Manhasset Bay. $-$$$ (Installation, Long-term). See **S-1/3/6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
2. Promote property owner/municipal BMPs (reducing fertilizer/pesticide use on lawn areas, educating the public on sustainable lawn maintenance and alternative landscapes, wetland buffers, native lawn alternatives). $ (Short-term)
3. Create and distribute educational materials to landscapers and landowners about the importance of proper fertilization practices and their effect on water quality. This recommendation links to Recommendations **P-7** and **O-1**. $ (Short-term)
4. Encourage volunteer cleanups along the shorelines, especially through yacht club youth clubs. $ (Short-term)
5. Continue and, where possible, expand programs such as the Town's Rain Barrel Program and others to capture rainwater from residences and other properties. $ (Short-term)

Benefits:

- Reduce pollutant loads, improve infiltration, and increase flood and erosion control
- Increase climate resilience through community engagement/stewardship programs. Support community awareness of water quality within their subwatershed.

Project ID: S-16	Priority: High	Cost: $$$
Subwatershed: Whitney Pond	**Location:** Residential Developments	



Key Issues:

Stormwater runoff, legacy high density/high impervious lot coverage, fertilizer/pesticide use, waterfowl/pet waste management, floatable debris and illicit discharges.

Project Description/Action (Cost Per Recommendation): *The numbered project descriptions shown below apply to all priority opportunity areas shown on the map above.*

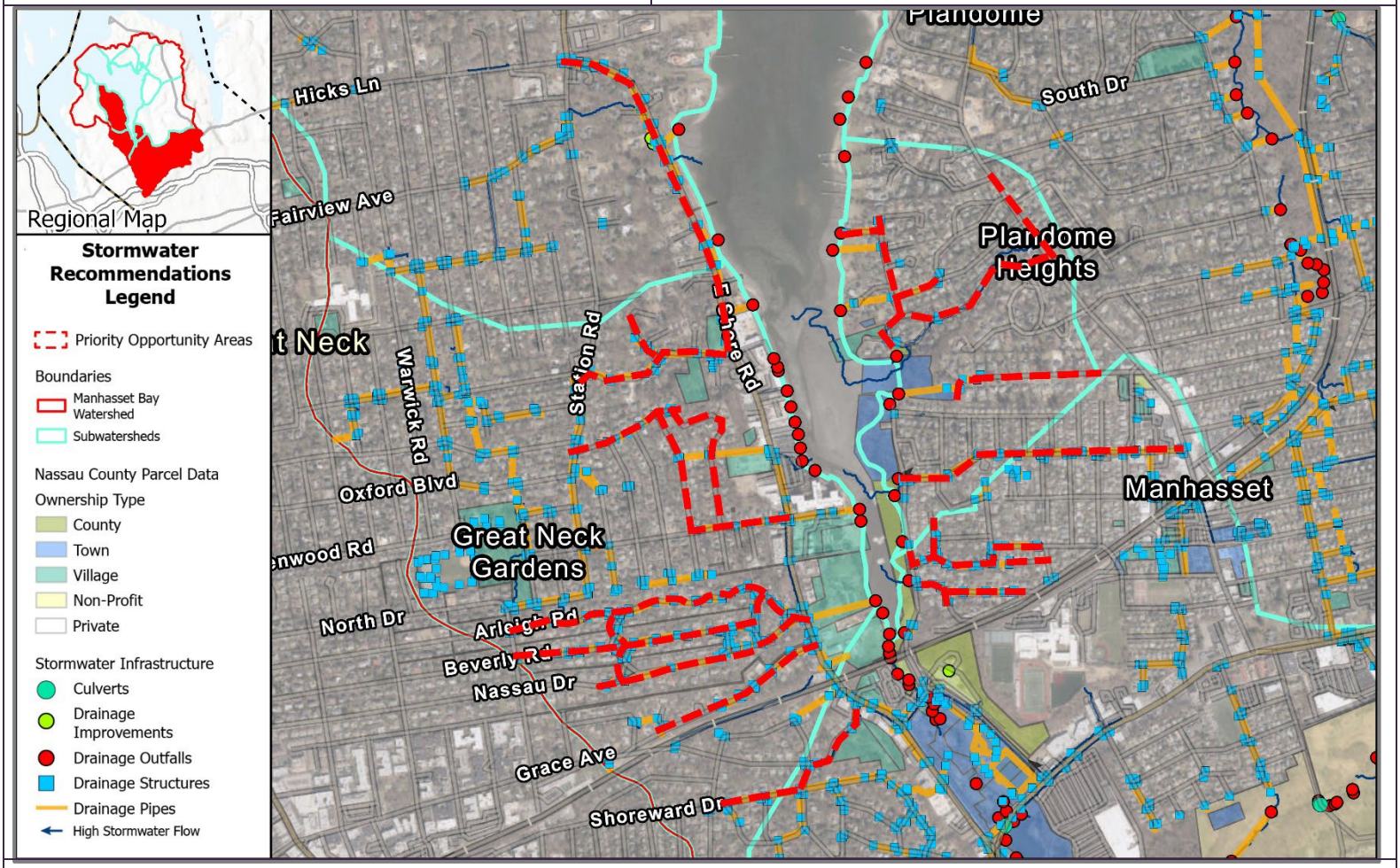
GREEN INFRASTRUCTURE

1. Create rain gardens and bioswales along right-of-ways where possible, or retrofit existing drainage systems with off-line hydrodynamic separators/media filter inlet inserts in the above identified residential and commercial/industrial uses (including Mt. Olive Former LILCO/Hortonsphere site). $$$ (Installation, Long-term). See **S-1/3/6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
2. Promote property owner/municipal BMPs (reducing fertilizer/pesticide use on lawn areas, educating the public on sustainable lawn maintenance and alternative landscapes, wetland buffers, native lawn alternatives). $ (Short-term)
3. Create and distribute educational materials to landscapers and landowners about the importance of proper fertilization practices and their effect on water quality. This recommendation links to Recommendations **P-7** and **O-1**. $ (Short-term)
4. Encourage volunteer cleanups along the shorelines, especially through yacht club youth clubs. $ (Short-term)
5. Continue and, where possible, expand programs such as the Town's Rain Barrel Program and others to capture rainwater from residences and other properties. $ (Short-term)

Benefits:

- Reduce pollutant loads, improve infiltration, and increase flood and erosion control
- Increase climate resilience through community engagement/stewardship programs. Support community awareness of water quality within their subwatershed.

Project ID: S-17	Priority: High	Cost: $$$
Subwatershed: Plandome Heights, Kensington, Whitney Pond?	**Location:** Residential Developments	



Key Issues:
Stormwater runoff, legacy high density/high impervious lot coverage, fertilizer/pesticide use, waterfowl/pet waste management, floatable debris and illicit discharges.

Project Description/Action (Cost Per Recommendation): *The numbered project descriptions shown below apply to all priority opportunity areas shown on the map above.*

GREEN INFRASTRUCTURE

1. Create rain gardens and bioswales along right-of-way's where possible, or retrofit existing drainage systems with off-line hydrodynamic separators/media filter inlet inserts in the above identified residential and commercial/industrial uses. $-$$$ (Installation, Long-term). See **S-1/3/6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
1. Promote property owner/municipal BMPs (reducing fertilizer/pesticide use on lawn areas, educating the public on sustainable lawn maintenance and alternative landscapes, wetland buffers, native lawn alternatives). $ (Short-term
2. Install a vegetative or concrete curb and/or shoulder to act as an erosion control buffer along problematic roadways to prevent uncontrolled runoff gullies along the wooded/vegetated areas along the eastern shoreline.
   Install retention chambers or sediment traps at stormwater outfalls. $ (Short-term). See **S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
3. Create and distribute educational materials to landscapers and landowners about the importance of proper fertilization practices and their effect on water quality. This recommendation links to Recommendations **P-7** and **O-1**. $ (Short-term)
4. Encourage volunteer cleanups along the shorelines, especially through yacht club youth clubs. $ (Short-term)
5. Continue and, where possible, expand programs such as the Town's Rain Barrel Program and others to capture rainwater from residences and other properties. $ (Short-term)

Benefits:
- Reduce pollutant loads, improve infiltration, and increase flood and erosion control

- Increase climate resilience through community engagement/stewardship programs. Support community awareness of water quality within their subwatershed.

Project ID: S-18	Priority: High	Cost: $$$
Subwatershed: Kings Point Creek, Mitchell Creek, Kings Point Pond	**Location:** Residential Streets	

Key Issues:

Stormwater runoff, legacy high density/high impervious lot coverage, fertilizer/pesticide use, waterfowl/pet waste management, floatable debris and illicit discharges.

Project Description/Action (Cost Per Recommendation): *The numbered project descriptions shown below apply to all priority opportunity areas shown on the map above.*

