

**WELCOME TO THE CITY OF MIAMI BEACH'S
RESILIENCE CONVERSATION SERIES ON**

MIAMIBEACH
RISING
ABOVE

BLUE GREEN INFRASTRUCTURE

Did you know Miami Beach is implementing creative infrastructure techniques to mitigate flooding and improve our water quality as part of our Integrated Water Management Strategy?

Tonight, you'll get a sneak peek at the overall approach and draft concepts for specific projects.

1

Join us for a presentation to discuss the proposed approach to blue green infrastructure and the potential co-benefits for recreation and social spaces.



2

Following the presentation there are displays of proposed concepts that could help our city live with water, including:



Small interventions that will be employed throughout the city, often on private property

Typical interventions that will be recommended in the City's upcoming Blue Green Infrastructure Concept Plan



Alternative conceptual designs for transformative, city-scale, blue green infrastructure projects.



These major projects are high-impact interventions, generally on public property

Share your thoughts by voting with dot stickers and writing your comments on the boards.



BGI PLANT MATRIX

South Florida is home to a diverse and vibrant tapestry of plant communities and ecosystems. For implementing blue green infrastructure across Miami Beach, Florida-friendly plants are the perfect choice as they are **climate adapted**, excel at **ecosystem services** and enhance **sense of place**. The list below is a **summary of species** that may be used in the BGI program.

STRATEGIC VALUE

FLORIDA-FRIENDLY PLANTS FOR BIORETENTION + BIOSWALE APPLICATIONS



Conoclinium coelestinum
Blue Mistflower



Stachytarpheta jamaicensis
Blue Porterweed



Erythrina herbacea
Coralbean



Heliotropium angiospermum
Scorpion Tail



Tripsacum dactyloides
Fakahatchee Grass



Tripsacum floridanum
Florida Gamagrass



Muhlenbergia capillaris
Muhly Grass



Serenoa repens
Saw Palmetto



Ilex cassine
Dahoon Holly



Coccolthrinax argentata
Silver Palm



Thrinax morrisii
Key Thatch Palm



Lysiloma latisiliquum
Wild Tamarind



Quercus virginiana
Live oak



Pontederia cordata
Pickerelweed



Nymphaea odorata
Fragrant Water Lily



Sagittaria latifolia
Arrowhead

FLORIDA-FRIENDLY PLANTS FOR CONSTRUCTED WETLANDS



Crinum americanum
Swamp Lily



Sagittaria lancifolia
Duck Potato



Eleocharis cellulosa
Spikerush



Eleocharis interstincta
Knotted Spikerush



Iris virginica
Blue Flag Iris



Canna flaccida
Golden Canna



Spartina bakerii
Sand Cord Grass



Taxodium ascendans
Pond Cypress

BGI PLANT MATRIX

FLORIDA-FRIENDLY PLANTS FOR CONSTRUCTED SALT MARSHES AND MANGROVES



Borrichia arborescens
Sea Ox-Eye



Helianthus debilis
Beach Sunflower



Heliotropium currasavicum
Seaside Heliotrope



Portulaca pilosa
Hairy Portulaca



Salicornia bigelovii
Glasswort



Strumphia maritima
Strumpfia



Juncus roemerianus
Black Rush



Spartina patens
Salt Marsh Cord Grass



Amphitecna latifolia
Black Calabash



Avicennia germinans
Black Mangrove



Languncularia racemosa
White Mangrove



Rhizophora mangle
Red Mangrove



Conocarpus erectus
Green Buttonwood



Conocarpus erectus var. sericeus
Silver Buttonwood



Coccoloba uvifera
Sea Grape



Coccoloba diversifolia
Pigeon plum

FLORIDA-FRIENDLY TREES FOR URBAN CANOPY RESTORATION



Acer rubrum
Red Maple



Codia sebestena
Geiger Tree



Quercus laurifolia
Laurel Oak



Pinus elliotii var. densa
South Florida Slash Pine



Bursera simaruba
Gumbo Limbo Tree



Ocotea coriacea
Lancewood



Krugiodendron ferreum
Black Ironwood



Swietenia mahagoni
American Mahogany

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STRATEGIC VALUE

COLLINS CANAL

HOW IT WORKS

- 1

MANAGED AQUATIC PLANT SYSTEMS
Managed Aquatic Plant Systems (MAPS) provide habitat, enhance aesthetics, and improve water quality in the canal by reducing common pollutants such as nitrogen, phosphorus, and suspended solids. MAPS will be anchored into the canal bottom, allowing them to rise during flood/high-tide conditions and remain functional and resilient.
- 2

