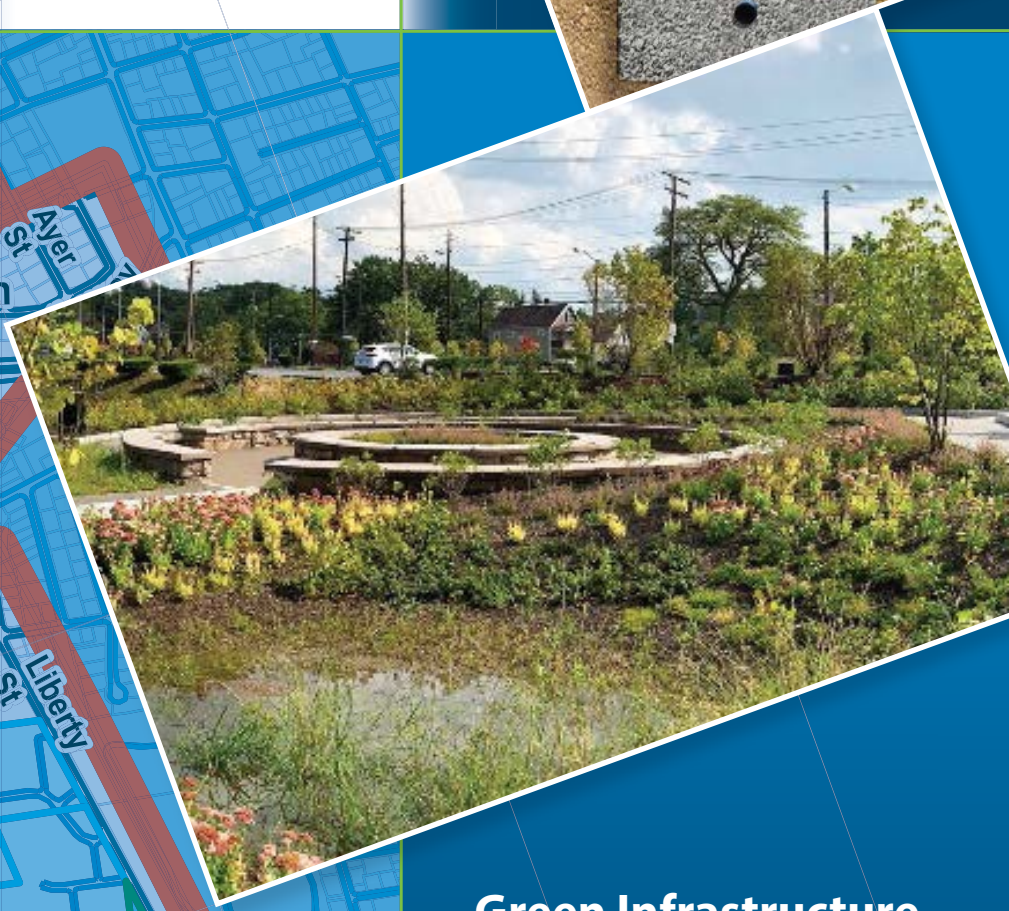
EXECUTIVE SUMMARY

City of New Bedford, Massachusetts



Green Infrastructure Master Strategy and Implementation Roadmap

June 2022

CDM Smith

KLA KIM LUNDGREN ASSOCIATES, INC

New Bedford is leading by example by implementing a Green Infrastructure Master Strategy to address climate change impacts and create a more resilient, equitable community.

What is Green Infrastructure and What are the Benefits?

More intense storms and increased precipitation caused by climate change mean that some aging stormwater systems are no longer capable of handling the volume of stormwater they receive. Green infrastructure is one solution that reduces urban flooding, mitigates extreme heat, improves neighborhood livability, and delivers environmental justice. Green infrastructure refers to a collection of natural solutions that store or absorb stormwater to reduce flows to existing stormwater infrastructure.

Types of Green Infrastructure

Vegetated Bioretention Areas/Rain Gardens

Shallow areas of plantings that collect and treat runoff from roofs, streets, and sidewalks.