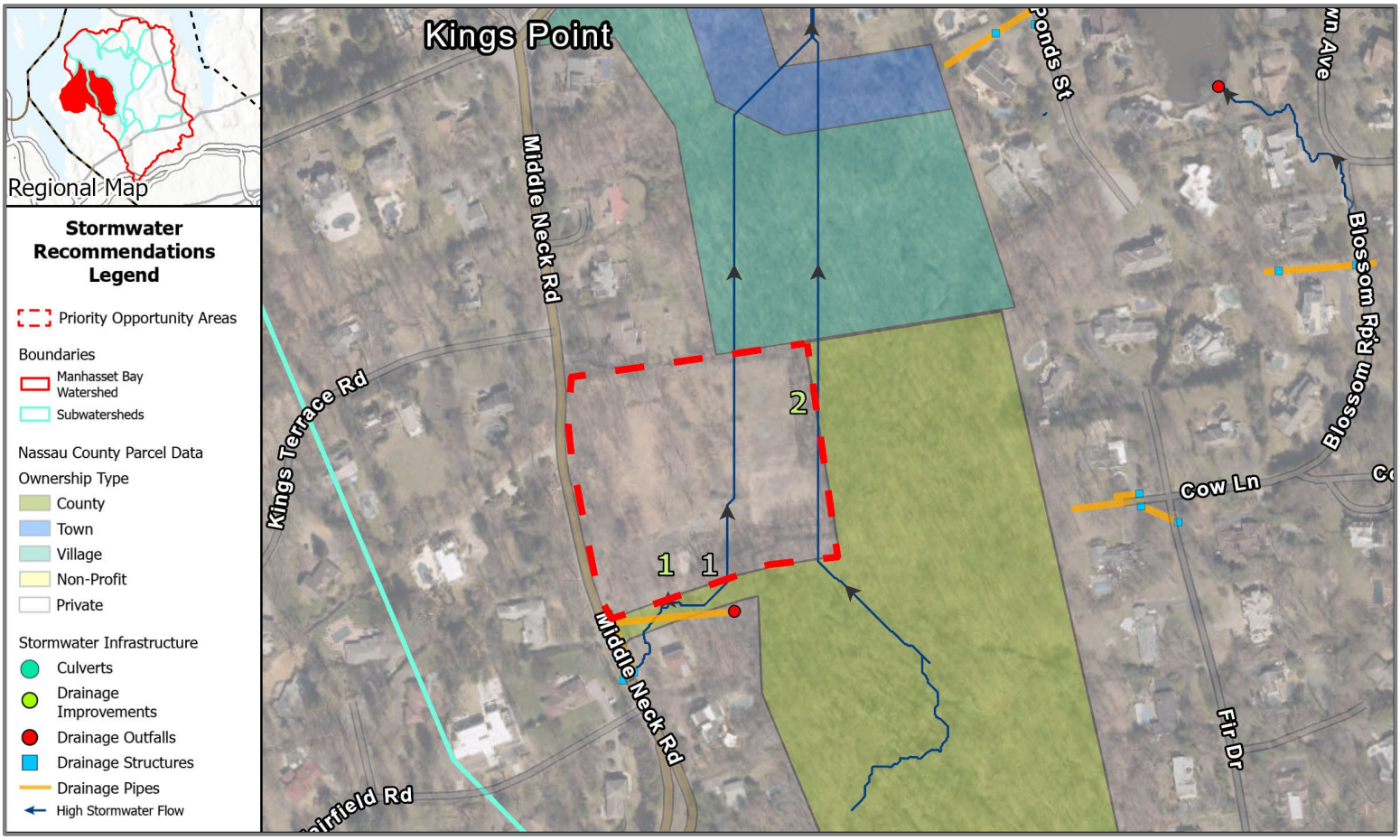
GREEN INFRASTRUCTURE

1. Create rain gardens and bioswales along right-of-ways where possible, or retrofit existing drainage systems with off-line hydrodynamic separators/media filter inlet inserts in the above identified residential and commercial uses and in streets with drainage infrastructure that discharges into Kings Point Park/public lands/wetlands. $-$$$ (Installation, Long-term). See **S-1/3/6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term
2. Promote property owner/municipal BMPs (reducing fertilizer/pesticide use on lawn areas, educating the public on sustainable lawn maintenance and alternative landscapes, wetland buffers, native lawn alternatives). $ (Short-term)
3. Create and distribute educational materials to landscapers and landowners about the importance of proper fertilization practices and their effect on water quality. This recommendation links to Recommendations **P-7** and **O-1**. $ (Short-term)
4. Encourage volunteer cleanups along the shorelines, especially through yacht club youth clubs. $ (Short-term)
5. Continue and, where possible, expand programs such as the Town's Rain Barrel Program and others to capture rainwater from residences and other properties. $ (Short-term)

Benefits:

- Reduce pollutant loads, improve infiltration, and increase flood and erosion control
- Increase climate resilience through community engagement/stewardship programs. Support community awareness of water quality within their subwatershed.

Project ID: S-19	Priority: High	Cost:$$$
Subwatershed: Kings Point Creek, Mitchell Creek	**Location:**Wildwood Village Parkland	



Key Issues:

Invasive Phragmites surrounding the wetlands within the Wildwood parcel. Stormwater runoff from former tennis courts and parking areas contributing pollutants directly into the wetlands within the parkland via overland flow.

Project Description/Action (Cost Per Recommendation):

GREEN INFRASTRUCTURE

1. Create bioretention practices and additional leaching structures (if necessary) in and around the proposed parking lot improvement to collect stormwater that will overflow into the Southeastern wetlands within Wildwood Village Parkland. $$ (Installation, Short-term). See **S-3/6** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)
2. Install native vegetative buffers by converting lawn areas to unfertilized native meadows within the proposed Wildwood Village Parkland to reduce runoff into the wetlands on the Western edge of the property. $$ (Installation, Short-term). See **S-3** for maintenance/monitoring guidance. $/Year (Maintenance, Long-term)

Benefits:

- Increase infiltration and reduce pollutant loading from stormwater, particularly sediment/chlorides/metals from roadways and parking lots.
- Improve buffers and shading around the wetland, reducing temperature, sediment inputs.

1.4 Municipal Facilities Recommendations (M)

The following recommendations pertain to good housekeeping at municipal facilities throughout the Manhasset Bay watershed area, which can be a source of contamination due to common maintenance practices, storage and handling of potentially hazardous materials (fuel, fertilizers and pesticides, road salt, large trucks and snow removal equipment, etc.).

M-1	**Complete a GIS-Based Mapping of the Stormwater Management System and Contributing Areas to the MS4 System.**

It is recommended that a partner or partners, yet to be identified, complete a GIS-based mapping of the entire stormwater management system and contributing areas throughout the entire watershed. The NYSDEC MS4 Permit requirements include mapping of all outfalls and associated drainage infrastructure with the storm sewershed (or the catchment area that drains into the storm sewer system based on the surface topography and pipe connections in the area served by the stormsewer). Mapping and updating the stormwater system through the entire watershed using ArcGIS provides a means to maintain and update information associated with the stormwater infrastructure, including tracking systems for maintenance (i.e., which catch basin has been cleaned out, the frequency of cleanings needed, establishment of a regular maintenance schedule, outfall monitoring and sampling). This tracking system would also aid in prioritization of drainage system cleanouts, repairs and replacements, regular monitoring of green infrastructure to ensure vegetation is well established and sediment is removed, and monitoring of structural water quality treatment systems that may require periodic filter replacement or cleaning), as well as help prioritize areas for street sweeping based on the frequency of necessary drainage cleaning.

It is important to note that all stormwater management systems require maintenance to ensure the practices are properly functioning. GIS is an excellent tool to keep mapping updated and track information such as frequency of inspections and maintenance of the systems. Oftentimes drainage improvements are installed and the mapping is not updated, so knowledge of such systems may disappear with changes in personnel. It is important for the municipalities to keep stormwater system mapping up to date and for the mapping to be used by highway and maintenance staff. This would ensure that maintenance personnel are aware of the locations of specific stormwater practices and are fully informed regarding the specific maintenance requirements of the stormwater practice (i.e., maintenance personnel know the locations of all systems with water quality treatment inserts and when such inserts need to be changed; know the location of bioretention areas and so vegetation is properly maintained, etc.).

M-2	**Provide Training for Municipal Maintenance Personnel Regarding Stormwater Runoff and Water Pollution, Hazardous Materials Handling, Illicit Discharge Detection and Best Management Practices.**

This recommendation is for a comprehensive training program for municipal maintenance personnel throughout all the Committee's municipal members. This recommendation may be undertaken municipality-by-municipality or could be coordinated by a single partner. Continue education of municipal maintenance personnel on municipal best management practices and the provisions in the municipal Stormwater Management Program Plan. Basic understanding by all maintenance employees of the need and benefits of regular maintenance of storm drains and how stormwater can carry harmful pollutants to surface waters is a critical component of effective watershed management. Regular maintenance and sediment removal from stormwater drains (which accumulate debris, metals, and other pollutants) can have a beneficial effect on water quality improvement. Additionally, if maintenance personnel understand best management practices for hazardous materials storage and handling (for everyday practices such as vehicle fueling, vehicle maintenance, pesticide and fertilizer applications and storage and storm drain cleaning as indicated in the stormwater program), it can significantly reduce pollutants carried in stormwater from municipal operations.

M-3	**Provide Designated Areas in Municipal Facilities (DPW Yards, Police and Fire Stations, Vehicle Storage Yards, etc.) for Washing of Vehicles with Proper Filtration and Drainage to Prevent Toxic or Hazardous Materials from Entering the Watershed.**

It is recommended that each municipal member provide designated areas in their municipal facilities for vehicle washing. Control of vehicle wash areas is a requirement of the MS4 and Multi-Sector Stormwater Permit requirements and represents good housekeeping and common sense. Municipal maintenance vehicle wash facilities should be properly controlled to ensure that no toxic or hazardous materials contained in wash water are released to surface or groundwater. Dedicated washing areas are designed to direct vehicle wash water to a contained area so that pollutants washed from vehicles can be filtered/treated and not allowed to enter the MS4 system or nearby surface waters. Such dedicated areas should have regular filter replacement and proper disposal.

M-4	**Ensure that All Municipal Operations within the Watershed Incorporate Best Management Practices (BMP)/Good Housekeeping Practices into Daily Operations.**

It is recommended that the Committee or a partner review and ensure that all watershed municipal operations incorporate best management practices into daily operations Municipal facilities including public works yards, parks, golf courses, marinas and administrative buildings can contribute to water pollution through poor housekeeping practices. This recommendation calls for the development and implementation of a watershed-wide municipal housekeeping program aligned with MS4 permit requirements. Actions include: proper storage, handling and disposal of hazardous materials (i.e., fuels, lubricants, fertilizers/pesticides, chemicals and salt for winter highway de-icing), regular street sweeping and cleaning of stormwater infrastructure, spill

prevention and clean up protocols, fleet and boat maintenance BMPs, integrated pest management protocols for fertilizer and pesticide applications, and staff training. Benefits include reduced pollutant discharge, improved compliance, and enhanced municipal leadership in water quality stewardship.

M-5	**Complete Regular Municipal Facility and Operations Audits.**

In accordance with the MS4 permit, it is recommended that each municipality in the watershed complete regular municipal facility and operation audits. At a minimum frequency of once every three years, municipalities are required under the MS4 Permit to conduct self-assessments of all municipal facilities. This is done to determine the sources of pollutants potentially generated by its operations and facilities (i.e., proper storage of hazardous materials and salt, fueling areas, waste storage areas, etc.). This self-assessment also helps identify the municipal operations and facilities that need to be addressed by the municipal pollution prevention and good housekeeping program (i.e., roadway maintenance, turf management, etc.). This recommendation must also include an educational component for golf course managers about fertilizer, pesticide, and other chemical use. This ties with Recommendation **O-1**.

M-6	**Incorporate Projections Addressing Changing Climate into Municipal Facility Planning and Upgrades.**

This recommendation is for all the municipalities in the watershed to incorporate climate change impacts and sea level rise projections into municipal facility planning and upgrades. Municipal infrastructure must be resilient to sea level rise, increased precipitation, and extreme weather events. This recommendation promotes climate-adaptive planning for municipal facilities, including elevating critical infrastructure, improving drainage systems and outfall placement, and integrating flood-resistant design including preservation and re-establishment of wetland buffers on municipal properties. Density should also be a consideration for incorporation. Review of building/zoning codes should include considerations of projected sea level rise. These actions will protect municipal assets and reduce water quality impacts during storm events. The NYS Department of State worked with the Department of Environmental Conservation and other partners to create model local laws to help local governments be more resilient. These model local laws can be found at https://dos.ny.gov/model-local-laws-increase-resilience.

M-7	**Enhance Municipal Trash Collection and Floatable Debris Control and Maintenance Across the Watershed.**

It is recommended that each watershed entity with public space(s) enhance their trash collection and floatable debris control. Public input during the initial public input sessions highlighted overflowing trash bins, significant accumulation of floatable debris/trash near stormwater

outfalls and along shorelines, skeet shooting from various yacht clubs, and concerns of industrial operations/waste storage in nearshore areas. This recommendation calls for municipalities to improve monitoring of critical shoreline areas for trash/debris collection, installation of additional enclosed trash bins, increase trash collection frequencies at popular public trails/parks and facilities, and deploy outfall floatable catchment nets/control structures where feasible. Public signage and education campaigns should accompany infrastructure upgrades and existing waste receptacles to encourage public use of trash receptacles and the harms of littering. These actions will reduce litter, improve aesthetics, and help to protect aquatic life.