ENHANCED TREE PITS/TRENCHES
Filters and stores stormwater flows to improve water quality prior to discharging into the canal, while providing significant rooting volume for street trees
- 3

PERMEABLE PAVEMENT
Stormwater from Dade Boulevard will flow onto bike and pedestrian lanes constructed of permeable pavement, which looks similar to standard pavement but allows water to drain through its openings and into an underlying infiltration / storage trench. Permeable pavement will reduce the amount of stormwater flowing into the canal.

← **TODAY**
← **ENHANCED**



WATER MANAGEMENT BENEFITS

Capture of roadway runoff helps to reduce peak flows (during high frequency events)

Treatment of roadway runoff reduces hydrocarbons and heavy metal pollution

Treatment uptakes nitrogen and phosphorus, reducing likelihood of algae blooms



ADDITIONAL BENEFITS

Neighborhood Beautification

Walking and biking paths

Waterfront Seating

Kayak drop-in points

RESIDENTIAL STREET

STRATEGIC VALUE

HOW IT WORKS

1 PERMEABLE PAVEMENT / DELINEATED ON-STREET PARKING

Stormwater will discharge in defined permeable pavement parking areas. Permeable pavement looks like standard pavement but allows water to drain into an underlying infiltration trench. Permeable pavement will reduce stormwater flowing into private property, minimize soil compaction from parked vehicles on lawns, recharge groundwater, and filter stormwater.

