Green Infrastructure Resources

Kate England, Deputy Assistant Commissioner
Massachusetts Department of Environmental Protection
October 23, 2025

Stormwater

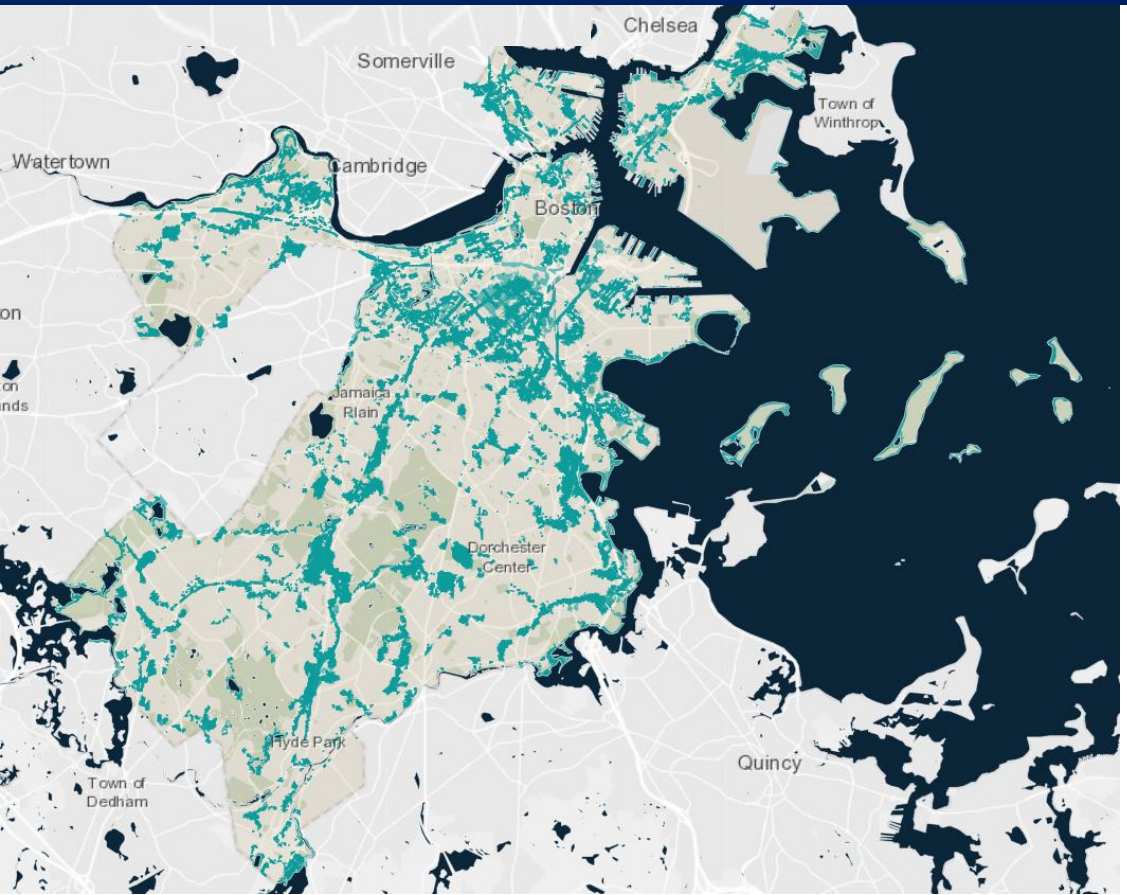
Quality

- As stormwater travels along hard, impervious surfaces, it picks up pollutants and litter along the way.
- Storm drains then release pollutant laden stormwater into receiving waters, which creates impaired water bodies, damages ecosystems and closes beaches.

Quantity

- During “typical” storm events, stormwater is largely captured and conveyed by storm drains.
- During large storm events, the storm drain system can become overwhelmed and outfalls can be blocked by storm surge and higher than normal tides, resulting in stormwater flooding.

Stormwater Flooding



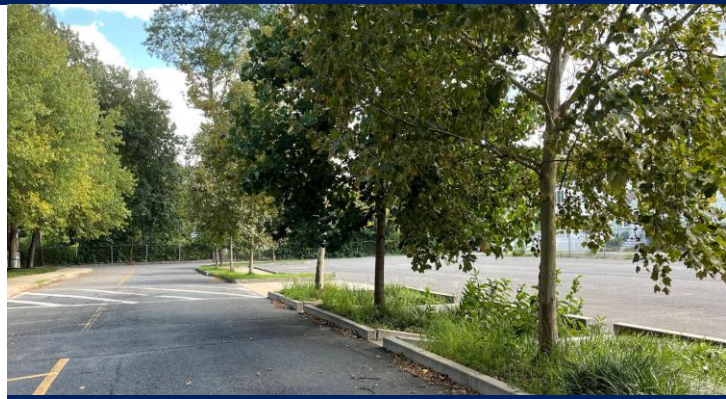
- Stormwater Inundation Mapping shows the projected “Long Term” impacts of stormwater
- Flooding in every neighborhood
- This affects us all!

Source: Climate Ready Boston Map Explorer

Green Infrastructure ("GI") uses plants, soil and other natural materials to mimic or restore the natural water cycle. GI can capture, purify, store and infiltrate stormwater back into the ground.

Harambee Park (Parks | Dorchester)

Rain Gardens & Bioswales



Sumner Upper School (Schools | Roslindale)

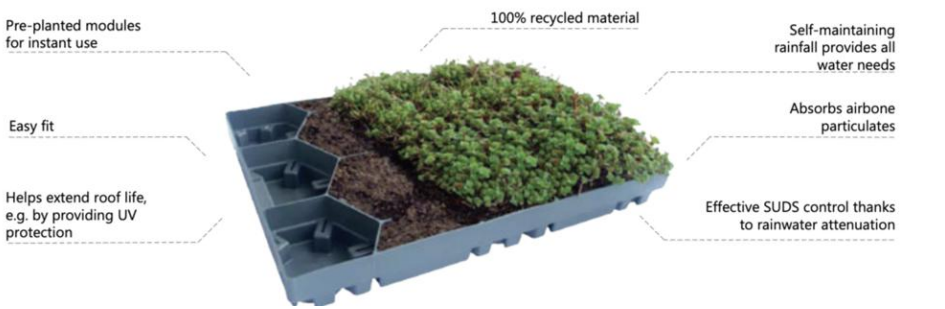
Hernandez K-8 School (Schools | Roxbury)