M-8	**Improve Public Access to Waterfront Areas through Infrastructure Upgrades and Recreational Amenities.**

This recommendation, as is also recommended in **O-2**, is to improve and, where possible, expand public access to the waterfront. As individual properties are the focus of this recommendation, partners would have to be identified in the planning phase. Community feedback emphasized limited access to waterfront recreation. This recommendation supports municipal efforts to develop and expand waterfront recreation, improve shoreline pathways, and enhance ADA accessibility. Such enhancements could also incorporate public education on pollution sources and impacts. New developments should consider public access to the waterfront in their plans. These projects promote stewardship of the land and Bay, public engagement, and equitable use of the Bay's resources. This recommendation should also incorporate litter reduction strategies as called for in Recommendation **P-9**.

1.5 Wastewater Management (W)

As documented in the Watershed Characterization, reducing pathogen and nitrogen loading is essential to improving water quality in the Bay. This section details recommendations related to the wastewater management aimed at achieving water quality goals.

W-1	**Expand Sewer Connections and Eliminate Legacy Septic Systems**

Is it recommended that sewer connections be expanded to eliminate legacy on-site wastewater treatment systems. Such an effort would likely, but not necessarily, be led by the water pollution control districts. Promote the expansion of sanitary sewer infrastructure throughout the watershed, prioritizing areas with the highest densities, high groundwater tables, proximity to surface waters, and clusters of aging or failing septic/cesspool systems. This includes prioritizing sewering of Kings Point (which incorporates three subwatersheds), Sands Point (in the North East

Shore and Sheets Creek East subwatersheds), Manhasset (in the Whitney Pond subwatershed), the Plandomes (in the Leeds Pond and Plandome Heights subwatersheds), and portions of Port Washington (in the Mill/Baxter Ponds subwatersheds) that are unsewered and have aging septic systems and close proximity to surface waters. See **Figure 9-2** for priority areas for sewering. This work could be informed by investigating and identifying "hot spots" of on-site wastewater pollution as called for in Recommendation **B-3**.

Advocate for dedicated grant programs and financial incentives to support septic-to-sewer conversions, as current funding is often limited to Innovative and Alternative (I/A) on-site wastewater treatment system upgrades. Smaller sewer area options could also be examined for existing high-density, unsewered areas, in order to reduce existing nitrogen loading. This action will significantly reduce nitrogen, coliform bacteria, and other nutrient loads entering Manhasset Bay, directly addressing one of the largest sources of water quality impairment. Benefits include improved public health, reduced risk of groundwater contamination, and measurable improvements in bay water quality.

W-2	**Incentivize and Require Upgrades to Innovative/Alternative Onsite Wastewater Treatment Systems (I/A OWTS)**

Where sewer expansion is not feasible, it is recommended that unsewered municipalities throughout the watershed update their codes to require and incentivize the replacement of conventional septic systems with advanced nitrogen-removing I/A OWTS. Updates to local codes could include mandating I/A OWTS for all new construction, major renovations, and potentially considering property transfers in unsewered areas. Utilize public locations, such as the Science Museum of Long Island, as demonstration sites with press releases and educational kiosks installed on site. Provide outreach and technical assistance to homeowners and businesses to facilitate adoption. This approach will reduce nutrients and pathogen loading to groundwater and surface waters, supporting compliance with nitrogen reduction targets and protecting sensitive aquatic habitats. This incentivization would go hand-in-hand with Recommendation **P-2**, which calls for strengthening local codes for wastewater management. This work could be informed by investigating and identifying "hot spots" of on-site wastewater pollution as called for in Recommendation **B-3**.

W-3	**Develop a Program and Update Town and Village Codes to Identify and Require Regular Maintenance of Septic Systems in Areas with Shallow Depth to Groundwater and Poor Integrity/Not Properly Functioning**

This recommendation is to identify areas in the watershed with shallow depth to groundwater and poor integrity/not properly functioning on-site wastewater treatment systems and then update Town and Village codes to require regular maintenance of these on-site wastewater treatment systems in those areas. This Recommendation is similar to **P-2** which also calls for the adoption and enforcement of wastewater management ordinances.

Areas with sanitary systems situated in locations with shallow depth to groundwater have the greatest potential to discharge nutrients to the waters surrounding Manhasset Bay. Sanitary systems without adequate vertical separation between the bottom of the leaching pool and groundwater do not function properly as there is insufficient conversion of ammonia to nitrite and nitrate (the nitrification part of the intended treatment process) and reduced natural attenuation of the sediments separating the system from groundwater. As a result, there is a greater potential for groundwater transport and surface water release of available nitrogen and biological pollutants (i.e., bacteria and virus) to waterbodies. Prioritizing these areas is an important step to reducing direct wastewater overflows and nitrogen loading of the Bay.

Additionally, a program of regular sanitary system maintenance could be established to require property owners to provide proof of inspection and certification of sanitary systems once every three to five years. This data could be collected in an online platform. In addition to inspection by a licensed contractor, certification of the system could also be achieved through proof of maintenance (i.e., pumping of the sanitary system) within the three to five year timeframe, proof of new system installation compliant with Nassau County requirements, or proof of adequate depth to groundwater through a test boring. If inspection revealed a failing system or a system which could not be certified, the system would either have to be pumped or replaced, depending on the severity of the failure. Once property owners demonstrate certification of a Nassau County-approved system, no additional submission/proofs of a compliant systems would be required (which may encourage property owners to replace antiquated systems rather than continually pumping the systems). **Figure 4-9** illustrates areas which may potentially have shallow depth to groundwater (less than 10 feet)[1], and could be utilized as a basis for target locations to be included in the inspection program.

Nassau County initiated a septic system replacement program[2] – Septic Environmental Program to Improve Cleanliness (S.E.P.T.I.C), which will provide grant funding to eligible recipients to replace a conventional or failing septic system with an innovative and alternative on-site wastewater treatment system. Continued funding for this program and similar incentive programs are an excellent way to incentivize property owners to voluntarily replace aging systems. This work could be informed by investigating and identifying "hot spots" of on-site wastewater pollution as called for in Recommendation **B-3**. Additionally, an educational campaign to spread awareness about the programs existence and importance can go a long way to addressing this issue. This ties with Recommendation **O-1.**

W-4	**Upgrade and Optimize Wastewater Treatment Plant (WWTP) Performance**

[1] This figure was generated utilizing GIS to graphically evaluate data from both Suffolk County LiDAR topographic data and USGS groundwater elevation data.

[2] https://www.nassauswcd.org/SEPTIC

It is recommended that the Committee and its partners support ongoing upgrades and optimizations at the Port Washington and Great Neck Water Pollution Control Districts (WPCDs) to further reduce nitrogen, other nutrients or pollutants, and pathogen discharges. These facilities treat wastewater from parts or all of the subwatersheds of Sheets Creek North and East, Mill/Baxter Ponds, Stannard's Brook, Leeds Pond, Whitney Pond, Kensington, Kings Point Creek, and Mitchell Creek, as well as areas outside the Manhasset Bay watershed.

It is also recommended to encourage the adoption and implementation of best available technology including tertiary treatment, effluent polishing, and advanced nutrient removal technologies. Evaluate opportunities to relocate or extend outfalls to areas with better tidal flushing, and consider installation of diffusers to improve mixing and reduce localized impacts. These actions will help meet TMDL requirements, improve dissolved oxygen levels, and reduce algal blooms in the Bay.

W-5	**Promote and Implement Water Reuse and Resource Recovery**

It is recommended that the partners implement water reuse projects at local WWTPs, such as the Port Washington and Great Neck WPCDs. This is the process where treated wastewater is used to irrigate and fertilize nearby land, thus reducing effluent discharge volumes and nitrogen loading to Manhasset Bay. There is the added benefit that such reuse also reduces draws on groundwater. Partners will need to identify and connect potential end users (e.g., golf courses, hospitals, institutional campuses) for reclaimed water and encourage infrastructure sharing among clustered users to reduce costs. Water reuse conserves potable water supports drought resilience and can save tens of millions of gallons of drinking water annually while reducing nutrient pollution.

A Long Island Water Reuse Road Map & Action Plan published in 2023 highlights opportunities for water reuse from the two WPCDs on Manhasset Bay.[3] Aside from reusing water within each WWTP, the water reuse plan also prioritized irrigation projects using treated effluent from the WWTPs across Long Island.

These WPCDs treat wastewater from parts or all of the subwatersheds of Sheets Creek North and East, Mill/Baxter Ponds, Stannard's Brook, Leeds Pond, Whitney Pond, Kensington, Kings Point Creek, and Mitchell Creek, as well as areas outside the Manhasset Bay watershed.

[3] https://seatuck.org/water-reuse/

W-6	**Enforcement and Education of Boat Pump-Out Practices**

This recommendation is to identify a partner or partners to expand current enforcement of improper boat pump-out practices and to educate the boating public about proper pump-out practices throughout the Bay and surrounding watershed. Improper disposal of sewage from recreational and commercial boat vessels contributes to elevated levels of fecal coliform, nitrogen, and phosphorus in waterbodies. These pollutants degrade water quality, harm aquatic life, and pose risks to human health. While pump-out stations are available, lack of awareness and enforcement leads to underutilization. Public input received indicated suspected improper sewage disposal from vessels within the Bay is occurring.

It is recommended that the frequency of waterway patrols be increased during peak boating seasons to monitor compliance, and vessels be required to maintain pump-out logs, subject to inspection. Tiered fines can be implemented for illegal discharge, with escalating penalties for repeat offenses. Partnership with local marina operators is also recommended to encourage reporting of suspected violations and promoting compliance with pump-out use throughout the Bay.

Additionally, it is recommended that signage and mapping of pump-out station locations be improved, and pump-out practices be included in seasonal educational campaigns and social media posts. Partnering with the community to offer incentives for pump-out usage (e.g., fuel discounts, discounts for frequent pump out use, discounts at local waterfront restaurants and yacht clubs, etc.) could also assist in improving practices.

1.6 Natural Resource Management (N)

As documented in the Watershed Characterization, protection and restoration of natural resources within the watershed is essential to improving water quality in the Bay. This section details recommendations related to natural resource management aimed at achieving water quality goals. See **Figure 9-3** for overall natural resource recommendation project locations. In addition, each recommended project includes a planning-level cost estimate, expressed as cost ranges ($: $0–$50,000; $: $50,000–$100,000; $$: $100,000–$300,000; $$: $300,000+).