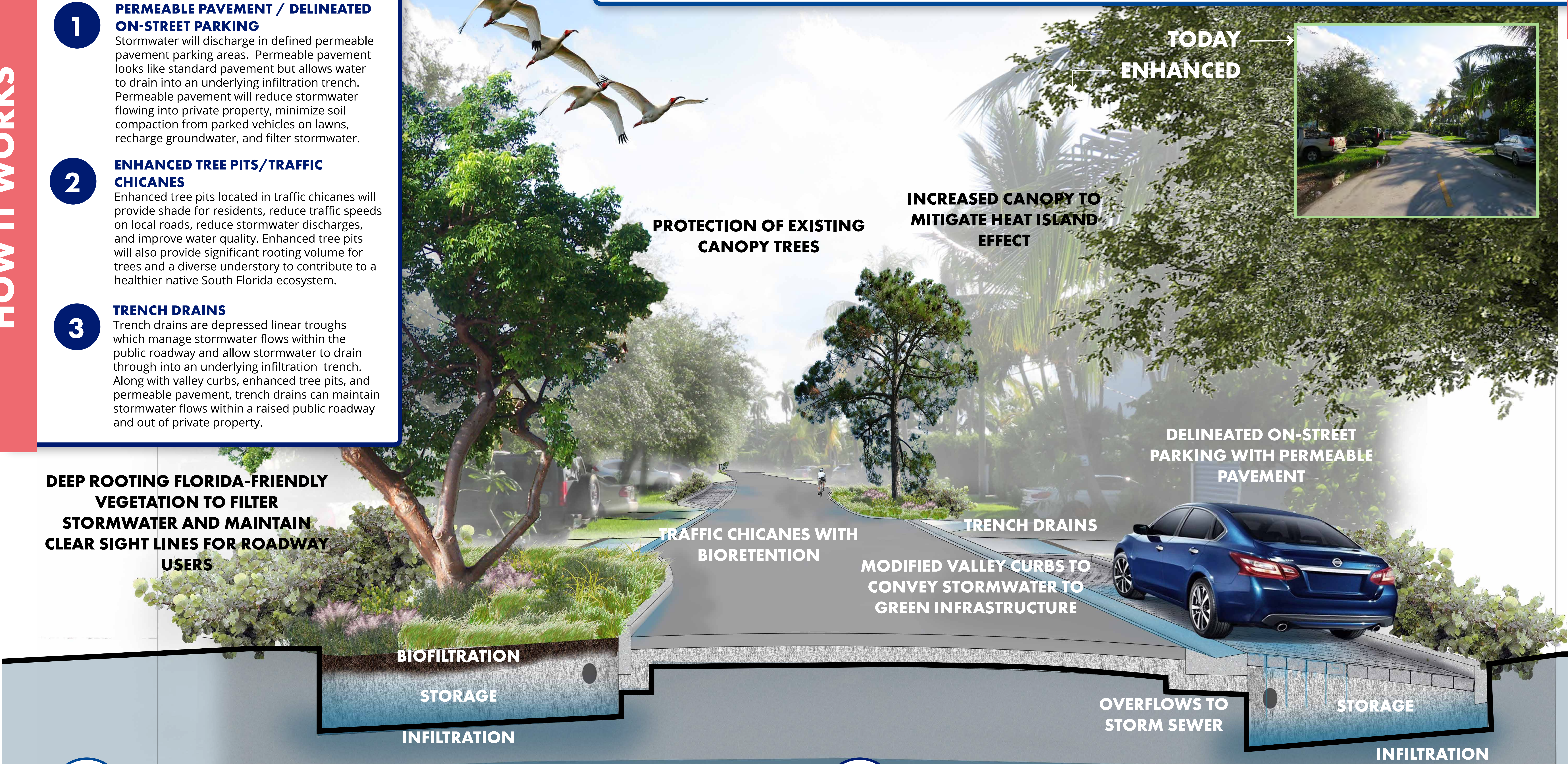
2 ENHANCED TREE PITS/TRAFFIC CHICANES

Enhanced tree pits located in traffic chicanes will provide shade for residents, reduce traffic speeds on local roads, reduce stormwater discharges, and improve water quality. Enhanced tree pits will also provide significant rooting volume for trees and a diverse understory to contribute to a healthier native South Florida ecosystem.

3 TRENCH DRAINS

Trench drains are depressed linear troughs which manage stormwater flows within the public roadway and allow stormwater to drain through into an underlying infiltration trench. Along with valley curbs, enhanced tree pits, and permeable pavement, trench drains can maintain stormwater flows within a raised public roadway and out of private property.

In Miami Beach residential streets vary in whether they include on-street parking, curbs, sidewalks, and other improvements, while often accommodating numerous driveways, alleys, and roadway intersections. Permeable pavement, enhanced tree pits, traffic chicanes, and other drainage features such as trench drains can be incorporated within varying residential roadway conditions to **improve water quality, calm traffic, and reduce flows to private property.**



WATER MANAGEMENT BENEFITS

Capture of roadway runoff helps to reduce peak flows (during high frequency events)

Treatment of roadway runoff reduces hydrocarbons and heavy metal pollution

Treatment and infiltration of stormwater to recharge groundwater supplies and replenish freshwater lens