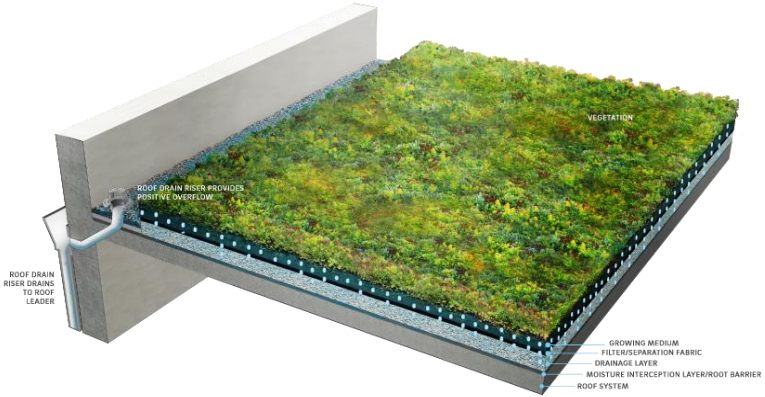
Tree Pits & Tree Infiltration Trenches

Audubon Circle (Streets | Fenway)

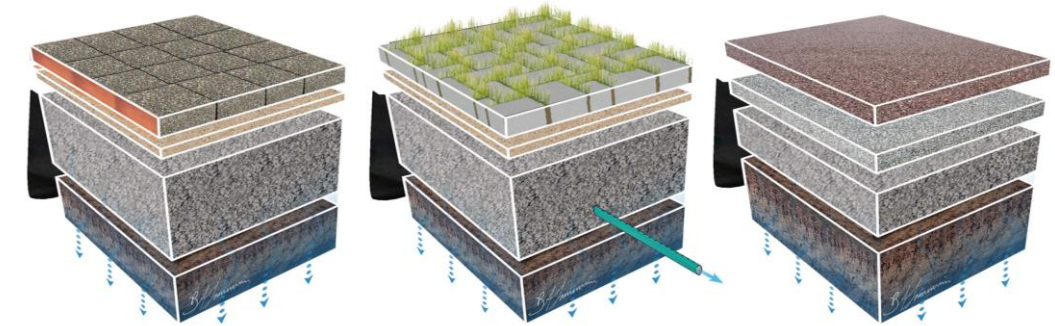
Central Square (Streets | East Boston)

Green Roofs & Living Walls





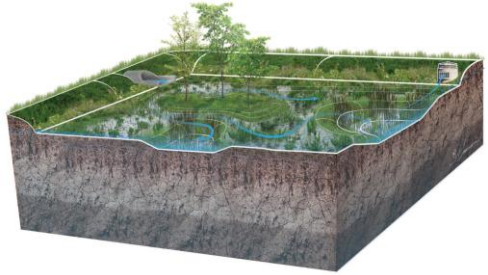
Porous Paving Materials



Nubian Square (Streets | Roxbury)

Constructed Wetlands & Marshlands

Harambee Park (Parks | Dorchester)



Harambee Park (Parks | Dorchester)

Co-Benefits

Nubian Square (Streets | Roxbury)

- Increased urban green space / tree canopy
- Reduced urban heat island effect
- Slower streets / improved pedestrian & cyclist safety
- More biodiversity / pollinator habitat
- Reduced energy usage
- Improved human health
  (*e.g. air quality, access to nature, food security, etc.*)
- Opportunities for environmental education

GI Details & Specifications

Audubon Circle (Streets/Parks | Fenway)