Project ID: N-1a	Priority: High	Cost: $, $$, $$$$
Subwatershed: Sheets Creek N	**Location:** Sheets Creek North	

Key Issues:

Loss of native marsh habitat, replaced by invasives, algal blooms, shoreline erosion, and water quality degradation (including high bacteria counts); high stormwater and nutrient inputs from the dense surrounding development; industrial runoff; habitat fragmentation due to invasive species growth within the nature preserve. For information on work already completed at this site, see Table 3-2 in Section 3.1.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

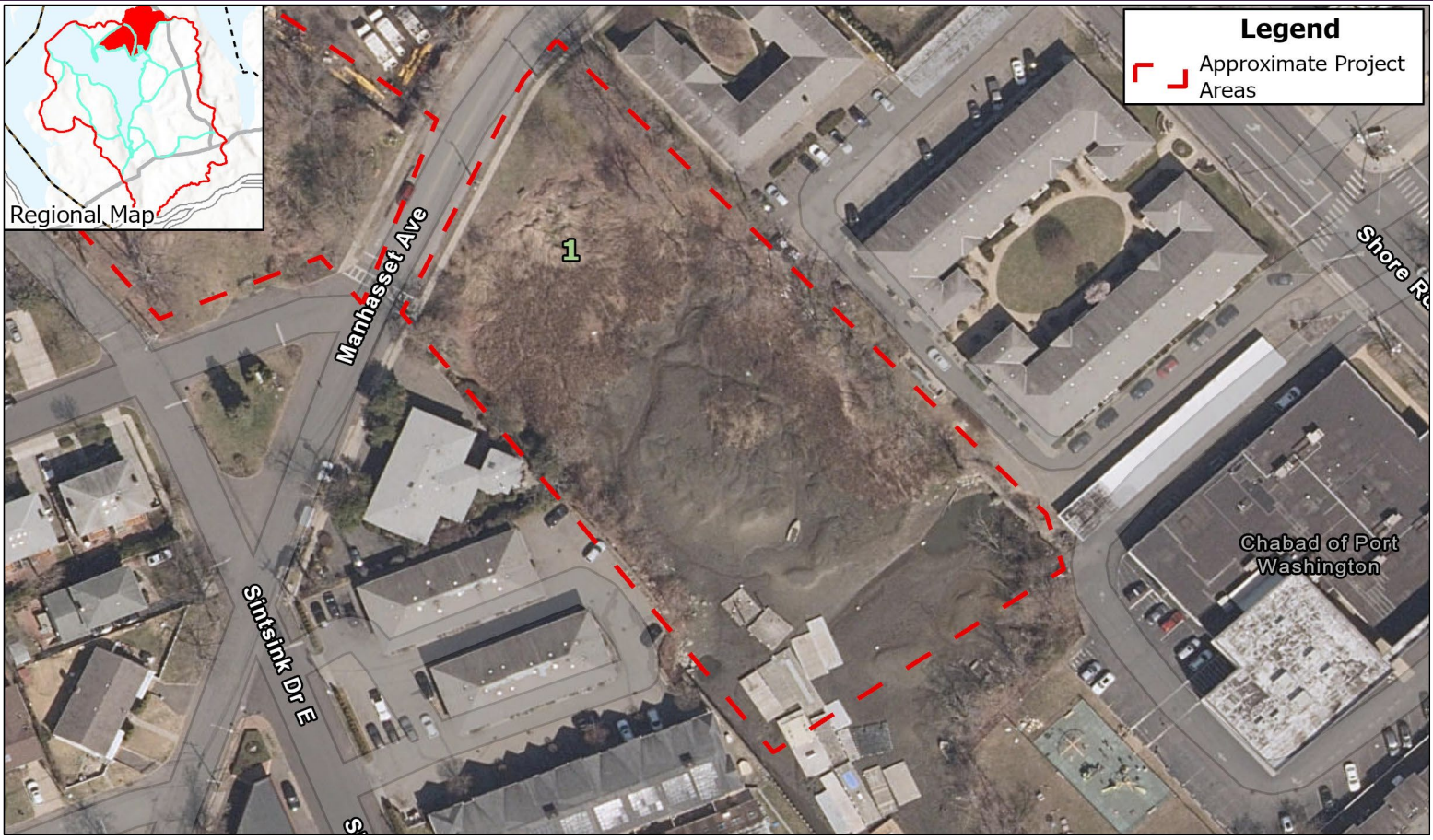
1. Invasive plant removal within the Manorhaven nature preserve. Annual monitoring and invasive plant treatment. $-$$ (Installation, Short-term), $/Year (Maintenance, Short-term)
2. Removal/treatment of invasives and planting of native species as a continuation of already completed restoration in the Sheets Creek. Annual monitoring and invasive plant treatment. $-$$ (Installation, Short-term), $/Year (Maintenance, Short-term)
3. Install a native vegetated buffer from industrial property that abuts the nature preserve to prevent sedimentation from the unvegetated dirt lot and any potential contamination sources. Determine if encroachment is occurring from this property. Annual maintenance includes invasive plant treatment and potential replanting of unsuccessful vegetation until successful establishment of plantings. $-$$ (Installation, Short-term), $/Year (Maintenance, Short-term)
4. Continued shoreline stabilization into the nature preserve to the east of Manorhaven Beach Town Park in the back of Sheets Creek North. Annual monitoring and maintenance of native plantings until successful establishment and invasive plant treatment. $$$$ for construction, $/Year ongoing maintenance (Mid-term)
5. Stormwater outfall water quality sampling at all outfalls after storm events to determine point and nonpoint sources of pollution and nutrient loading. $/Year (Long-term)
6. Conduct a feasibility study for sediment removal in both creeks $(Short term), $$$$ (Long Term)

Benefits:

- Shoreline stabilization/living shoreline* along the eastern shoreline, within the Manorhaven nature preserve, will halt the degradation of the sloped shoreline and promote native species. It will also provide increased habitat for sessile organisms which will in turn improve oxygen content and water quality through filtration.
- Invasive species removal and replacement with native species will increase biodiversity and habitat for native fauna/flora as well as assisting in shoreline stabilization and erosional forces.
- Development of an outfall water quality study will provide data to support future projects related to nutrient and contamination inputs from stormwater runoff after storm events.

* A living shoreline is a nature-based shoreline stabilization technique that uses native plants and natural materials to control erosion, enhance habitat, and improve water quality.

Project ID: N-1b	Priority: High	Cost: $, $$, $$$$
Subwatershed: Sheets Creek E	**Location:** Sheets Creek East	



Key Issues:

Loss of native marsh habitat, replaced by invasives, algal blooms, shoreline erosion, and water quality degradation (including high bacteria counts); high stormwater and nutrient inputs from the dense surrounding development; industrial runoff; habitat fragmentation due to invasive species growth within the nature preserve.

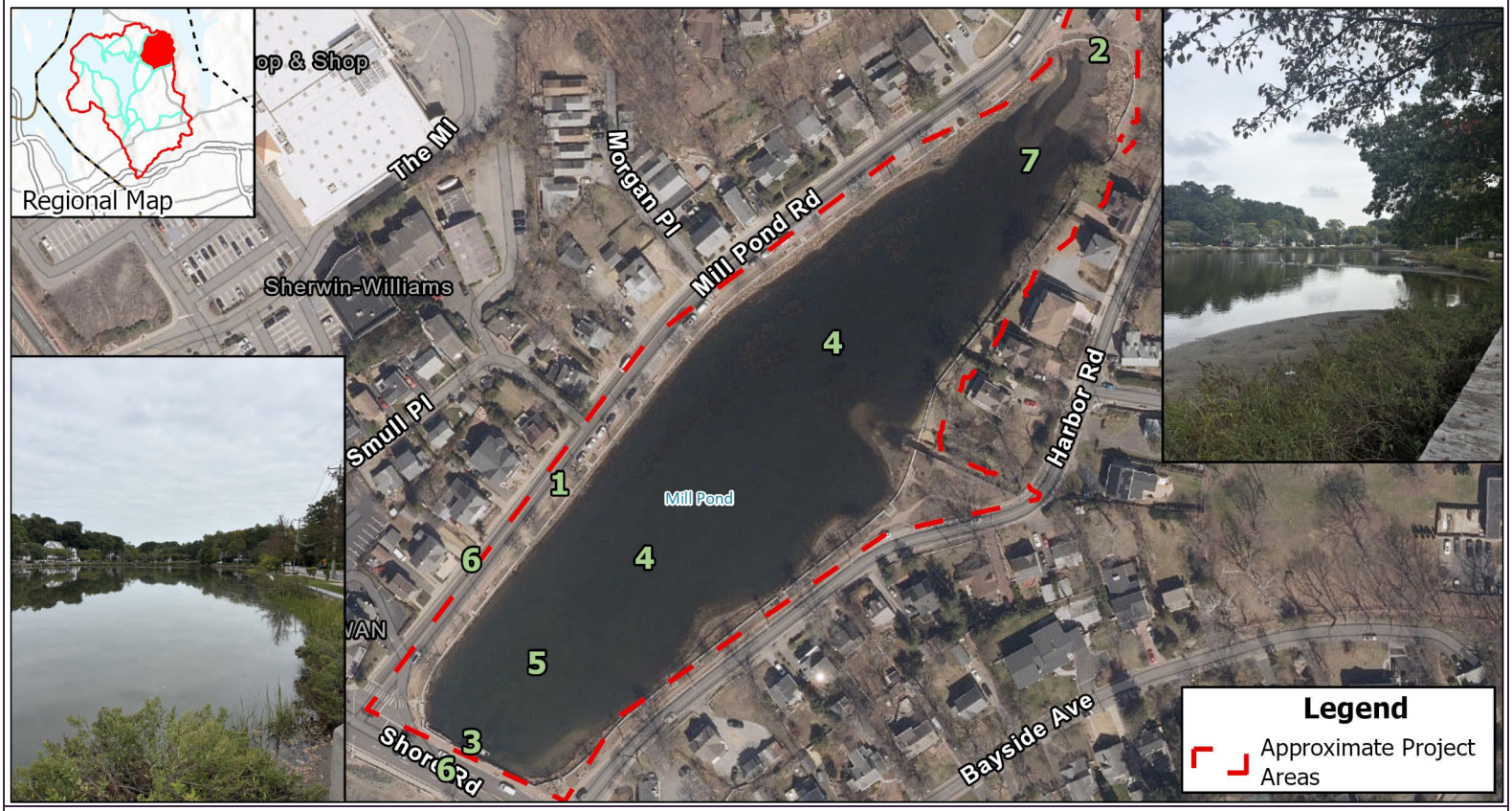
Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Removal/treatment of invasives and planting of native species as a continuation of already completed restoration in the Sheets Creek. Annual monitoring and invasive plant treatment. $-$$ (Installation, Short-term), $/Year (Maintenance, Short-term)
2. Conduct a feasibility study for sediment removal in both creeks. $ (Feasibility, Mid-term), $$$$ (Implementation, Long-term)

Benefits:

- Invasive species removal and replacement with native species will increase biodiversity and habitat for native fauna/flora as well as assisting in shoreline stabilization and erosional forces.