ADDITIONAL BENEFITS

Neighborhood beautification

Additional shade for walking and biking

Increased biodiversity

Traffic calming

Reduced heat island effect

COMMERCIAL STREET

HOW IT WORKS

- 1

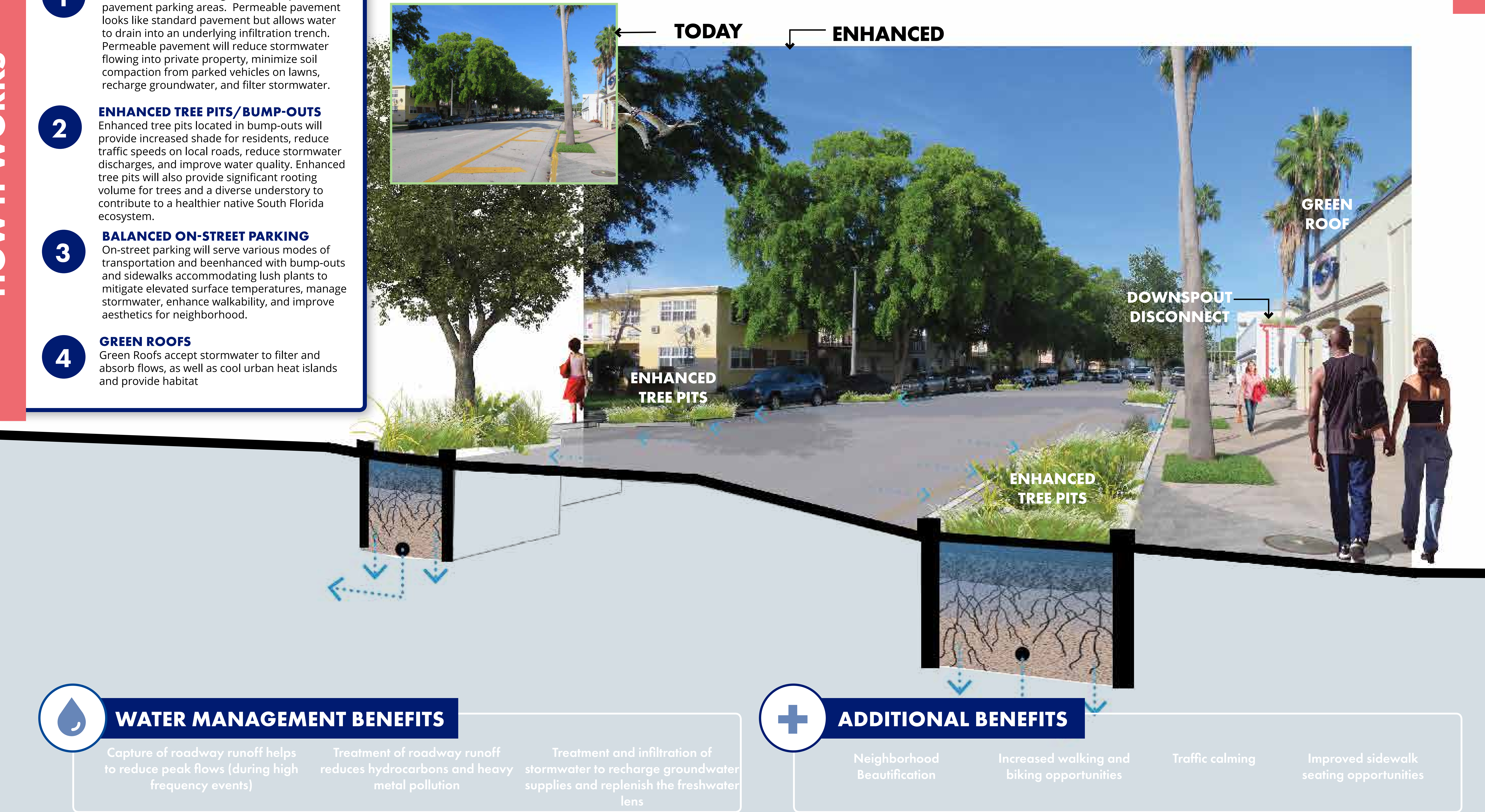
PERMEABLE PAVEMENT
Stormwater will discharge in defined permeable pavement parking areas. Permeable pavement looks like standard pavement but allows water to drain into an underlying infiltration trench. Permeable pavement will reduce stormwater flowing into private property, minimize soil compaction from parked vehicles on lawns, recharge groundwater, and filter stormwater.
- 2

ENHANCED TREE PITS/BUMP-OUTS
Enhanced tree pits located in bump-outs will provide increased shade for residents, reduce traffic speeds on local roads, reduce stormwater discharges, and improve water quality. Enhanced tree pits will also provide significant rooting volume for trees and a diverse understory to contribute to a healthier native South Florida ecosystem.
- 3

BALANCED ON-STREET PARKING
On-street parking will serve various modes of transportation and beenhanced with bump-outs and sidewalks accommodating lush plants to mitigate elevated surface temperatures, manage stormwater, enhance walkability, and improve aesthetics for neighborhood.
- 4

GREEN ROOFS
Green Roofs accept stormwater to filter and absorb flows, as well as cool urban heat islands and provide habitat

Commercial streets often **accommodate on-street parking**, curbs, and sidewalks serving varying land uses. Lessened driveway conflicts within these corridors provide opportunities for longer segments of **permeable pavement, trees, infiltration and storage trenches** to **improve water quality**.