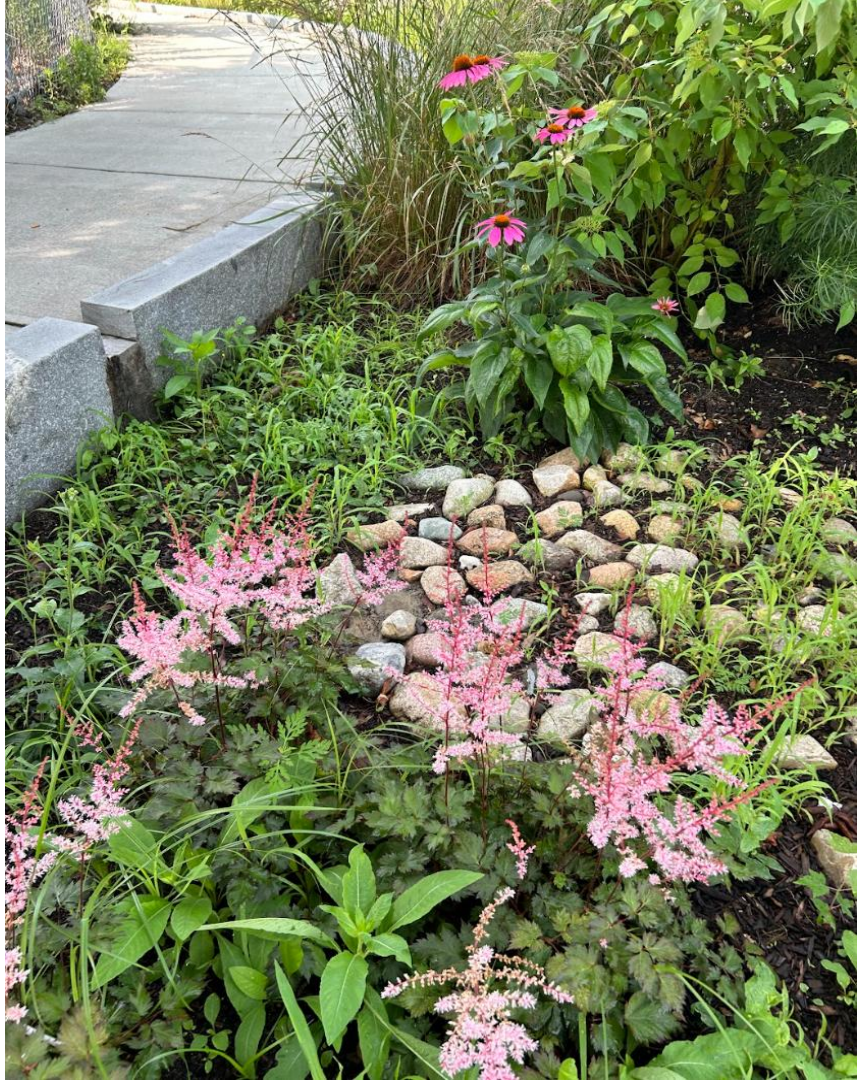
Chestnut Hill Ave
Brighton | 2019/2020

New England Avenue
Dorchester | Pre-Construction

New England Avenue
Dorchester | Post-Striping

New England Avenue
Dorchester | Post-Construction

New England Avenue
Dorchester

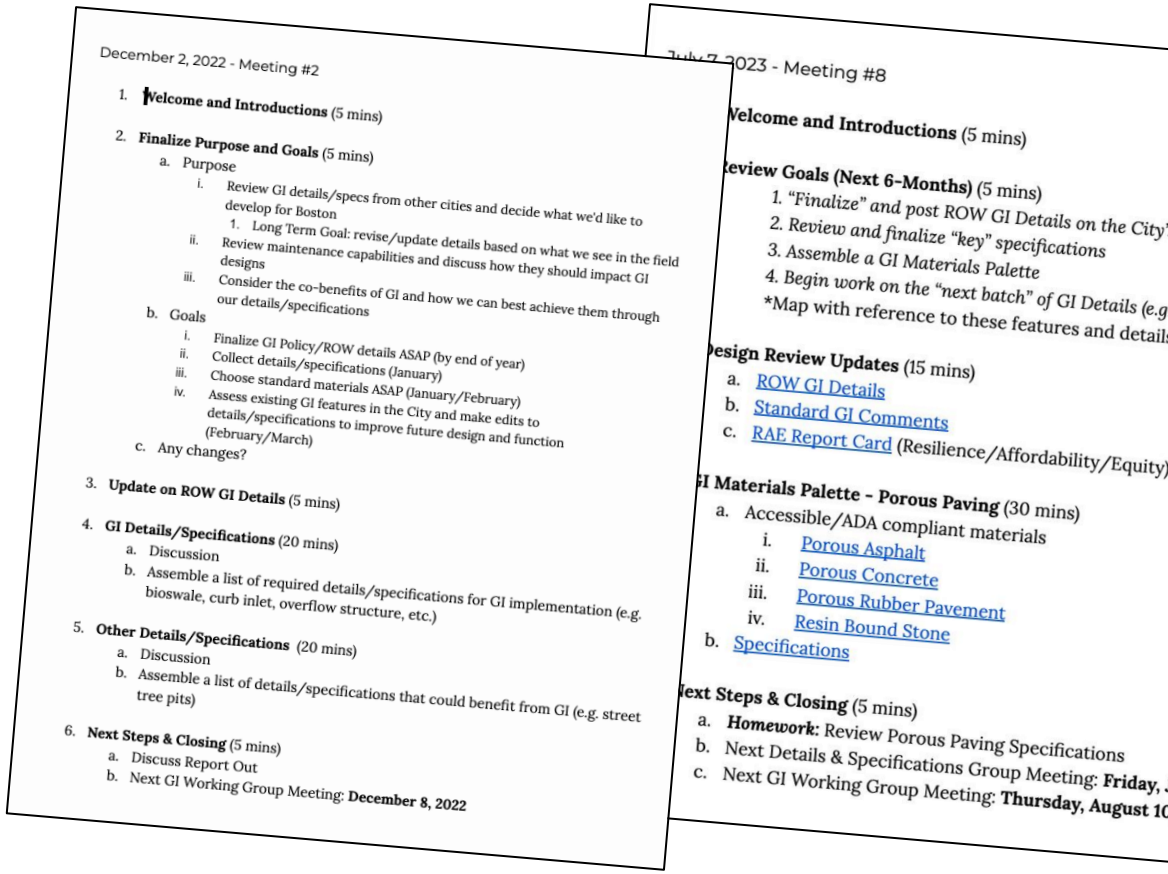


New England Avenue
Dorchester

GI ROW Details | Selecting Details & Materials

Details and materials were selected based on current best practice, feedback from the *Details & Specifications Subgroup* of the Green Infrastructure Working Group & discussions with relevant departments, e.g.:

- Disabilities Commission
- Public Works Department
- Transportation Department
- Parks & Recreation Department
- Boston Public Schools
- Boston Water & Sewer Commission



December 2, 2022 - Meeting #2

1. **Welcome and Introductions** (5 mins)
2. **Finalize Purpose and Goals** (5 mins)
   a. Purpose
      i. Review GI details/specs from other cities and decide what we'd like to develop for Boston
         1. Long Term Goal: revise/update details based on what we see in the field
      ii. Review maintenance capabilities and discuss how they should impact GI designs
      iii. Consider the co-benefits of GI and how we can best achieve them through our details/specifications
   b. Goals
      i. Finalize GI Policy/ROW details ASAP (by end of year)
      ii. Collect details/specifications (January)
      iii. Choose standard materials ASAP (January/February)
      iv. Assess existing GI features in the City and make edits to details/specifications to improve future design and function (February/March)
   c. Any changes?
3. **Update on ROW GI Details** (5 mins)
4. **GI Details/Specifications** (20 mins)
   a. Discussion
   b. Assemble a list of required details/specifications for GI implementation (e.g. bioswale, curb inlet, overflow structure, etc.)
5. **Other Details/Specifications** (20 mins)
   a. Discussion
   b. Assemble a list of details/specifications that could benefit from GI (e.g. street tree pits)
6. **Next Steps & Closing** (5 mins)
   a. Discuss Report Out
   b. Next GI Working Group Meeting: **December 8, 2022**

...2023 - Meeting #8

...**elcome and Introductions** (5 mins)

...**eview Goals (Next 6-Months)** (5 mins)
1. *"Finalize" and post ROW GI Details on the City*
2. *Review and finalize "key" specifications*
3. *Assemble a GI Materials Palette*
4. *Begin work on the "next batch" of GI Details (e.g*

*Map with reference to these features and details

...**esign Review Updates** (15 mins)
a. ROW GI Details
b. Standard GI Comments
c. RAE Report Card (Resilience/Affordability/Equity)

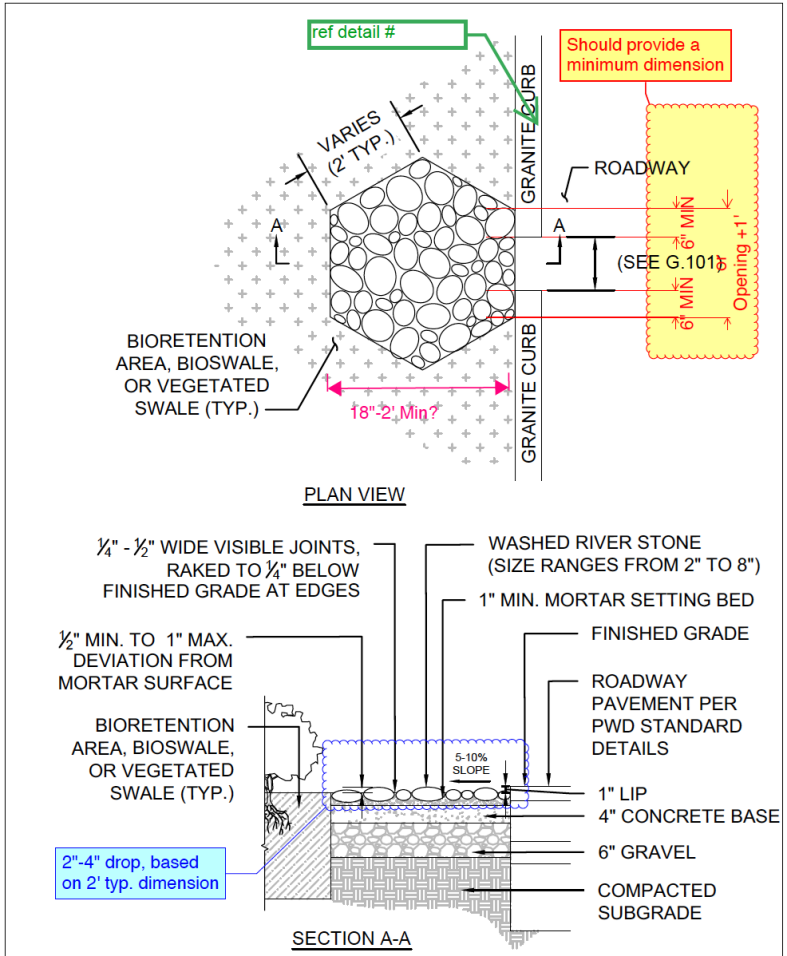
...**I Materials Palette - Porous Paving** (30 mins)
a. Accessible/ADA compliant materials
   i. Porous Asphalt
   ii. Porous Concrete
   iii. Porous Rubber Pavement
   iv. Resin Bound Stone
b. Specifications