Project ID: N-2	Priority: Medium	Cost: $, $$$$
Subwatershed: Mill/Baxter Pond	**Location:** Mill Pond	



Key Issues:

Periodic fish kills and algal blooms due to low oxygen and eutrophication, waterfowl overpopulation, road salt toxicity. The Town of North Hempstead undertook a multi-million-dollar restoration of Mill Pond. The project included sediment removal, extensively reshaping the pond floor, and rebuilding its surrounding wall. The wetland was revegetated to stabilize the bank, filter stormwater runoff, cleanse pond water, and discourage Canada geese. For information on work already completed at this site, see Table 3-2 in Section 3.1.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Planting of appropriate species and increased vegetation on the land along the northern pond shoreline to limit waterfowl resting habitat. Annual maintenance includes invasive plant treatment/removal and continued seeding for increased success rates until established. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
2. Removal, treatment, and proper disposal of invasive species on the east side of the pond. Annual monitoring and invasive plant treatment. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
3. Installation & maintenance of floatable traps at spillway to prevent floatable/debris from entering Manhasset Bay. Periodic monitoring and maintenance to ensure proper function and remove debris/floatables from the traps. - $ (Installation, Short-term), $/Year (Maintenance, Long-term)
4. Feasibility study for the installation & maintenance of aeration methods for the pond. Annual maintenance to ensure proper function and cleaning of aeration components. $ (Installation, Short-term), $/Year (Maintenance, Long-term)
5. Investigate the feasibility of seeding Oysters and Clams -. $$-$$$$ (Long-term)
6. Implementation of salt alternatives on roads around aquatic habitat. $/Year (Long-term)
7. Conduct a feasibility study on sediment removal for hydrological/habitat connectivity, sediment management, and potential invasive plant root mass removal to improve water quality.$ (Feasibility, Mid-term), $$$$ (Implementation, Long-term)

8. Targeted education to homes around the pond about the importance of tall, vegetated buffers $ (Short-term)

Benefits:

- Continued shoreline stabilization/living shoreline features to the east, within the nature preserve, will halt the degradation of the sloped shoreline and promote native species. It will also provide increased habitat for sessile organisms which will in turn improve oxygen content and water quality through filtration.
- Invasive species removal and replacement with native species will increase biodiversity and habitat for native fauna/flora.
- Aeration methods on the pond will increase dissolved oxygen concentrations and further discourage waterfowl use of the pond.

Project ID: N-3	Priority: Medium	Cost: $, $$$$
Subwatershed: Mill/Baxter Pond	**Location:** Baxter Pond	

Key Issues:

Erosion and sediment buildup, stagnant water, overpopulation of waterfowl, periodic fish kills due to low oxygen. For information on work that was previously completed at this site, see Table 3-2 in Section 3.1.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Installation & maintenance of fountain. Annual maintenance to ensure proper function and cleaning of fountain components. $ (Installation, Short-term), $/Year (Maintenance, Long-term)
2. Planting of native wildflower seed mix and increased non-grass vegetation on the northern pond shoreline to limit waterfowl resting habitat and stabilize slope. Annual maintenance includes invasive plant treatment/removal and continued seeding for increased success rates until established. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
3. Installation & maintenance of floatable traps at spillway to prevent floatables/debris from entering Manhasset Bay. Periodic monitoring and maintenance to ensure proper function and remove debris/floatables from the traps. $ (Installation, Short-term), $/Year (Maintenance, Long-term)
4. Conduct a feasibility study of sediment removal for hydrological/habitat connectivity, sediment management, and potential invasive plant root mass removal to improve water quality. $$$$ (Short-term)
5. Remove fallen trees and debris from Baxter Brook $/Year (Maintenance, Long-term)

Benefits:

- Installation of fountains will increase oxygen content and water movement while deterring overpopulation of waterfowl.
- Native vegetation planted along the mowed grass shoreline on the north side of the pond will limit waterfowl resting areas as well as increasing biodiversity and promoting native pollinators. It will also decrease municipal maintenance of these areas during the growing season.

- Installation of a floatable debris trap at the weir system will prevent floatables/debris from entering Manhasset Bay from Baxter Pond.

Project ID: N-4	Priority: High	Cost: $$$$
Subwatershed: Mill/Baxter Pond	**Location:** Manhasset Bay Shoreline West of Baxter Pond	

Key Issues:

Shoreline erosion, dilapidated concrete structures, unvegetated shoreline.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Installation of living shoreline features for shoreline stabilization. Annual monitoring of native plantings until successful establishment, invasive plant treatment, and maintenance of living shoreline features. $$$$ for construction, $/Year ongoing maintenance (Mid-term)

Benefits:

- Installation of living shoreline features and native vegetation will increase shoreline stabilization, assist in flood control and prevent further erosion towards Shore Road
- Installation of living shoreline features will provide water quality treatment for stormwater runoff, and provide beneficial habitat for native fauna.
- Installation of living shoreline features provides protection from climate change and sea level rise

Project ID: N-5	Priority: High	Cost: $-$$, $$$$
Subwatershed: Leeds Pond	**Location:** Leeds Pond	

Key Issues:

Reduced aquatic biodiversity, waterfowl overpopulation, and periodic fish kills due to invasive plant growth, eutrophication, and low oxygen; fragmented aquatic habitat due to barriers (culverts, dams).

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

Overall comprehensive management/restoration plan that includes the following:

1. Removal/treatment of invasive species and plant native vegetation along stream banks, pond margins, and locations in the upper watershed. Annual monitoring and invasive plant treatment. $ (Construction, Short-term), $/Year (Maintenance, Short-term)
2. Investigate green infrastructure solution(s) for stormwater management on Stonytown Road where stormwater runoff is directly input into stream connected to Leeds Pond. $ (Planning, Short-term), $ (Construction, Mid-term).
3. Develop wetlands along tributaries in the watershed to trap sediment/nutrients, prevent erosion, and provide wildlife habitat where feasible. $-$$ (Mid-term)
4. Determine feasibility of seeding oysters and clams to improve water quality -. $ (Feasibility, Mid-term), $$$$ (Implementation, Long-term)
5. Install a fish ladder at the pond's outlet to help migratory fish like alewife reach upstream spawning areas . $$$$ (Long-term)
6. Conduct a feasibility study for sediment removal in the pond and tributaries $ (Feasibility, Mid-term), $$$$ (Implementation, Long-term)

Benefits:

- Removal of invasive species and planting of native vegetation along streambanks will create slope stabilization, improve habitat connectivity by decreasing fragmentation, and improve biodiversity and suitable habitat for native fauna.
- Vegetation will act as a deterrent and limit waterfowl
- Wildlife passage restoration helps fish like alewife and other wildlife reach their spawning areas, which supports populations, improves the ecosystem, and strengthens the food chain.

- Removal of sediment will improve hydrological/habitat connectivity and sediment management

Project ID: N-6	Priority: Low	Cost: $-$$
Subwatershed: Leeds Pond	**Location:** Plandome Park	

Key Issues:

Algal growth in pond, lack of biodiversity due to mowed grass areas.

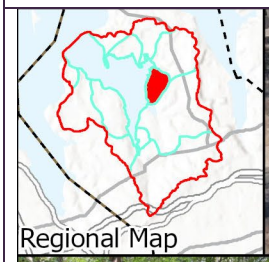
Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

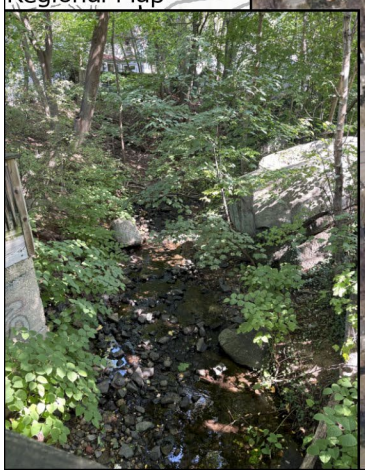
1. Continue with native vegetation planting around the pond (some has already been completed and should be expanded). Annual maintenance includes invasive plant treatment and potential replanting of unsuccessful vegetation until successful establishment of plantings. $-$$ (Construction, Short-term), $/Year (Maintenance, Short-term)
2. Conversion of some mowed areas into native wildflower meadows with some elevated beds for aesthetics. Annual maintenance includes invasive plant treatment/removal and continued seeding for increased success rates until established. $ (Short-term), $/Year (Maintenance, Short-term)

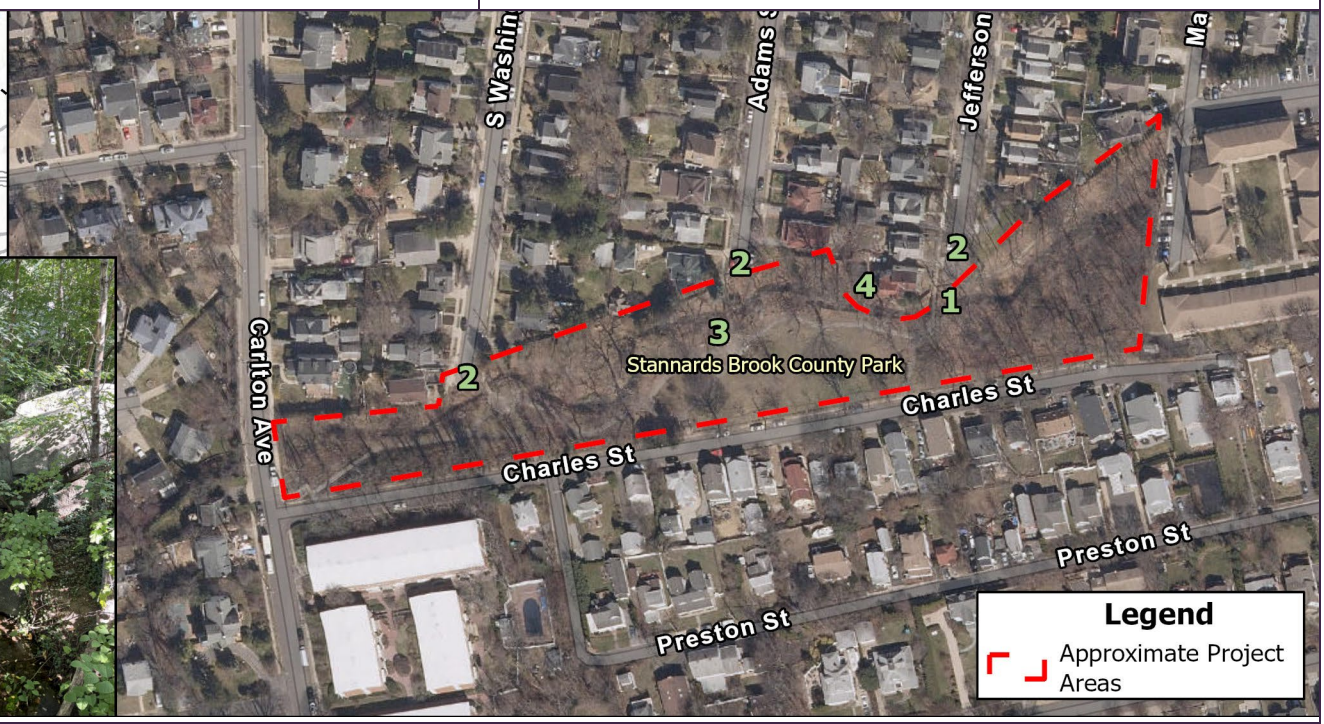
Benefits:

- Continued planting of native wetland vegetation around the pond will promote biodiversity and improve bank stabilization and water quality.
- Conversion of mowed areas into native wildflower meadows will increase biodiversity, promote pollinators, and decrease municipal maintenance efforts.