NEIGHBORHOOD PARK

STRATEGIC VALUE

HOW IT WORKS

- 1 **PERMEABLE PAVEMENT**
Stormwater will discharge in defined permeable pavement areas. Permeable pavement looks like standard pavement but allows water to drain into an underlying infiltration trench. Permeable pavement will reduce stormwater flowing into private property or streets, minimize soil compaction from parked vehicles on lawns, recharge groundwater, and filter stormwater.
- 2 **ENHANCED TREE PITS**
Enhanced tree pits and biofiltration trenches will provide increased shade for residents, reduce stormwater discharges, and improve water quality. Enhanced tree pits will also provide significant rooting volume for trees and a diverse understory to contribute to a healthier native South Florida ecosystem.
- 3 **RAIN GARDENS AND BIOSWALES**
Rain gardens generally reduce stormwater discharges by absorbing storm water runoff from impervious areas such as walkways, parking lots, hard sports courts, and compacted lawn areas. Bioswales generally reduce stormwater discharges and recharge groundwater by intercepting, diverting, and absorbing storm water runoff from impervious areas such as walkways, parking lots, hard sports courts, and compacted lawn areas.
- 4 **CONSTRUCTED WETLANDS**
Constructed wetlands mimic natural wetlands by retaining and filtering water, cycling nutrients, while supporting habitat for a diverse range of species. They are designed to continually hold water, either at the surface or just below the soil surface.

Parks provide a great opportunity to **collect, infiltrate, and store** stormwater during smaller, more frequent rain events. Permeable pavement, enhanced tree pits, bioswales and infiltration trenches may be used near park perimeters and access points. Rain gardens and constructed wetlands can be utilized within parks to **reduce** stormwater quantities, **improve** water and air quality, and **enhance** gathering spaces.



← **TODAY**
↓ **ENHANCED**



WATER MANAGEMENT BENEFITS

- Capture of roadway runoff helps to reduce peak flows (during high frequency events)
- Treatment of roadway runoff reduces hydrocarbons and heavy metal pollution
- Treatment and infiltration of stormwater to recharge groundwater supplies



ADDITIONAL BENEFITS

- Neighborhood Beautification
- Walking and biking paths
- Additional shade along park perimeter
- Enhanced biodiversity

MIAMI BEACH GOLF CLUB

The Art of the Possible - below are **three high-level scenarios** exploring the redevelopment of the Miami Beach Golf Club into a blue green infrastructure asset: 1) a **retrofit** scenario - keeping all eighteen holes; 2) a **repurpose** scenario - converting the back nine holes into a signature park; and 3) a **reimagine** scenario - converting the club into a central park with potential development opportunities.

STRATEGIC VALUE



1 RETROFIT



2 REPURPOSE



3 REIMAGINE

MIAMI BEACH GOLF CLUB

HOW IT WORKS

- 1 GOLF CLUB REMAINS INTACT**
The existing eighteen hole golf course remains largely intact and functioning much the same as it does today.
- 2 RETROFIT THE WATER HAZARDS**
The water hazards and out of bounds areas are redesigned to include BGI interventions such as stormwater detention, wet ponds and bioswales.
- 3 TRANSFORM THE EDGES TO BGI**
The edges of the golf club will be redesigned to include bioretention zones, pervious pavement and facilities may be retrofitted to include rainwater harvesting features.
- 4 CONNECT TO DISTRICT SYSTEMS**
The increased stormwater capacity and water quality treatment facilities may allow for networking the interventions to other BGI projects, such as Collins Canal.

Scenario 1 retrofits the Miami Beach Golf Club with tactical blue green infrastructure interventions to reduce stormwater volumes and improve water quality. The existing water hazards and edges of the golf club would be enhanced and redesigned with blue green practices. **All eighteen holes and golf facilities would be maintained** more or less as they are today.



1 RETROFIT

MIAMI BEACH GOLF CLUB

HOW IT WORKS

- 1 GOLF CLUB FRONT NINE STAYS AS-IS**
The land area of the front nine of the golf club is kept intact and reconfigured as necessary for an executive course.
- 2 REPURPOSE THE BACK NINE**
Consider repurposing the 65 acres comprising the back nine to accommodate BGI interventions and the potential for a substantial open space improvement.
- 3 CREATE A SIGNATURE PARK SPACE**
Repurposing the back nine into a signature modern park space. A park which balances environmental, social and economic considerations and provides a framework for district-wide resiliency.
- 4 LINK BGI SYSTEMS IN PARK TO THE NEIGHBORHOOD**
Stormwater storage and water quality measures may be designed to accept and integrate with adjacent BGI improvements, such as Collins Canal.