...**ext Steps & Closing** (5 mins)
a. ***Homework:*** Review Porous Paving Specifications
b. Next Details & Specifications Group Meeting: **Friday, ...**
c. Next GI Working Group Meeting: **Thursday, August 10**

Detail	Title	Date of Issue
	STORMWATER CAPTURE	
G.101	CURB CUT INLET	XXX 2023
G.102	GRANITE COBBLE PAVER SPLASH PAD	XXX 2023
G.103	WASHED RIVER STONE SPLASH PAD	XXX 2023
G.104	STORMWATER CAPTURE WITH DROP INLET	XXX 2023
G.105	PREFABRICATED TRENCH DRAIN WITH GRATE	XXX 2023
G.106	CAST-IN-PLACE TRENCH DRAIN WITH GRATE	XXX 2023
G.107	PRECAST CONCRETE END SECTION FOR TRENCH DRAIN	XXX 2023
G.108	CURB CASTING FOR TRENCH DRAIN	XXX 2023
G.120	GENERAL NOTES FOR POROUS PAVEMENT SYSTEMS	XXX 2023
G.121	TYPICAL POROUS ASPHALT SECTION	XXX 2023
G.122	TYPICAL POROUS CONCRETE SECTION	XXX 2023
G.123	TYPICAL POROUS PAVER SECTION	XXX 2023
G.124	PERMEABLE RUBBER PAVING	XXX 2023
G.125	RESIN BOUND AGGREGATE OR PERMEABLE RUBBER PAVING AT TREES	XXX 2023
G.126	WATERSTOP	XXX 2023
	PRETREATMENT MEASURES	
G.201	PVC AREA DRAIN	XXX 2023
G.202	DRAIN CLEANOUT	XXX 2023
G.220	STONE FOR PIPE ENDS	XXX 2023
G.221	SEDIMENT FOREBAY AT PIPE INLET	XXX 2023
G.222	MINI-FOREBAY WITH WEIR AT CURB INLET	XXX 2023
G.223	MINI-FOREBAY WITH CHECK DAM AT CURB INLET	XXX 2023
G.224	STONE DIAPHRAGM	XXX 2023

(CONTINUED ON NEXT SHEET)

Detail	Title	Date of Issue
	DETENTION / INFILTRATION / EXFILTRATION	
G.301	GRANITE CURB FOR GREEN INFRASTRUCTURE NEAR SIDEWALK	XXX 2023
G.302	GRANITE CURB FOR GREEN INFRASTRUCTURE NEAR ROADWAY	XXX 2023
G.303	LOW METAL FENCE AT GREEN INFRASTRUCTURE	XXX 2023
G.304	SPECIAL LIGHT POLE FOUNDATION	XXX 2023
G.320	BIORETENTION SECTION	XXX 2023
G.321	BIOSWALE SECTION	XXX 2023
G.322	VEGETATED SWALE SECTION	XXX 2023
G.330	STONE INFILTRATION TRENCH	XXX 2023
G.331	SAND BASED STRUCTURAL SOIL INFILTRATION TRENCH	XXX 2023
G.360	SEEDED BIORETENTION AREA	XXX 2023
G.361	SHRUB, ORNAMENTAL GRASS, PERENNIAL, AND GROUNDCOVER PLANTING	XXX 2023
G.362	TREE PLANTING	XXX 2023
G.363	TREE PIT WITH AERATION / WATERING LOOP	XXX 2023
	STORMWATER RELEASE AND OVERFLOW	
G.401	PILED STONE CHECK DAM	XXX 2023
G.402	GRANITE OR CONCRETE WEIR	XXX 2023
G.403	METAL WEIR	XXX 2023
G.410	DOMED FRAME AND GRATE OVERFLOW STRUCTURE	XXX 2023



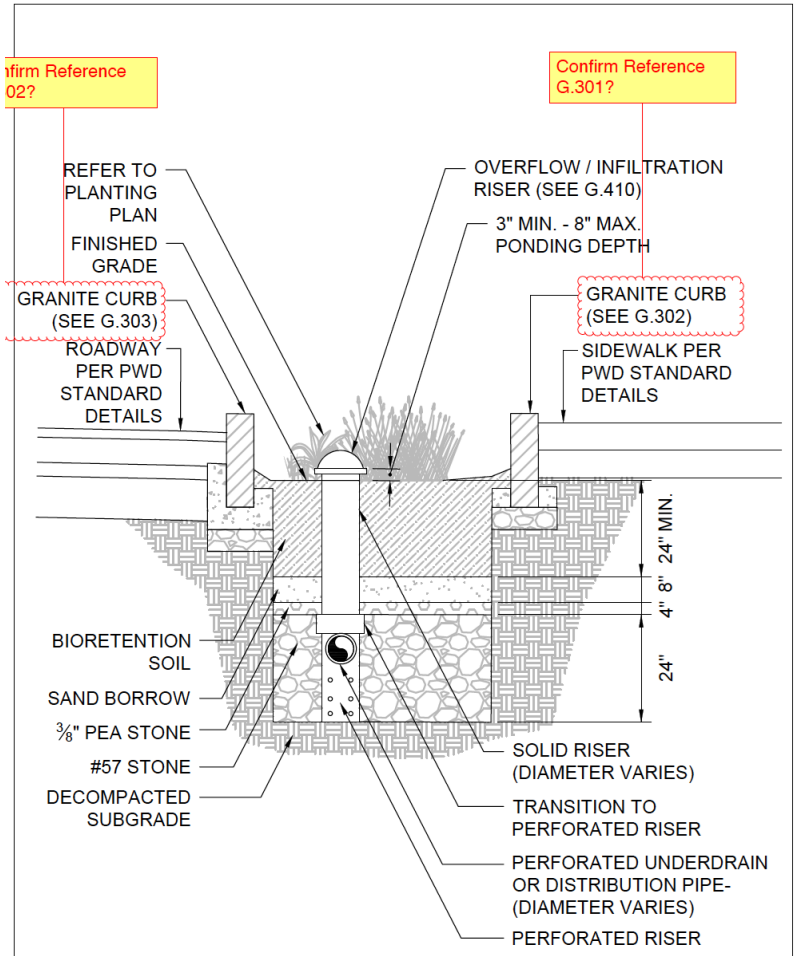
Public Works Department
Engineering Division
1 CITY HALL SQUARE, ROOM 710
BOSTON, MA 02201
(617) 635-4968

WASHED RIVER STONE SPLASH PAD

DATE OF ISSUE:

SCALE: N.T.S.