Project ID: N-7	Priority: Medium	Cost: $, $$-$$$$
Subwatershed: Stannard's Brook	**Location:** Stannard's Brook County Park	







Key Issues:

Nassau County completed a wholesale park and stream rehabilitation project within the park in 2011/12, but some issues still remain, such as: direct stormwater inputs, stream obstructions, etc. For information on work already completed at this site, see Table 3-2 in Section 3.1.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Removal of debris and stream obstructions, such as fallen trees and branches. $ (Short-term)
2. Installation & maintenance of floatables/debris traps on stormwater culverts from the adjacent streets to the north of Stannard's Brook. (Washington, Adams, and Jefferson streets). Roadway jurisdiction would have to be established Once installed, periodic monitoring and maintenance to ensure proper function and remove debris/floatables from the traps. $ (Installation, Short-term), $/Year (Maintenance, Long-term)
3. Removal/treatment of invasive species and replacement with native species. Annual monitoring and invasive plant treatment. This may be done with assistance from others who already conduct invasive removal in the area. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
4. Explore the possibility of creating wetlands within the park to hold back runoff and capture sediments - $ (Planning, Short-term), $$$ (Construction, Mid-term), $/Year (Maintenance until established, Short-term)

Benefits:

- Removal of stream obstructions will allow existing check dams to function properly.
- Installation and maintenance of floatables/debris traps on the stormwater systems will prevent floatables/debris from entering Stannard's Brook and the associated waterways.
- Removal/treatment of monocultures of invasive species (Japanese knotweed (*Reynoutria japonica*)) around Stannard's Brook will increase biodiversity and promote native species growth.
- Implementation of shoreline stabilization features will eliminate shoreline erosion and degradation on the steep banks to the north of Stannard's Brook, which will reduce erosion of the shoreline and sedimentation into the Brook improving habitat and water quality.

Project ID: N-8	Priority: Low	Cost: $-$$
Subwatershed: Whitney Pond	**Location:** Manhasset Valley Park	

Key Issues:
Severe erosion and sedimentation, degraded aquatic habitat, waterfowl overpopulation and nutrification, stormwater overflows, high turbidity, loss of native habitat and habitat connectivity, established invasives, sediment contamination.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Conversion of mowed areas into native wildflower meadows. Annual maintenance includes invasive plant treatment/removal and continued seeding for increased success rates until established. $ (Short-term), $/Year (Maintenance, Short-term)
2. Sediment classification and sampling plan prior to sediment removal. Feasibility study of sediment removal along the pond and lake bottoms $ (Short-term)
3. Installation of bioswale along west side of the pond in Manhasset Valley Park. Annual monitoring of native plantings until successful establishment, invasive plant treatment, and maintenance of bioswale to ensure proper function. $-$$ (Construction, Short-term), $/Year (Maintenance, Long-term)
4. Invasive plant removal/treatment and replacement with native vegetation on the island in Manhasset Valley Park and around the ponds within Whitney Park. Annual monitoring and invasive plant treatment. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
5. Maintenance and potential replanting of forebay on the west side of the pond in Manhasset Valley Park. Annual monitoring of native plantings until successful establishment, invasive plant treatment and maintenance of forebay to ensure proper function. $ (Installation, Short-term), $ (Maintenance, long-term)
6. Feasibility study about right-sizing culverts or installing passages for wildlife where needed- $$ (Construction, Long-term)
7. Educational outreach & signage around the ponds and associated streams. $ (Short-term)

Benefits:

- Conversion of mowed areas into native wildflower meadows will increase biodiversity, promote pollinators, decrease municipal maintenance efforts, stabilize soils through increased groundcover , and reduce the sediment loadings to the lake, stream and ponds.
- Development of a sediment sampling and classification plan will determine if there is contamination within the sediment in the ponds prior to sediment removal.
- Installation of a bioswale on the west side of the pond in Manhasset Valley Park will collect overland flow, including sediment and debris, prior to entering the pond. This will help remove pollutants from stormwater prior to entering the pond that will improve water quality.
- Installation of fountains will increase oxygen content and water movement while deterring overpopulation of waterfowl.
- Invasive species removal and replacement with native species will increase biodiversity and habitat for native fauna/flora as well as assisting in shoreline stabilization and erosional forces.
- The existing forebay is full of sediment and does not function properly as a sediment collection area for the pond. Preparation and adherence to a regular maintenance plan will allow for the existing forebay to function as intended.

Project ID: N-9	Priority: Low	Cost: $-$$
Subwatershed: Whitney Pond	**Location:** Whitney Pond Park	

Key Issues:
Severe erosion and sedimentation, degraded aquatic habitat, waterfowl overpopulation and nutrification, stormwater overflows, high turbidity, loss of native habitat and habitat connectivity, established invasives, sediment contamination.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Installation & maintenance of fountains at both locations.Annual maintenance to ensure proper function and cleaning of fountain components. $ (Installation, Short-term), $/Year (Maintenance, Long-term)
2. Removal/replacement of the dilapidated dock within Whitney Lake. $ (Short-term)
3. Water quality sampling to determine impacts of rust laden stormwater runoff and potential illicit discharges . $ (Short-term)
4. Feasibility study about right-sizing culverts or installing passage for wildlife where needed- $$ (Construction, Long-term)
5. Educational outreach & signage around the ponds and associated streams. $ (Short-term)
6. Education of municipal staff about proper maintenance techniques, illicit discharges, etc. - $ (Establish educational program, Short-term, then continual training, Long-term)

Benefits:

- Conversion of mowed areas into native wildflower meadows will increase biodiversity, promote pollinators, and decrease municipal maintenance efforts. It will also improve ground cover, stabilize the soil, and reduce the sediment loadings to the lake, stream and ponds.
- Development of a sediment sampling and classification plan will determine if there is contamination within the sediment in the ponds prior to sediment removal.

- Installation of a bioswale on the west side of the pond in Manhasset Valley Park will collect overland flow, including sediment and debris, prior to entering the pond. This will help remove pollutants from stormwater prior to entering the pond that will improve water quality.
- Installation of fountains will increase oxygen content and water movement while deterring overpopulation of waterfowl.
- Invasive species removal and replacement with native species will increase biodiversity and habitat for native fauna/flora as well as assisting in shoreline stabilization and erosional forces.
- The existing forebay is full of sediment and does not function properly as a sediment collection area for the pond. Preparation and adherence to a regular maintenance plan will allow for the existing forebay to function as intended.

Project ID: N-10	Priority: High	Cost: $, $$$$
Subwatershed: Mitchell's Creek	**Location:** Kings Point Park	

Key Issues:

Sediment loading, habitat degradation from fragmentation, nutrient loading from increased development, reduces biodiversity from invasive species.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Feasibility study to assess access constraints and management options for dense invasive species (predominately Common Reed (*Phragmites australis*)) along Split Rock Drive for future project development, including invasive plant treatment and habitat connectivity development. $ (Short-term)
2. Invasive plant removal/treatment and native vegetation planting where feasible. Annual monitoring and invasive plant treatment. $(Installation, Short-term), $/Year (Maintenance, Short-term)
3. Plant native vegetation on the land along streambanks where feasible. Annual monitoring of native plantings until successful establishment and invasive plant treatment. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
4. Educational outreach and signage around the freshwater streams in Kings Point Park. $ (Short-term)
5. Determine feasibility of removing sediment in the mouth of Mitchell Creek to improve tidal flow and allow wildlife passage. $ (Feasibility, Mid-term), $$$$ (Implementation, Long-term)

Benefits:

- Proper access for future projects will help determine feasibility of project success within the creek. Increased private residential development around the eastern portion of the creek has limited public and maintenance access.
- Removal of invasives and replacement with native species will increase biodiversity and improve habitat connectivity.
- Sediment removal at the mouth of Mitchell Creek would have benefits including aquatic connectivity and increased flush rates to combat nonpoint sources of pollution within Mitchell's Creek.

Project ID: N-11	Priority: Low	Cost: $-$$
Subwatershed: Mitchell's Creek	**Location:** Mitchell's Pond	

Key Issues:

Wetland loss due to development, poor water quality, sedimentation, high nitrogen, lack of detailed wetland inventory and assessment.

Project Description/Action (Cost Per Recommendation): *The numbers shown on the map above identify project locations and correspond directly to the numbered project descriptions and actions listed below.*

1. Wetland inventory and restoration. $-$$ (Mid-term)
2. Invasive plant removal/treatment and native planting. Annual monitoring and invasive plant treatment. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
3. Conduct studies on the water quality of the pond, water depths throughout the pond, and the degree of groundwater flow to the pond and its impact $ (Short-term/Long-term)
4. Development of native habitat buffers on the pond's margins as well as bioswales, berms, and native plantings where feasible. Annual monitoring of native plantings until successful establishment and invasive plant treatment. $ (Installation, Short-term), $/Year (Maintenance, Short-term)
5. Conduct a feasibility study to evaluate the condition of the outlet gate and potential replacements. $(Feasibility, Mid-term), $$$$ (Implementation, Long-term)
6. Investigate the feasibility of adding areas for marsh migration[1] $ (Installation, Short-term), $/Year (Maintenance, Short-term)
7. Conduct a feasibility study for sediment removal in the pond. $ (Feasibility, Mid-term), $$$$ (Implementation, Long-term)

Benefits:

- The preparation of a water quality study and wetland inventory/habitat mapping will allow for a detailed project plan to be created to help identify and address water quality issues within Mitchell's Pond. Sub-projects can then be implemented with the goal of increasing biodiversity, habitat connectivity, water quality, and fish/native species habitat improvements.

- Establishment of native plant buffers would improve bank stabilization, provide flood control and improve water quality by filtering stormwater pollutants entering the pond from the lawn areas associated with the surrounding residential development.

N-12	**Consideration of Wildlife Crossings and Water Flow During Road Work and Infrastructure Improvements**

Sensitive wildlife species and natural hydrologic patterns could be adversely impacted by road work and other infrastructure improvement projects if wildlife movement and water conveyance are restricted. Road work and infrastructure improvements should consider maintaining or enhancing wildlife passage and aquatic organism connectivity through existing and proposed culverts during the design process. Culvert design and sizing should also ensure adequate water flow to prevent flooding, erosion, and habitat degradation upstream and downstream. The design process should reference the Nassau County Culvert Assessment to identify priority culverts for upgrade, right-sizing, or repair, and incorporate best management practices that support long-term ecological function, climate resilience, and infrastructure performance.

[1] The fate of significant marsh systems on Long Island Sound under future Sea-Level Rise projections- https://lispartnership.org/LIMAPS/

1.7 Water Quality Research and Monitoring (R)

This section outlines recommendations to enhance water quality in the Bay through improved research and monitoring efforts. Recommendations include expansion of the frequency and parameters of water quality sampling, implementing real-time data collection, increasing spatial coverage to better track trends and pollution hotspots, and consideration of climate vulnerability in monitoring efforts.

R-1	**Implement Targeted Source Tracking and Microbial Source Identification**

It is recommended that the Committee and/or its partners implement targeted source tracking and microbial source tracking (MST) studies in areas with persistent pathogen exceedances at sampling sites (e.g., the subwatersheds of Sheets Creek North and East and Mill/Baxter Ponds) to distinguish between human, pet, wildlife, and avian sources. Use DNA-based methods to inform targeted management actions in order to enable the development of more effective interventions. This is also recommended in **B-3** to specifically identify areas with cesspool inputs.