Source: CDM Smith

Tree Infiltration Chamber

Trees planted in an infiltration chamber that absorbs and filters stormwater with relatively lower maintenance requirements.

Source: City of New Bedford

Right-of-Way Bioswales/ Linear Rain Garden

Often found along curbs and in parking lots, bioswales use vegetation to slow and filter stormwater flows. Linear rain gardens are relatively longer vegetated areas that can cost-effectively manage runoff from roadways and other large paved areas.

Source: CDM Smith

COMMUNITY BENEFITS

Green infrastructure delivers a host of community benefits, including:

Reduces flooding

Improves water quality

Mitigates extreme heat

Saves energy

Beautifies neighborhoods

Increases property values

Subsurface Storage

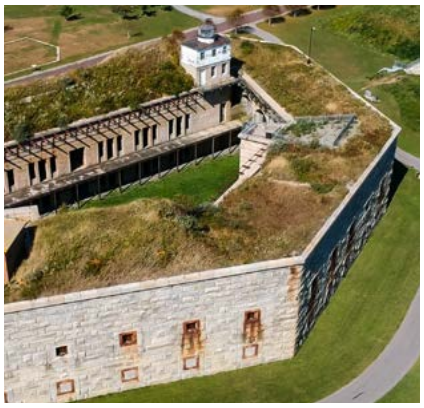
Systems that provide temporary underground storage and infiltration of stormwater runoff.

Source: CDM Smith

Blue Roofs

Roof designed for retention and slow release of stormwater to slow rates of runoff to street drainage systems.

Source: NYCDEP



Green Roofs

Roofs covered with vegetation that filter stormwater and reduce peak rates of runoff.

Source: City of New Bedford

Porous Pavements

Pavement that allows infiltration of stormwater runoff, including permeable pavers, precast pervious concrete, porous asphalt, or pervious concrete.

Source: CDM Smith

Synthetic Turf

Material used for athletic fields that provides an opportunity to collect, treat, and infiltrate stormwater within the crushed stone base below the field.

Source: CDM Smith

Rainwater Harvesting

Systems that reduce stormwater runoff volume by slowing and collecting runoff for later use.

Source: City of New Bedford

Green Infrastructure Master Strategy Objectives

The **Green Infrastructure Master Strategy and Implementation Roadmap** takes a holistic look at New Bedford's existing conditions and identifies priority areas for green infrastructure and opportunities for action. The Strategy strives to preserve and enhance New Bedford's coastal and natural areas and prioritizes disadvantaged neighborhoods where green infrastructure may provide the most community benefits.

The goals of the **Green Infrastructure Master Strategy and Implementation Roadmap** are to:

G O A L S

Identify equitable and impactful green infrastructure opportunities throughout the city.

Develop best practices for design, installation, and maintenance of green infrastructure.

Provide educational opportunities about green infrastructure and its maintenance.

Evaluate existing policy and provide tools to developers and engineers.

Identify the most cost-effective green infrastructure solutions to reduce urban flooding, improve water quality, and enhance neighborhood livability.

NB RESILIENT CLIMATE ACTION AND RESILIENCE PLAN

This Strategy helps New Bedford make progress with four *NB Resilient* actions:

Infrastructure, Utilities & Waste

Promote G.I. throughout NB parks, streets, and residential and commercial developments.

Natural Resources

Alternatives to impervious surfaces to improve stormwater flow and quality and reduce urban heat island effect.

Develop and implement an Urban Reforestation Plan to increase tree canopy coverage, reduce the urban heat island, and improve stormwater management.

Adopt a city-wide policy to use only native plant species, with a focus on pollinator plantings.

Priority Sites for Green Infrastructure

This Strategy identified 270 priority areas for green infrastructure throughout New Bedford. Locations were prioritized based on available space, quantity of impervious area, nearby streets and pedestrian paths, proximity to existing buildings, topography, and stormwater flow.