DETAIL NO. G.103



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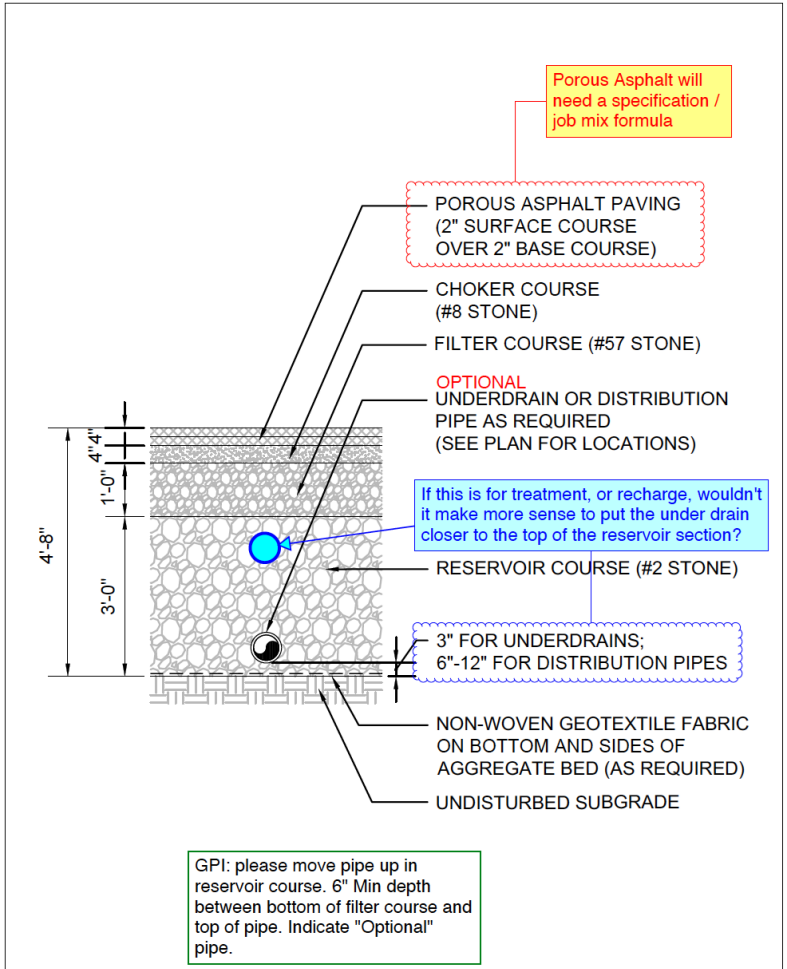
BIORETENTION SECTION

DATE OF ISSUE:

SCALE: N.T.S.

DETAIL NO. G.320



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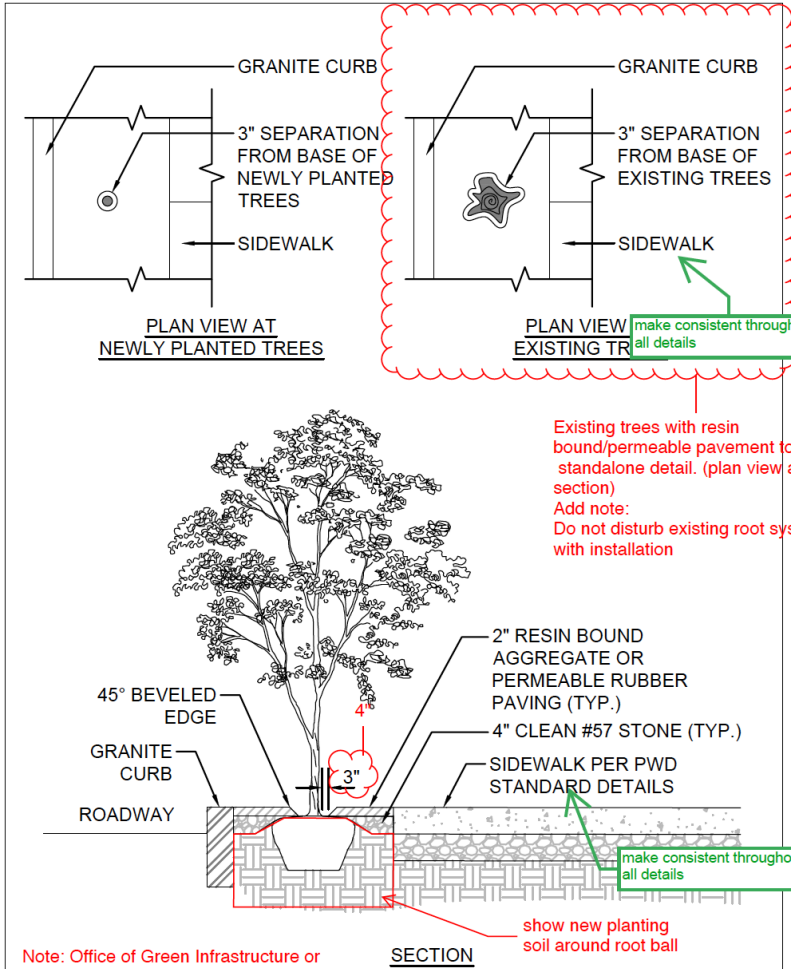
TYPICAL POROUS ASPHALT SECTION

DATE OF ISSUE:

SCALE: N.T.S.

DETAIL NO. G.121



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RESIN BOUND AGGREGATE OR PERMEABLE RUBBER PAVING AT TREES

DATE OF ISSUE:

SCALE: N.T.S.