R-2	**Establish a Watershed-Wide Stormwater Outfall and Illicit Discharge Monitoring Program**

This recommendation is to establish a watershed-wide stormwater outfall and illicit discharge monitoring program, though more investigation will need to be done to identify who and how to

undertake this. Many outfalls within the watershed area discharge directly to the Bay with little or no treatment. As recommended in **P-10,** the recommendation to enforce illicit discharge ordinances, coordinated municipal efforts related to illicit discharges should be undertaken. Systematically screening all stormwater outfalls within the watershed for dry-weather flows, conducting regular sampling for indicator pollutants (bacteria, nutrients, surfactants), and mapping all outfalls and their contributing sewersheds will aid in each municipality's detection, track down, and elimination of illicit discharges and their compliance with the MS4 Program. The evaluation of watershed-wide baseline data will inform prioritization of retrofits and enforcement requirements. While this is a watershed-wide problem, it is recommended that this coordinated effort prioritize outfalls in subwatersheds with high pollutant loads per acre (e.g., Kensington, Sheets Creek North).

R-3	**Conduct Subwatershed-Scale Pollutant Loading and Trend Analysis**

It is recommended that pollutant loading modeling be updated/refined and re-evaluated routinely (every ±5 years) in each subwatershed in order to account for new land uses/development and climatic data, and track effectiveness of implemented BMPs and policy changes. This may be coordinated by the Committee or taken on by a partner organization or municipality. This expansion of pollutant loading data will aid in the analysis of trends in nitrogen, phosphorus, sediment, and bacteria loads, collected through the monitoring programs recommended in **B-1,** at the subwatershed scale to identify emerging hotspots and track progress toward reduction goals. A better understanding of trends will support adaptive management and prioritization of projects and will provide a quantitative basis for grant applications and regulatory reporting.

Additionally, targeted subwatershed planning can advance stormwater mitigation and improve habitat health and connectivity. Subwatershed plans forWhitney Pond and Leeds Pond would be impactful and a high priority for this recommendation.

R-4	**Expand Citizen Science and Community-Based Monitoring**

This recommendation is to expand citizen science and community-based monitoring throughout the watershed. This will likely be taken on by individual partner organizations. There is a high public interest within the watershed and a perceived willingness to participate in improving the water quality of Manhasset Bay, which can be leveraged to increase monitoring coverage in light of limited resources for agency-led monitoring. It is recommended that the MBPC and watershed municipalities support and expand citizen science programs for water quality monitoring, including bacteria sampling, HAB reporting, and floatable debris surveys. Stakeholders can provide training, QA/QC protocols, and integrate data into a centralized portal as called for in Recommendation **R-6**.

R-5 Monitor and Assess Climate Change Impacts on Water Quality

It is recommended that the Committee or a partner monitor and assess climate change impacts on Bay water quality. Climate change is leading to increased frequency/intensity of storms, sea level rise, and temperature changes, which are altering pollutant dynamics and risks. There is a need for data to support the implementation of resilient infrastructure and management.

Climate vulnerability assessments are recommended including tracking sea level rise, storm surge impacts, temperature trends, and extreme precipitation events. Documenting such trends can help to assess impacts on pollutant loading, flooding, and habitat conditions. Data collected will inform climate adaptation and resilience planning and will aid in anticipation of future water quality challenges. This data can be entered into the centralized data portal, described below in Recommendation **R-6**.

R-6 Utilize a Centralized Water Quality Data Portal(s) for Manhasset Bay Data

It is recommended that the Committee and other partners who collect water quality data in the Bay utilize a centralized water quality data portal. Currently, a lack of standardized data management hinders regional analysis and reporting at a watershed-wide scale. Data are currently siloed among the different municipal entities and not easily accessible by the public. It is recommended that a publicly accessible, centralized online portal be utilized to compile, visualize, and share all water quality data collected by municipalities, agencies, academic partners, and citizen scientists. The portal should allow for mapping, trend analysis, and data downloads, and include metadata and QA/QC protocols. Such portals are already in use through EPA (Water Quality Portal)[4] and the Long Island Sound Partnership (Quick Drops)[5].

This watershed-wide data sharing initiative would facilitate inter-municipal coordination and data-driven decision-making, improve transparency and public engagement, reduce duplication of effort, and ensure data consistency.

[4] https://www.epa.gov/waterdata/water-quality-data
[5] https://quickdrops.org/#/sts/overview

1.8 Watershed Planning and Regulatory Measures (P)

This section outlines recommendations for strengthening municipal codes throughout the watershed to protect water quality. It further advocates for the expansion of collaborative watershed planning through the active involvement of the MBPC, local stakeholders, municipalities, and environmental organizations in the development of effective management strategies.

P-1	**Encourage the Adoption/Update of Municipal Comprehensive/Master Plans**

It is recommended that all the watershed municipalities adopt or, where one has already been established, update their Municipal Comprehensive/Master Plan. A comprehensive plan can impact water quality through thoughtful and coordinated land use planning, resource management, and infrastructure decisions. For example, a comprehensive plan can guide where it is appropriate for certain types of development to occur and steer intense growth away from sensitive areas, it can promote green infrastructure and incentivize smart growth, identify needs for stormwater infrastructure, and encourage low-impact development techniques. Additionally, comprehensive plans often identify the need for upgrades to wastewater treatment facilities and offer recommended resilience strategies for adapting to changing climates and storm events. The comprehensive planning process involves gathering community input regarding the current landscape, issues, and opportunities regarding land use which may directly impact the watershed area. Community input helps inform the municipality's values (e.g., the waterfront, groundwater quality, etc.), which encourages municipalities to adopt zoning for protection of these resources.

Based on the regulatory assessment, the majority of the municipalities within the watershed do not have a comprehensive/master plan, and the ones that do are dated. It is recommended that communities that do not have comprehensive plans develop and adopt one to ensure consistent stormwater management, pollution control, and other land and water quality protections. A comprehensive plan would provide clear regulations to address pollution sources and improve resilience to environmental challenges. For the municipalities that have existing comprehensive/master plans, it is recommended that comprehensive plans be updated every 5 to 10 years to maintain relevancy and ensure that local policies are adaptive, and reflect the goals and values of the community.

P-2	**Strengthen Local Codes and Intermunicipal Coordination for Wastewater Management**

This recommendation is for all watershed municipalities to adopt and enforce model ordinances for wastewater management, including requirements for I/A OWTS, sewer connection mandates, and regular inspection/maintenance of onsite systems. Fostering intermunicipal collaboration is

recommended to ensure consistent standards, data sharing, and coordinated grant applications. Uniform regulations will help to close regulatory gaps, improve compliance, and maximize the effectiveness of wastewater management efforts across the watershed.

Just as is recommended in Recommendation **W-3**, which calls for updating codes to require regular maintenance of on-site wastewater systems in certain areas, it is recommended that municipalities adopt local laws requiring that new or replacement sanitary systems in areas with shallow depth to groundwater or within shallow groundwater conditions (i.e., establish a minimum distance from surface waters) to utilize best current available technology. It is recommended municipalities within the watershed consider adoption of a Nitrogen Protection Zone, designed to require stricter nitrogen removal standards for sanitary systems associated with newly constructed structures in proximity to surface waters. These requirements would also apply to structures undergoing substantial reconstruction or expansion. This initiative should be considered for all unsewered areas within the Watershed that are within a minimum of 500 feet of surface water (this distance could be modified based on additional factors such as density, soil conditions and depth to groundwater).

The Villages of Plandome, North Haven[6], and Sag Harbor[7] have code that require upgrades to IA systems on all new construction and renovations/additions meeting certain requirements. These codes can serve as model codes for similar legislation in other watershed municipalities.

P-3	**Strengthen Local Codes and Intermunicipal Coordination for Protection of Wetlands Within the Watershed**

This recommendation is to strengthen local codes and intermunicipal coordination for the protection of wetlands throughout the watershed. This could be undertaken by each individual municipality or a single partner could coordinate across multiple municipalities. There are many smaller un-mapped wetlands not protected under federal or state regulations that municipalities should document and extend protections to. Municipalities can benefit from a wetland protection, creation, and restoration program in many ways including reducing water quality problems, protecting water supplies, reducing stormwater quality and quantity problems, reducing flood and erosion losses, providing outdoor recreation activities, providing research and educational opportunities, and allocating lands throughout the community to their most suitable uses. Additionally, wetland-adjacent areas directly influence the ecological health, water quality, and hydrology of the wetland. Particular attention should be given to the vicinity of Mitchell Creek, where potential land preservation efforts could protect sensitive wetland and riparian habitats. These areas could be made subject to specific municipal regulations, such as overlay districts, minimum setbacks and buffers, sanitary system regulation, etc., to prevent

[6] https://www.northhavenny.gov/environmental-information/pages/innovativealternative-ia-septic-systems
[7] https://ecode360.com/34136080#34136080

development or harmful activities that could degrade the wetland and impact overall surface water health within the watershed.

Currently, only 6% of municipalities within the watershed have a regulation in place pertaining to wetlands (**Table 6-2** of the Regulatory Review and Assessment Section). Model local regulatory tools[8] available to municipalities include wetland conservation overlay districts, simple wetland and watercourse setbacks, and local freshwater wetland laws, as outlined in the New York State Department of State's Model Local Laws to Increase Resilience. These tools provide municipalities with flexible, legally vetted options to enhance local protections for wetlands and watercourses, particularly where state or federal jurisdiction does not apply. It is encouraged for municipalities to explore these tools for any applicability and adoption locally where applicable. Incorporating such measures into local codes can strengthen resilience to flooding, improve water quality, and preserve critical habitat.

P-4	**Update Municipal Codes for Commercial and Industrial Redevelopment**

This recommendation is to update local codes for commercial and industrial site redevelopment throughout the watershed. This could be undertaken by each individual municipality, or a single partner could coordinate across multiple municipalities. There are several large commercial properties within the Manhasset Bay watershed with redevelopment opportunities. Such sites may impact a large land area, have existing direct discharges of stormwater to the waterbody, or directly abut the waterbody providing opportunities for establishment of beneficial buffers, updated nitrogen reducing sanitary systems, and green stormwater infrastructure. Therefore, it is recommended that municipalities explore incorporation of green infrastructure, drainage improvements with water quality treatment requirements and requirements for establishment of native vegetative buffers into new development and redevelopment projects properties. There are few known industrial-zoned properties in the watershed; however, this recommendation should also be considered for industrial properties to ensure potential redevelopment incorporates these same recommendations.

It is recommended that any commercial or industrial property undergoing substantial redevelopment (e.g., site plan approval, change in use, or expansion over a set square footage) must include:

- Stormwater drainage improvements/upgrades upon existing conditions to meet best management practices, and ensure that drainage and water quality volumes account for the entirety of the property being redeveloped;
- Limitation of impervious surfaces;

[8] New York State Department of State. 2020. *Model Local Laws to Increase Resilience*. Accessible at: https://dos.ny.gov/system/files/documents/2020/09/model_local_laws_to_increase_resilience.pdf

- Installation of native vegetative buffers along property edges, especially abutting waterbodies, wetlands, or stormwater outfalls;
- Sewer connections or wastewater system upgrades in accordance with best-available technologies;
- Implementation of current energy/water conservation measures;
- Incorporation of green infrastructure techniques and stormwater pre-treatment to remove sediment, oils, and nutrients before discharge.
- Review of any open violations and pending status of permit coverage under the NYS Multi-Sector Stormwater General Permit (if applicable).