BY THE NUMBERS / The Strategy identified opportunities for green infrastructure in the following locations:

5

MUNICIPAL FACILITY SITES

(including Fire Station, Police Headquarters)

67

MUNICIPAL SEPARATE STORM SEWER SYSTEM RETROFIT OPPORTUNITIES

31

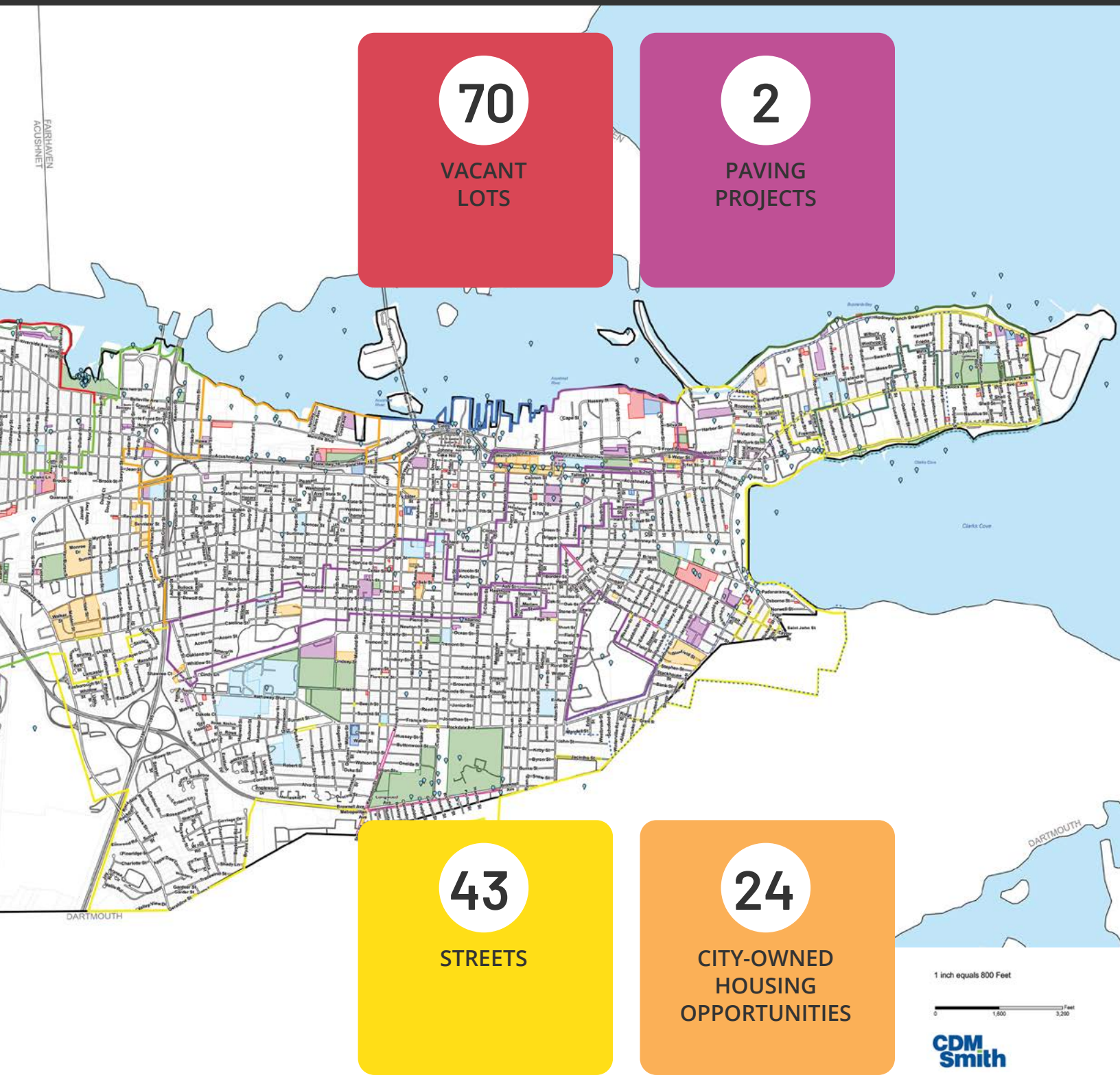
PARKS

(including fields, walking trails, playgrounds)