DETAIL NO. G.125

Supporting Resources

Rain Garden (David A. Ellis Elementary School | Roxbury)

Supporting Resources | Guidelines

General Guidelines - Curb Extension Projects:

1. **Draw Curb Lines:** Determine the proposed curb lines based on the stated safety and modal goals of the Streets Cabinet
   a. Evaluate the length of the curb extension to provide adequate space for directional ramps and to improve or maintain sightlines.
   b. Lengthen the curb extension, as appropriate, to provide space for GI and avoid creating any "half parking spaces" in parking lanes

2. **Paths of Travel:** Determine the layout and widths for the proposed accessible paths of travel; both pedestrian and bicycle
   a. Pedestrian (5' min - don't oversize until after GI siting), and
   b. Bicycle (varies - 7.5' min - don't oversize until after GI siting)

3. **Ramp Locations:** Determine the locations for all proposed accessible ramps
   a. With wings: 5' wide
   b. Without wings: 6' wide (min)

4. **Infrastructure/Furnishings:** Determine locations for priority infrastructure, especially with unforgiving siting requirements
   a. e.g. bikeshare stations (standard 15-dock: 6' by 42'), bus shelter, etc.

5. **Green Infrastructure:** In the remaining "open" areas, chose one of four (4) Vegetate Surface Features (measurements below are inclusive of roadway curb width)
   a. *Seeded Area* - small areas (less than 3' x 3' - approx.)
   b. *Vegetated Swale* - narrow linear areas (less than 3' wide x any length - approx.)
   c. *Bioswale* - medium sized areas (2' - 6' wide x 10' - 15' long - approx.)
   d. *Bioretention* - "large" areas (larger than 5' wide x larger than 12' and other large open areas - approx. - can be exceptions)
   e. Note: *approx. measurements above are minimum dimensions - i.e. features c all be used in larger areas than the presented approx. dimensions, if desired*

Additional GI siting considerations and design guidelines (by feature type), below

Siting:

- Small linear areas - less than 3' wide x any length (approximate - can be used in larger areas)
- Can be located: between the roadway and a paved pathway; between two paved pathways, or; at the "back" of a paved pathway

Design:

- Swale-shaped (level bottom 6" - 2' wide)
- Maximum slope is 1:3
- Ponding depth of 2" - 4", max 6"
- Swale edge should be at grade or recessed approx. 1" below adjacent paved areas to allow runoff to sheet flow into the feature
- Minimum 6" wide level area (stone/planted) adjacent to any paved pathways
- Minimum soil depth of 12" (approx. 12" - 24")

Materials:

- Only biosoil, planting soil or amended native soils may be used - NO LOAM
  - Soil may be amended with sand for increased permeability
    - 3:1 ratio of soil (75%)/sand (25%)
  - Native soils may be amended with sand and compost
    - 3:1:1 ratio of soil (60%)/compost (20%)/sand (20%)
- Simple planting palettes should be used
  - Less than 3 plant species - grasses/herbaceous
- If seeded, an Office of Green Infrastructure approved seed mix must be used (use tools like Google Earth, ShadowMap and other apps to determine light levels):
  - Groundcover - herbaceous
  - Wildflower - Sun or Shade Mix
  - Miscellaneous mix from the approved list
- Trees may be planted in these features (with appropriate soil material volume/depth and if sightlines permit)

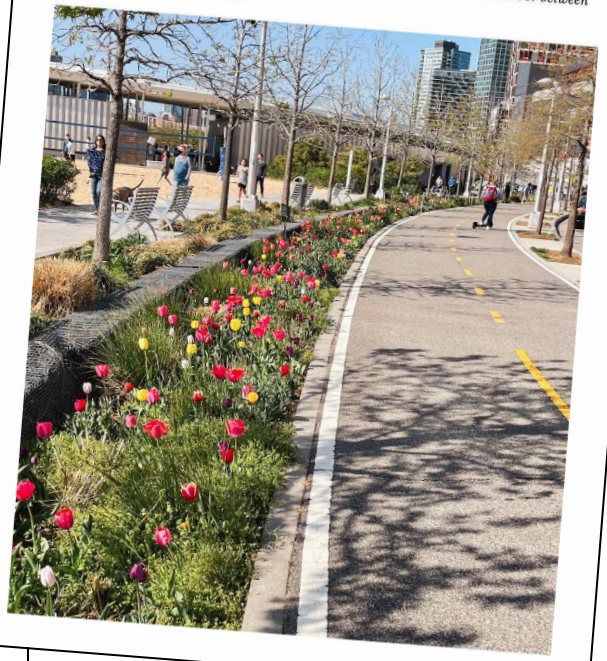
Additional Information:

- Areas that meet the size "requirements" for a Bioswale or Bioretention feature, but would not receive roadway runoff due to grading constraints should (at a minimum) be vegetated swales that accept runoff from the adjacent sidewalk/cycle track

- Tree fence or curb (granite/concrete) may be used around the perimeter of the feature, if desired, but are not required

Vegetated Surface Feature - Vegetated Swale:

Vegetated swales are small linear planted features with simple planting palettes, also sometimes referred to as "green strips." As the name implies, these features are swale-shaped and accept runoff from adjacent sidewalks and cycle tracks (rarely roadways). Vegetated swales are typically used at the back of curb, between the roadway and sidewalk or between walking paths and cycle tracks.



Supporting Resources | Plant Palettes

CoB ROW GI - Plant Palettes .XLSX

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Fern	Scientific Name	Light
Lady Fern	Athyrium filix-femina	P*/Sh
Sensitive Fern	Onoclea sensibilis	F/P*/Sh
Cinnamon Fern	Osmunda cinnamomea	F/P/Sh*

Grasses	Scientific Name	Light
Creek Sedge	Carex amphibola	P/Sh*
Fringed Sedge	Carex crinita	P/Sh
Pennsylvania Sedge	Carex pensylvanica	P/Sh*
Tussock Sedge	Carex stricta	P/Sh
Soft Rush	Juncus effusus	F/P
Switchgrass	Panicum virgatum	F
Little Bluestem	Schizachyrium scoparium	F*/P
Soft Stem Bullrush	Scirpus validus	F*/P

Perennials	Scientific Name	Light
Yarrow	Achillea millefolium	F*/P
Swamp Milkweed	Asclepias incarnata	F*/P
Butterfly Milkweed	Asclepias tuberosa	F
False Blue Indigo	Baptisia australis	F
Marsh Marigold	Caltha palustris	F/P
Turtlehead	Chelone glabra	F/P
Purple Coneflower	Echinacea purpurea (L.) Moench	F
Trout Lily	Erythronium americanum	F/P
Spotted Joe Pye Weed	Eupatorium maculatum	F*/P
Boneset	Eupatorium perfoliatum	F/P

Wetland Edge Seed Mix: Wet

Common	Scientific Name
Bluestar	Amsonia 'Blue Ice'
Dwarf Joe Pye Weed	Eupatorium dubium 'Little Joe'
Short Toothed Mountain Mint	Pycnanthemum muticum
Culver's Root	Veronicastrum virginicum 'Lavender Towers'

Wetland Edge Seed Mix: Wet/Dry

Common	Scientific Name
Swamp Milkweed	Asclepias incarnata
Showy Milkweed	Asclepias speciosa
Common Milkweed	Asclepias syriaca
Purple Milkweed	Asclepias purpurascens
White Wood Aster	Aster divaricatus