Scenario 2 repurposes the back nine holes of the Miami Beach Golf Club to create a new **signature park** focused on integrating **passive and active recreation** with a robust blue green infrastructure program to mitigate stormwater volumes and improve water quality. In this high-level concept the **front nine holes** of the Golf Club **remain** intact as an executive course.

STRATEGIC VALUE



2 REPURPOSE

MIAMI BEACH GOLF CLUB

HOW IT WORKS

- 1

REIMAGINE ALL 145 ACRES

The entire publicly-owned golf club may be transformed into an amenity for all Miami Beach residents. One that responds to a holistic view of sustainability.
- 2

MIAMI BEACH'S CENTRAL PARK

Reimagining the golf club as a new central park for Miami Beach. A 21st century open space working to bring people together while improving the city's resiliency.
- 3

A POSTCARD DESTINATION

The potential is to create a new postcard moment for Miami Beach - one that advertises its proactive approach to mitigating climate change impacts and understanding urban placemaking.
- 4

LIVING WITH WATER

Additional potential opportunities may include leveraging a portion of the land for public and private development, such as a mixed-use eco-district working to fulfill the City's objectives on sustainability, social equity and environmental justice.

Scenario 3 reimagines the entire Miami Beach Golf Club to establish a 21st century **"Central Park"** for Miami Beach. This initial concept sketch explores the potential of a **new neighborhood** predicated on a **Living with Water** theme, a **recreation hub**, and a signature **wetland park** with hiking and biking trails and passive and active recreation opportunities.