28

SCHOOLS

- Municipal Facilities
- MS4 Retrofits
- Vacant Lots
- Planned Paving Projects
- Public Green Infrastructure Input
- Parks
- Schools
- Streets
- City-owned Housing Developments
- Integrated Plan Green Infrastructure Area



70
VACANT LOTS

2
PAVING PROJECTS

43
STREETS

24
CITY-OWNED HOUSING OPPORTUNITIES

Recommended Green Infrastructure Opportunities

Costs and benefits for incorporating green infrastructure at different locations, such as parking lots, roadways, playgrounds, building entrances, and rooftops, were considered as part of this project. This evaluation helps identify the most cost-effective green infrastructure solutions for different types of locations. Green infrastructure solutions were evaluated based on maintenance, ease of installation, aesthetic value, environmental impact, volume of stormwater managed, and cost. Solutions were ranked using a ranking system of 1 to 5, with values of "1" being unfavorable and values of "5" being most favorable.

1 = UNFAVORABLE / **5** = MOST FAVORABLE

LOCATION	ALTERNATIVES BY TYPE OF GREEN INFRASTRUCTURE	Maintenance	Ease of Installation	Aesthetics	Environmental Impacts	Volume Managed	Cost	Score
Parking Lots	**Vegetated Bioretention Area/Rain Garden**	**2**	**4**	**5**	**5**	**4**	**5**	**4.05**
	Subsurface Storage	**4**	**2**	**2**	**4**	**5**	**5**	**4.05**
	Permeable Pavers	4	4	4	3	3	3	3.45
	Porous Asphalt	3	3	3	3	3	4	3.30
	Precast Pervious Concrete	4	4	3	3	3	2	3.00
	Cast-in-Place Pervious Concrete	3	2	3	3	3	3	2.95
Roadways	**Linear Rain Garden**	**2**	**4**	**5**	**5**	**4**	**5**	**4.05**
	Subsurface Storage (Under Sidewalks)	**4**	**2**	**2**	**4**	**5**	**5**	**4.05**
	Right-of-Way Bioswales	2	3	5	5	4	2	3.10
	Precast Pervious Concrete Gutters	4	4	3	3	3	2	3.00
	Tree Infiltration Chamber	3	4	4	4	4	1	2.85
Playgrounds	**Vegetated Bioretention Area/Rain Garden**	**2**	**4**	**5**	**5**	**4**	**5**	**4.05**
	Subsurface Storage	**4**	**2**	**2**	**4**	**5**	**5**	**4.05**
	Synthetic Turf Field	1	4	4	3	3	4	3.00
Building Entrance Areas	**Vegetated Bioretention Area/Rain Garden**	**2**	**4**	**5**	**5**	**4**	**5**	**4.05**
	Permeable Pavers	4	4	4	3	3	3	3.45
	Porous Asphalt	3	3	3	3	3	4	3.30
	Precast Pervious Concrete	4	4	3	3	3	2	3.00
	Cast-in-Place Pervious Concrete	3	2	3	3	3	3	2.95
Rooftops	**Redirect Roof Runoff to Green Infrastructure**	**4**	**3**	**5**	**5**	**3**	**3**	**3.75**
	Rainwater Harvesting	4	2	2	3	2	2	2.60
	Blue Roof	3	3	3	3	2	1	2.25
	Green Roof	1	2	5	5	1	1	2.05

Vegetated Bioretention Area/Rain Garden

Small, shallow areas of plantings that collect runoff from roofs, streets, and sidewalks.

Most Favorable For:

- **Parking**
- **Playgrounds**
- **Building Entrance Areas**

Community Benefits

- ☑ Allow for improved landscaping, better air quality and cooler environment during summer months
- ☑ Lowest cost per impervious acre treated and high positive environmental impact for playgrounds compared to artificial turf

SAMPLE CONCEPTUAL DESIGN

Source: CDM Smith

Linear Rain Garden

A rain garden that collects and treats stormwater runoff from large paved areas such as streets and parking lots.