General "Wet" Seed Mix

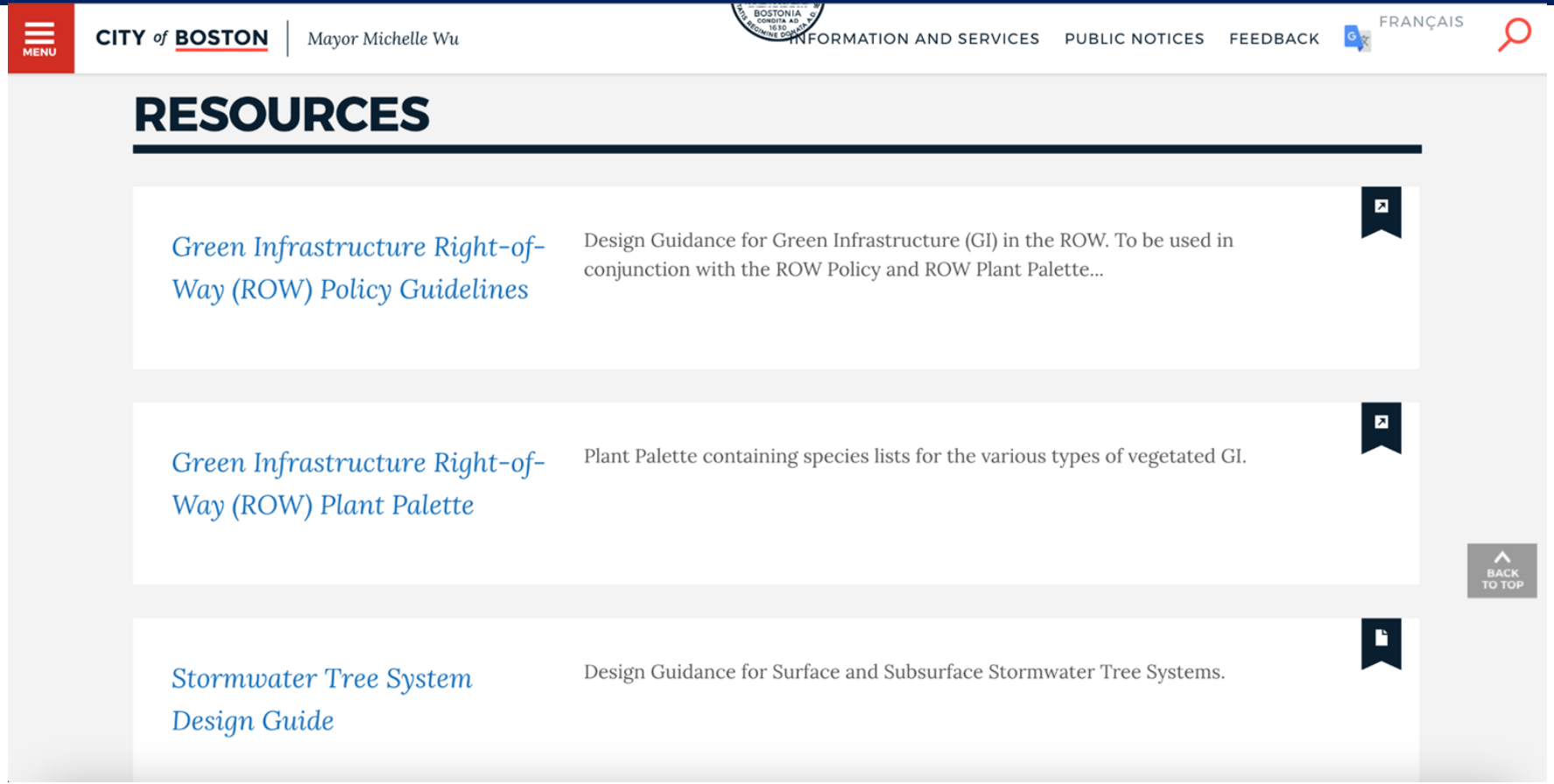
Common	Scientific Name
Joe Pye Weed	Eutrochium dubium
Little Bluestem	Schizachyrium scoparium
New England Aster	Symphyotrichum novae-angliae
Swamp Milkweed	Asclepias incarnata
Broom Sedge	Carex scoparia
Tussock Sedge	Carex stricta
Boneset	Eupatorium perfoliatum
Jewelweed	Impatiens capensis
Blue Flag Iris	Iris versicolor

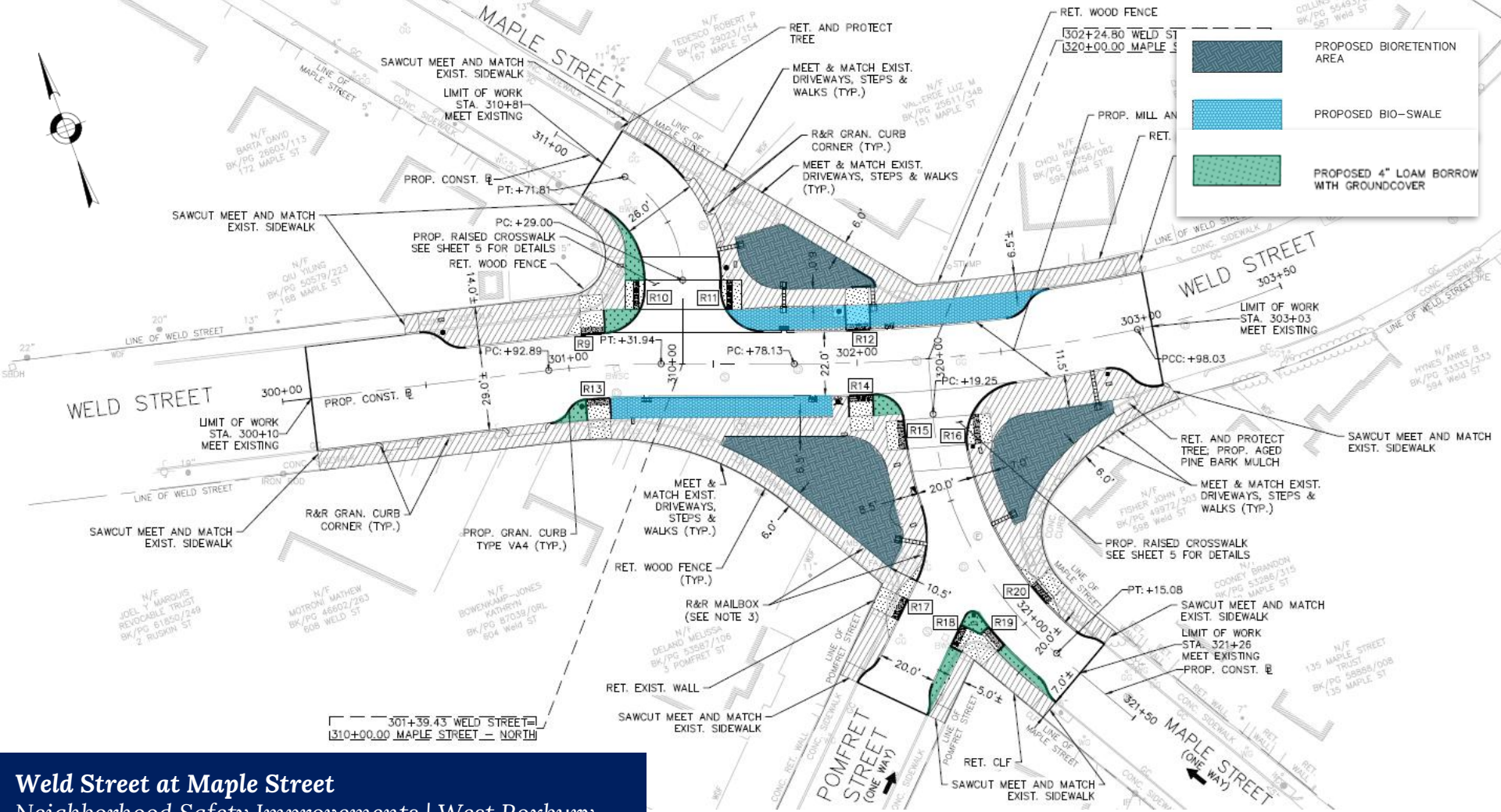
Seeded Areas | Vegetated Swale | Bioswale/Bioretention