STRATEGIC VALUE



3 REIMAGINE

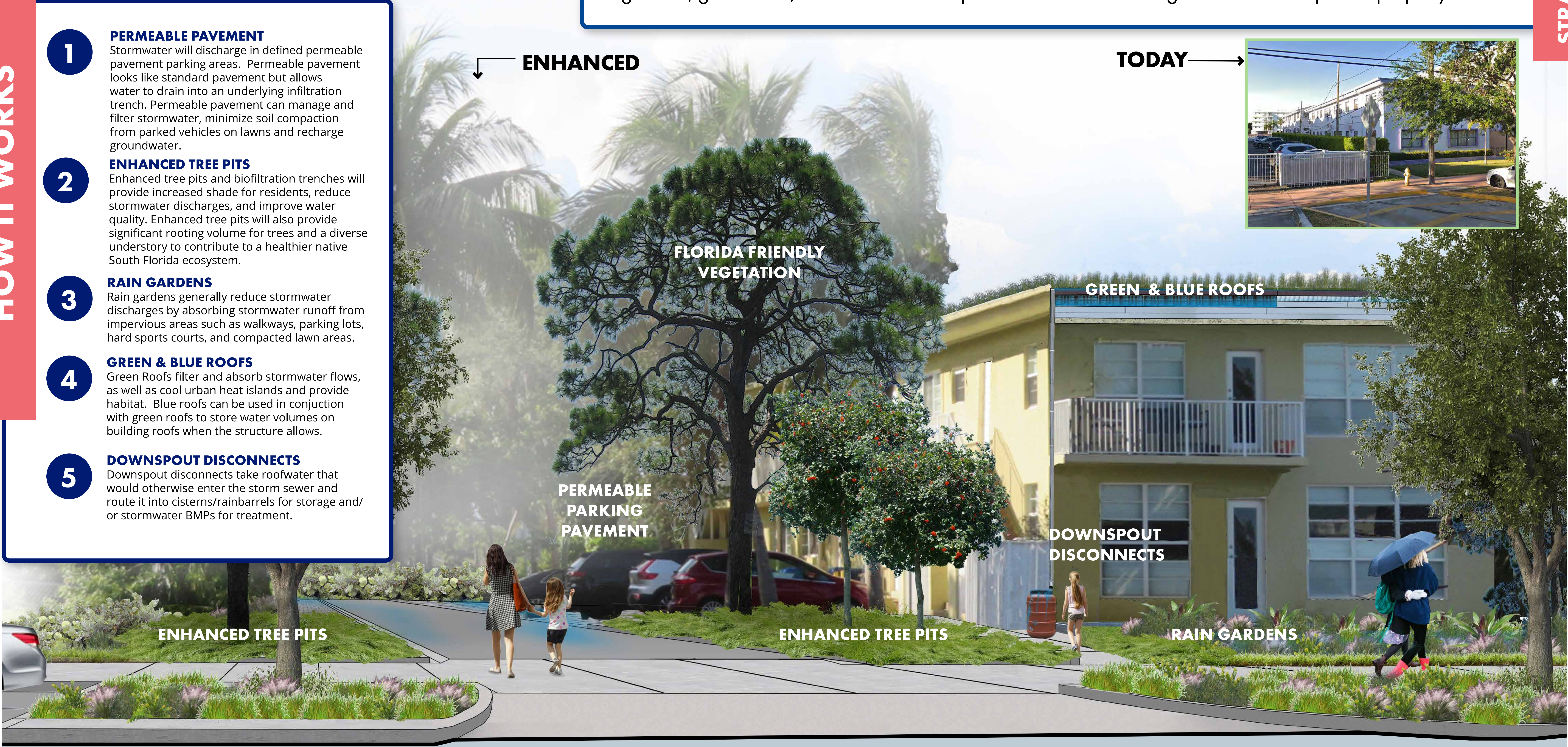
GARDEN APARTMENTS

HOW IT WORKS

- 1 PERMEABLE PAVEMENT**
Stormwater will discharge in defined permeable pavement parking areas. Permeable pavement looks like standard pavement but allows water to drain into an underlying infiltration trench. Permeable pavement can manage and filter stormwater, minimize soil compaction from parked vehicles on lawns and recharge groundwater.
- 2 ENHANCED TREE PITS**
Enhanced tree pits and biofiltration trenches will provide increased shade for residents, reduce stormwater discharges, and improve water quality. Enhanced tree pits will also provide significant rooting volume for trees and a diverse understory to contribute to a healthier native South Florida ecosystem.
- 3 RAIN GARDENS**
Rain gardens generally reduce stormwater discharges by absorbing stormwater runoff from impervious areas such as walkways, parking lots, hard sports courts, and compacted lawn areas.
- 4 GREEN & BLUE ROOFS**
Green Roofs filter and absorb stormwater flows, as well as cool urban heat islands and provide habitat. Blue roofs can be used in conjunction with green roofs to store water volumes on building roofs when the structure allows.
- 5 DOWNSPOUT DISCONNECTS**
Downspout disconnects take roofwater that would otherwise enter the storm sewer and route it into cisterns/rainbarrels for storage and/or stormwater BMPs for treatment.

Garden apartments as well as other **private properties** can be important partners in augmenting a comprehensive blue-green infrastructure system in Miami Beach. **Property owners can make a difference** citywide taking simple steps such as incorporating downspout disconnections, rain barrels, and tree plantings on their properties. Other BGSi BMPs such as permeable pavement for parking spaces, rain gardens, green roofs, and enhanced tree pits can be used to manage stormwater on private property.

STRATEGIC VALUE



WATER MANAGEMENT BENEFITS

Capture of driveway and roof runoff helps to reduce peak flows (during high frequency events)

Treatment uptakes nitrogen and phosphorus reducing likelihood of algae blooms

Treatment of residential runoff reduces sediment transfer, as well as fertilizer, pesticides, bacteria, and hydrocarbon pollution



ADDITIONAL BENEFITS

Neighborhood Beautification

Reduction in urban heat island effect / cooler ambient temperatures

Enhanced biodiversity and habitat

Increased shade from trees plantings

STREET ENDS

HOW IT WORKS

- 1

RAIN GARDENS
Rain gardens generally reduce stormwater discharges by absorbing storm water runoff from impervious areas such as walkways, parking lots, hard sports courts, and compacted lawn areas.
- 2