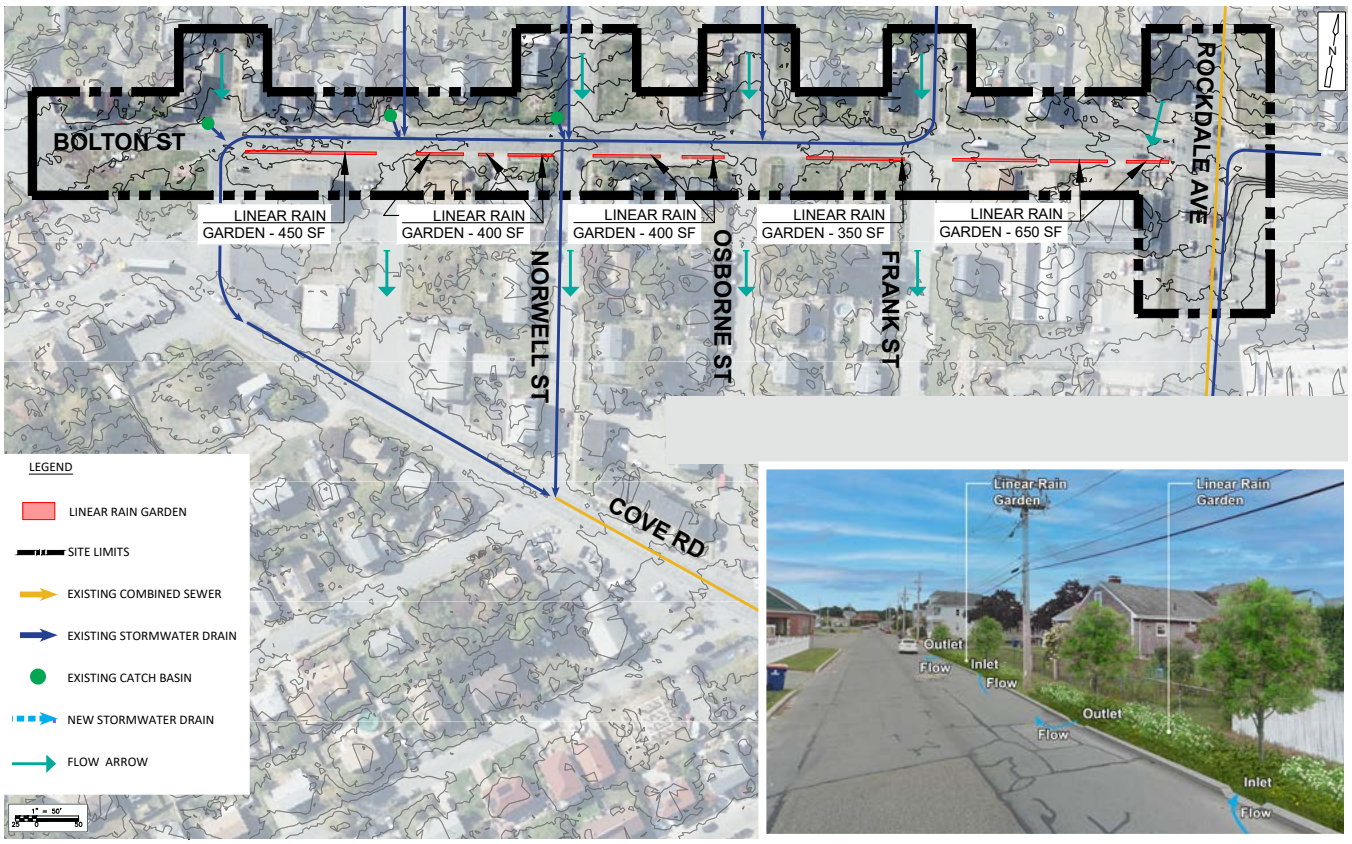
Most Favorable For:

- Roadways
- Parking
- Playgrounds

Community Benefits

- ☑ High aesthetic value in an urban environment, improving the quality of life for city residents
- ☑ Prioritizing vegetation and trees align with residents' preferred types of green infrastructure

SAMPLE CONCEPTUAL DESIGN



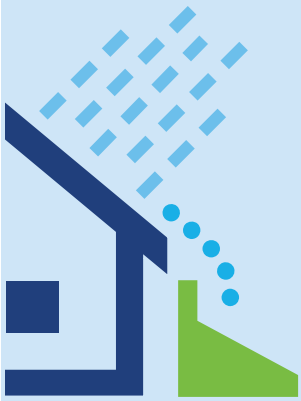
Source: CDM Smith

Please see **Section 3** of the *Green Infrastructure Master Strategy and Implementation Roadmap* for more examples of green infrastructure designs and cost estimates for different types of sites.

Operation and Maintenance Considerations

Each type of green infrastructure opportunity requires differing forms of operation and maintenance. Please see Section 3 of the **Green Infrastructure Master Strategy and Implementation Roadmap** for more detailed operation and maintenance guidelines.

GREEN INFRASTRUCTURE	MAINTENANCE GUIDELINES	FREQUENCY
Porous Pavements	Check for standing water after precipitation event	1-2x per year
	Remove debris and sediment	Bi-annually
	Maintain surrounding landscaped areas	As needed
	Check for cracking or deterioration	Annually
	Avoid storing or applying de-icing chemicals, sand/salt, mulch/soil, or yard waste on pavement	Continuously
Rain Gardens/ Vegetated Bioretention Areas	Check filter for debris after storm events and inlets/outlets for debris	Annually
	Inspect for damage or deterioration	Annually
	Inspect vegetation for health, density, and diversity	During growing season
	Remove fallen leaves and debris	Fall
	Apply pesticides, fungicides, fertilizers as required, add mulch, and cut back foliage	Spring
	Remove unwanted vegetation and litter and debris	Monthly
Tree Infiltration Chamber	Check filter for debris after storm events	Annually
	Inspect tree for health and prune excessive growth	During growing season
	Replace media to restore permeability	Every 5-10 years
	Remove litter and debris	Monthly
Subsurface Storage	Inspect chamber every 6 months for the first year.	Bi-annually
Synthetic Turf	Sweep surface of synthetic turf	Every 4-6 weeks
	Aerate the surface	3x per year
	Inspect and repair high traffic areas and add infill	As needed
Green Roof	Water and care for plants	During growing season
	Water vegetation or use automatic irrigation system	As needed
	Check that there is no ponding	Year 1: Bi-weekly Year 2+: Bi-annually
	Remove and replace dead plants and remove debris	As needed



MANAGING ROOF RUNOFF

During heavy rain events, large amounts of water drain off the roofs of buildings, which leads to increased runoff to collection systems and local waterways. While green and blue roofs are one potential solution to managing roof runoff, they have relatively high costs and may require structural analysis. The most cost-effective solution for managing roof runoff is redirecting stormwater to a vegetated bioretention area or other nearby green infrastructure. In terms of maintenance, cost, ease of installation, and beneficial impact, this strategy ranked most favorable of rooftop opportunities.

ACTIONS YOU CAN TAKE

Residents and businesses can help support New Bedford's efforts to reduce urban flooding, mitigate extreme heat, improve neighborhood livability, and deliver environmental justice.

Learn more about *NB Resilient* and its climate action goals at **nbresilient.com**

To learn more about green infrastructure in New Bedford, visit **nbresilient.com/category/green-infrastructure**

Get involved with **Greening the Gateway Cities** to plant more trees in New Bedford.

Prevent stormwater pollution from your home. Check out **Think Blue Massachusetts.**

Avoid using fertilizers and pesticides to prevent harmful runoff and keep our waterways clean with **these tips.**

Plant a rain garden with native plants to increase infiltration into the ground, limit runoff, and create a welcoming habitat for pollinators.