Shrubs	Scientific Name	Light
Black Chokeberry	Aronia arbutifolia	F*/P
Common Buttonbush	Cephalanthus occidentalis	F*/P
Sweet Pepperbush	Clethra alnifolia	P
Dogwood	Cornus stolonifera	F/P*
Vernal Witchhazel	Hamamelis vernalis	F/P
Oakleaf Hydrangea	Hydrangea quercifolia	F*/P
Inkberry	Ilex glabra	F/P/Sh
Winterberry	Ilex verticillata	F/Sh
Virginia Sweetspire	Itea virginica	F*/P/Sh
Spicebush	Lindera benzoin	F*/P/Sh
Swamp Azalea	Rhododendron viscosum	F/P*
Elderberry	Sambucus canadensis	F*/P
Lowbush Blueberry	Vaccinium angustifolium	F*/P
Arrowwood	Viburnum dentatum	F/P
American Cranberrybush	Viburnum trilobum	F/P

F = Full Sun
P = Partial
Sh = Shade
* = Preference

Supporting Resources | Available on boston.gov





Weld Street at Maple Street

Neighborhood Safety Improvements | West Roxbury

Examples of Green Infrastructure

Nubian Square (Streets | Roxbury)

Bioswale (Nubian Square | Roxbury)

Porous Paving (Public Library| Roxbury)

Multiple (Central Square | East Boston)

Multiple (Central Square | East Boston)

Engaging Youth & Community

Sumner Upper School (Schools | Roslindale)

Five Pilot Schools

Jackson Mann School (Schools | Allston)

East Boston Early Education Center

Early Education Center (Schools | East Boston)

Franklin Field Housing Development

Franklin Field (BHA | Dorchester)

Stormwater Utilities (Fees)

Audubon Circle (Streets | Fenway)

Why Establish a Stormwater Utility (Fee)?

- Managing stormwater is expensive - Stormwater Utilities create a designated funding source that ensures better stormwater management - and more GI!

- Funds for stormwater management often come from less predictible and equitable sources:
  - *General Fund (taxes)*: very competitive, hard to compete with schools and emergency services
  - *Sewer Fee*: properties that use more water/sewer disproportionately bear the burden

- Stormwater Utilities incentivize GI and increase implementation by employing both a “carrot” and “stick” approach

Elements of Stormwater Utilities

Stormwater Utilities typically have three parts:

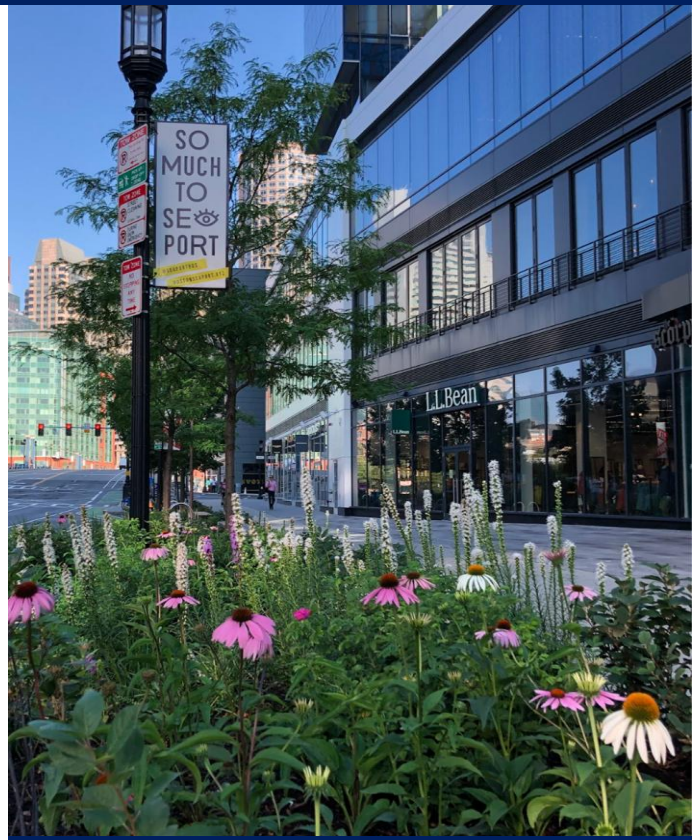
- **Stormwater Fee**
  - Fees, similar to water and sewer fees, that provide revenue for stormwater management
- **Credit Program**
  - Property owners can apply for “credits” to reduce fees
  - Credits can include: green infrastructure feature on site, impervious area reduction, public education, etc.
- **Grant Program**
  - Allows property owners to apply for grant funds to construct GI on their property
  - Then apply for a credit to reduce their fee!

Harambee Park (Parks | Dorchester)

What Are Your Goals?

Goals should determine the structure of the utility:

- **Revenue Generation**
  - Ample and defensible rate structure
  - Clearly articulated penalties for non-payment (& buffer)
- **Assistance from the Public**
  - Easily navigated Credit Program
  - Rates high enough to make applying for credits appealing to property owners
- **Municipality-Wide Behavior Change Around GI**
  - Generous Credit and Grant Programs
  - Resources and application support



Seaport Boulevard (Seaport)

Thank You!

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Central Square (Streets/Parks | East Boston)