These improvements upon commercial redevelopment properties may also be achieved via offering incentives and flexibilities, such as offering expedited permitting, discounted application fees, tax incentives or similar incentives for projects that exceed minimum requirements. Municipalities should also require maintenance agreements for long-term care of drainage systems and buffers to ensure they are maintained in working, effective condition.

P-5	**Update Municipal Codes to Include Minimum Buffer Width Requirements**

This recommendation is to strengthen local codes to include minimum buffer width requirements throughout the watershed. This could be undertaken by each individual municipality, or a single partner could coordinate across multiple municipalities. Although buffers should be as wide as possible to protect water quality, requiring the restoration of a minimum buffer width for those parcels where the native vegetation has been removed would provide an established standard to ensure some protection of a waterbody from stormwater runoff generated from site improvements and lawn areas. It is noted that the majority of the Bay's frontage is currently developed.

Redevelopment provides an opportunity to establish native buffers and provide stormwater treatment. In recognition of potential site constraints, particularly on water dependent uses, the establishment of a 25-50 foot wide buffer consisting of native plant species is the minimum recommended for redevelopment of residential properties fronting the Bay, while a minimum 20 foot wide buffer is recommended for the redevelopment of existing commercial properties (where parking lots immediately abut the Bay). In recognition of the limitations of some of the commercial uses that abut surface waters, an option to install a permeable reactive barrier (PRB) behind a bulkhead to provide filtration of stormwater contaminants in place of the vegetated buffer could be given to applicants so that loss of waterfront space vital to the commercial use does not occur.

P-6	**Strengthen Municipal Oversight of Marina Operations**

It is recommended that municipalities within the watershed adopt uniform marina regulations. This could be undertaken by each individual municipality, or a single partner could coordinate across multiple municipalities. These regulations should address stormwater management, fueling practices, and waste handling. Specifically, provisions should include requirements for spill containment and cleanup, including spill response kits at fueling docks, mandated installation of best management practices, runoff monitoring, and proper storage and disposal of hazardous materials and solid waste.

Enforcement protocols should be strengthened to require routine annual inspections of marina facilities to ensure compliance with environmental standards. Clear fines and corrective action timelines for non-compliance should be established, with escalating consequences for repeat offenses.

P-7	**Incorporate Municipal Code Amendments for Fertilizer and Pesticide Use Fertilizer-Dependent Vegetation Limits**

It is recommended that municipalities throughout the watershed adopt uniform code amendments to regulate the application, storage, and sale of fertilizers and pesticides within the watershed for both commercial and residential properties. This could be undertaken by each individual municipality or a single partner could coordinate across multiple municipalities. Strategic recommendations to be implemented in codes include:

- Restricting applications during high-risk periods (e.g., heavy rainfall forecasts) and with sprinkler use.
- Establishing buffer zones that prohibit application within proximity to shorelines, wetlands, stormwater outfalls, and impervious surfaces.
- Mandating soil tests to prove the need for fertilizer. .
- Requiring commercial applicators to be certified in integrated pest management (IPM) and nutrient management.
- Adopting codes to promote limitations on fertilizer-dependent landscaping by discouraging installation of turf grass or other fertilizer-intensive vegetation, and require use of native plants in landscaping plans.

Once adopted, educational materials should be created and distributed to landscapers and landowners about the code amendments and the importance of proper fertilization practices. This recommendation links to Recommendations **O-1** and **S-15**.

P-8	Incorporate Municipal Code Amendments for Clearing Restrictions

It is recommended that municipalities within the watershed adopt vegetation clearing restrictions. This could be undertaken by each individual municipality or a single partner could coordinate across multiple municipalities. Such restrictions include: requiring permits for vegetation clearing over a defined threshold, wetlands, or steep slopes; restrictions on clearing within close proximity of wetlands; and mandated retention of mature trees and native understory vegetation. It is recommended municipalities require developers to submit vegetation management and landscaping plans as part of site plan approval and include long-term maintenance agreements for preserved vegetation and buffer zones.

P-9	Incorporate Litter Reduction Strategies

This recommendation is for the partners and other entities throughout the watershed to incorporate litter reduction strategies. The majority of public comments on the Manhasset Bay WQIP were related to litter observations. Litter has been frequently encountered throughout the watershed. Implementing a coordinated municipal strategy that combines infrastructure, enforcement, education, and community engagement will reduce the volume of litter impacting storm drains, streams, and waterbodies. Volunteer groups, such as girl and boy scout troops, are valuable partners in this effort.

It is recommended municipalities strengthen municipal ordinances by updating littering laws to increase fines for littering, and mandate litter control plans for large public events, public spaces, and commercial properties.

A coordinated feasibility study should be conducted to evaluate the effectiveness of trash capture devices in stormwater outfalls, the expansion of public waste stations, and the implementation of smart bin technology. The feasibility study must consider maintenance costs and responsibilities to ensure long-term effectiveness.

P-10	Enforce Illicit Discharge Ordinances

This recommendation is to enforce illicit discharge ordinances throughout the watershed. Further investigation is required to identify the lead partner. It is recommended that a coordinated effort be established to ensure all municipalities within the watershed are conducting required detection, elimination, and prevention of illicit discharges to stormwater systems, as required by the MS4 Program. While the majority of municipalities within the

watershed have adopted codes pertaining to illicit discharge, a coordinated effort to ensure all municipalities are maintaining up-to-date maps of outfalls, conducting regular dry-weather screening of outfalls, and tracing sources of suspected discharges.

Municipal staff should be trained in illicit discharge protocols and legal enforcement procedures.

Data and best current management practices should be shared across all municipalities within the watershed in order to ensure enhanced municipal capacity for water quality protection throughout the watershed.

1.9 Public Outreach and Stewardship (O)

This section outlines three targeted Public Education Recommendations aimed at enhancing community awareness and involvement in watershed stewardship. While these specific recommendations focus on key areas such as waterfowl management and data collection, it is strongly encouraged that public education be woven throughout all actions incorporated with the recommendations. Promoting volunteer opportunities and sharing information about reported issues will help ensure that the public remains informed and engaged. By fostering a well-informed community, we support long-term stewardship and the overall success of watershed protection efforts.

O-1	**Expand Upon Public Education and Signage Within the Watershed**

This recommendation is to expand upon existing public education and signage already in place throughout the watershed. This is an on-going need and could have various leads and partners for numerous projects into the future. Based on public comments received, there is a need for public education initiatives within the watershed pertaining to litter, fertilizer use, and other behaviors that may impact water quality. Educating residents, businesses, and stakeholders within the watershed about pollution prevention, sustainable practices, and watershed stewardship can aid in fostering long-term water quality improvements. Partnering with civic groups, residents, interested parties, and scout troops, as well as high schools will further this effort. This recommendation links to Recommendation **S-14**.

It is recommended that targeted educational materials be distributed to homeowners regarding fertilizer/pesticide use, septic system care, tips for reducing stormwater runoff, and native landscaping In addition educational materials can be spread regarding various rebate programs available to incentivize stormwater practices and native plantings for homeowners. Educational materials should also inform residents on the impacts of septic systems, the benefits of sewer

connections and I/A OWTS, proper system maintenance, and the funding assistance offered by the S.E.P.T.I.C. program.

Targeted educational materials for businesses should include best practices for waste disposal, spill prevention, and stormwater compliance, and should include industry-specific materials for industries such as landscapers, marinas, and auto shops. Targeted educational materials for food-based businesses should include information about the ills of leaving food out for waterfowl and other animals.

Targeted educational materials should be distributed to boaters regarding clean boating practices including pumpout requirements and availability, littering impacts and prevention, oil and fuel spill prevention, friendly fishing, wildlife avoidance, and invasive species, among other topics. In regards to municipal code amendments for fertilizer and pesticide use, educational materials should be created and distributed to landscapers and landowners about the code amendments and the importance of proper fertilization practices. This recommendation links to Recommendations **P-7** and **S-15**.

Educational materials should be distributed via multi channels such as social media, local newspapers, municipal websites, and fliers.

Educational signage should be implemented throughout strategic areas of the watershed providing messaging related to littering, picking up pet waste, and feeding of waterfowl. Additionally, it is recommended the MBPC and municipalities within the watershed continue to collaboratively involve the public in volunteer opportunities, such as cleanups, focus groups, or habitat restoration plantings.

An additional educational campaign recommendation can be focused on golf course management about fertilizer, pesticide, and other chemical use. This ties with Recommendation **M-6**. An educational campaign to spread awareness about the Nassau County S.E.P.T.I.C. program's existence and importance can go a long way to encouraging septic upgrades. This ties with Recommendation **W-3**.

Develop an educational program about the consequences of trucks parked in the commercial district to water quality and what preventative measures can be taken to protect against environmental degradation. This is especially a problem in the Whitney Pond subwatershed. This ties with Recommendations **M-2, M-3, M-4** and **S-8**, though this issue goes beyond municipal operations and includes commercial truck use.

Increased public awareness of watershed health and pollution sources will strengthen community engagement and stewardship and improvements to problem behaviors will positively impact water quality. A targeted behavior change education campaign will further this impact.

O-2	**Expand Public Access to Manhasset Bay for Recreation**

It is recommended that public recreational access to Manhasset Bay be expanded, which is also called for in Recommendation **M-8**. Such an undertaking would likely take several partners and would need further investigation to identify the lead. Expansion of public access to Manhasset Bay where possible helps to promote equitable, safe, and environmentally responsible public access to the waterbody for recreation – such as kayaking, fishing, and nature observation – while implementing safeguards to protect water quality and aquatic ecosystems. Public comment expressed a need for additional access points for kayaking launches or similar recreational uses. It is recommended that additional access points be evaluated, and that signage and public notification be improved for existing access points to improve public access to the waterbody and stewardship. These projects promote stewardship of the land and Bay, public engagement, and equitable use of the Bay's resources.

The design of any new access points should use permeable surfaces for parking and pathways to reduce runoff, incorporate green infrastructure where possible, provide pet waste stations, liter/recycling bins, and implement signage to protect habitat or educate the public on the health of the watershed. This recommendation should also incorporate litter reduction strategies as called for in Recommendation **P-9**.

O-3	**Litter Tracking Portal**

It is recommended that a partner develop a litter tracking tool that could be used throughout the watershed. To strengthen public stewardship and support litter reduction, it is recommended that municipalities or the MBPC implement a watershed-wide portal for residents to report litter observations using a mobile app or web platform. This program will help identify litter hot spots and guide targeted cleanup and educational efforts. A GIS-based dashboard should be developed to track reported litter and monitor cleanup activities. Public education campaigns should accompany the program to encourage participation (use of QR codes on signs that directly link to the website/tracking portal), raise awareness about the impacts of litter on water quality, and promote responsible disposal practices. This initiative will foster individual stewardship, community engagement, empower residents to take an active role in watershed protection, and support data-driven improvements to litter management.