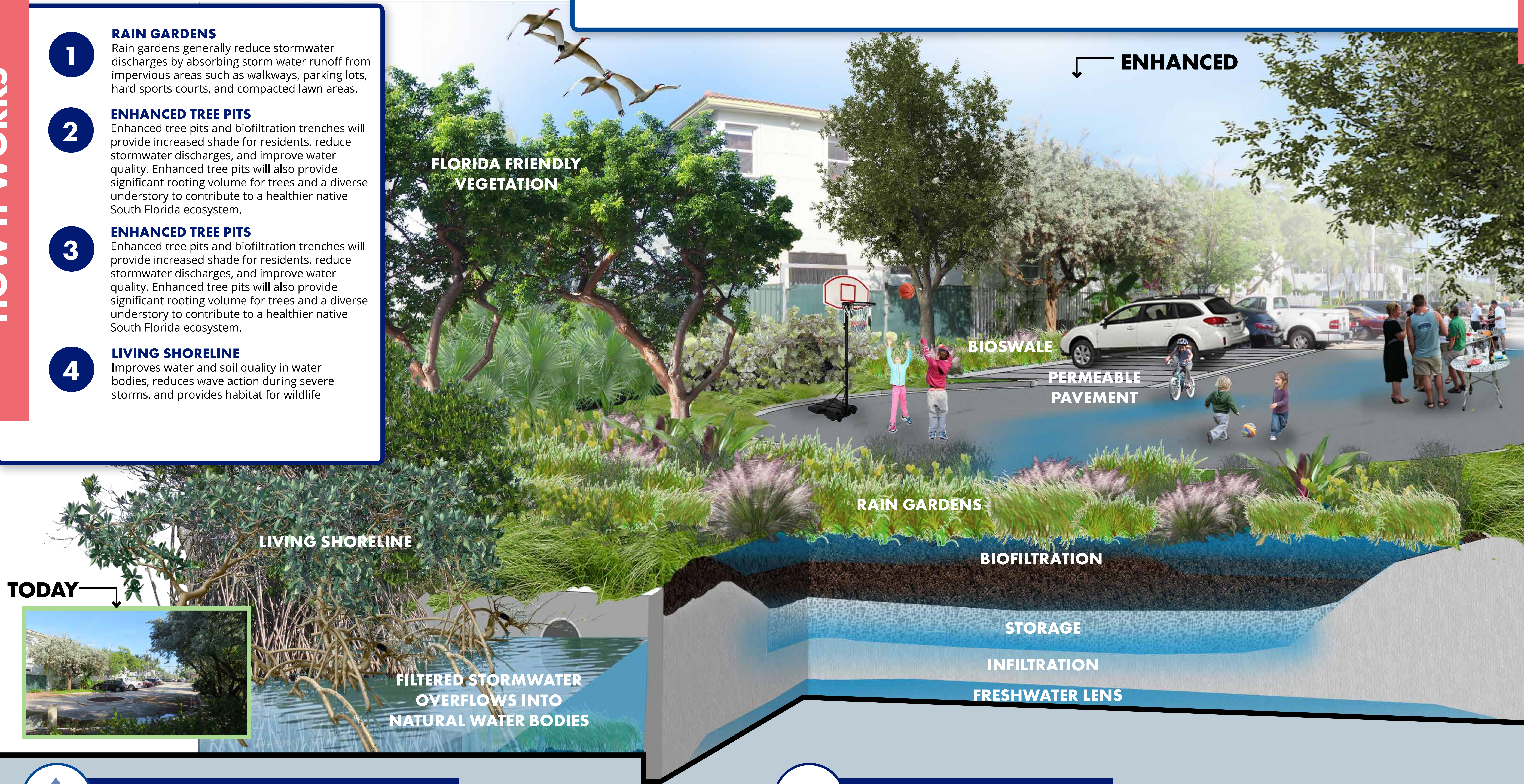
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- 4

LIVING SHORELINE
Improves water and soil quality in water bodies, reduces wave action during severe storms, and provides habitat for wildlife

Often located at waterfront locations, street ends provide opportunities to incorporate BGSi which **absorb and filter stormwater** prior to discharging into canals, the Biscayne Bay, and the ocean, while **incorporating and enhancing habitat** for land and aquatic species, and **providing flexible parking and play spaces** for residents.

STRATEGIC VALUE



WATER MANAGEMENT BENEFITS

- Capture of roadway runoff helps to reduce peak flows (during high frequency events)
- Treatment of roadway runoff reduces hydrocarbons and heavy metal pollution
- Treatment uptakes nitrogen and phosphorus reducing likelihood of algae blooms



ADDITIONAL BENEFITS

- Neighborhood Beautification
- Walking and biking paths
- Waterfront Seating
- Kayak drop in points