HOUSTON PUBLIC WORKS

GREEN STREETS PILOT PROJECTS

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TRANSPORTATION & DRAINAGE OPERATIONS

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PURPOSE

together we create a strong foundation for Houston to thrive

5 TO THRIVE VALUES

integrity | teamwork | ownership | communication | respect

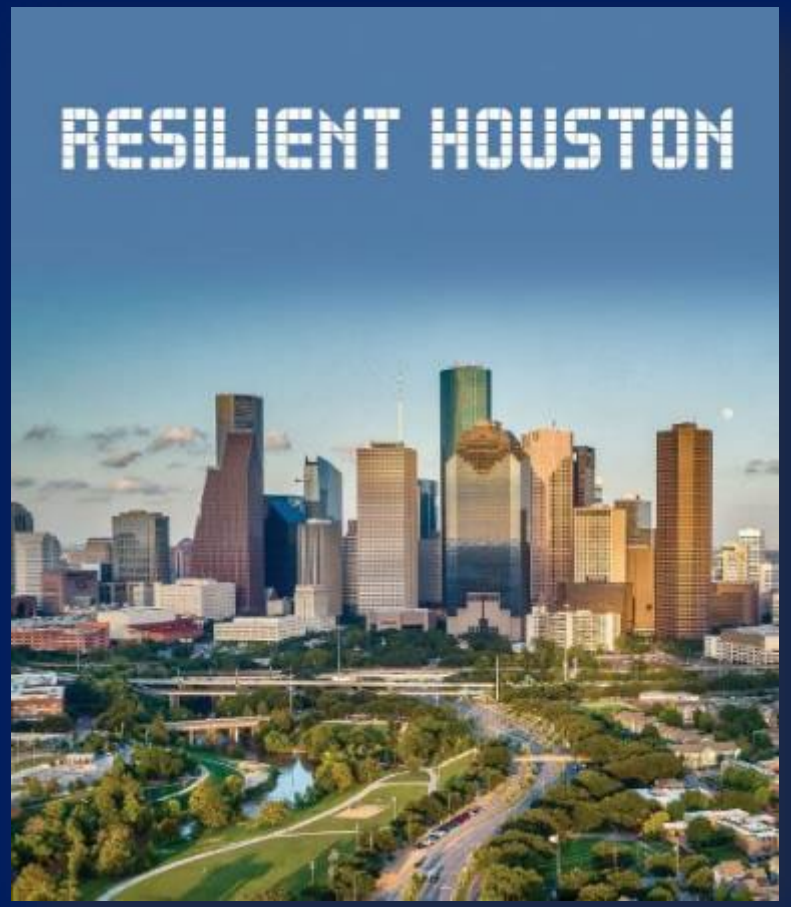
WHY GREEN INFRASTRUCTURE?

Several US cities are investing in green infrastructure as part of integrated management solutions to collect and treat stormwater runoff at its source.

The green approach can provide a range of environmental and social benefits that cannot generally be achieved through traditional methods.

Performance of Green Infrastructure:

- Reduce pollutant discharge to receiving waters
- Remove air pollutants
- Control stormwater runoff



"Resilient Houston is a framework for transformative change that comes from thinking and acting together to build and grow Houston's long-term resilience"
Mayor Sylvester Turner

VISION FOR A RESILIENT HOUSTON

While the future is uncertain, we can expect that Houston will only face increasing challenges over the next 30 years. But we can create opportunity for all Houstonians in how we tackle these challenges—at the individual, neighborhood, bayou, city, and regional scale. The steps we take today can begin to shape the future for the next generation of Houstonians. What kind of city will Houston be in 2050?

Resilient Houston sets an aspirational vision for the future of our city. As we look toward the Houston we want to be in 2050, we see:

+ A HEALTHY PLACE TO LIVE
+ AN EQUITABLE, INCLUSIVE, AND AFFORDABLE CITY
+ A LEADER IN CLIMATE ADAPTATION
+ A CITY THAT GROWS UP, NOT OUT
+ A TRANSFORMATIVE ECONOMY THAT BUILDS FORWARD

HOUSTON'S RESILIENCE TARGETS

Resilient Houston focuses on the pressing challenges and opportunities that will shape Houstonians' lives today and for future generations. The 18 Targets below correspond with the 18 Goals outlined in this strategy. These high-level Targets will be used to measure the impact of *Resilient Houston*. Each Target will be achieved through the implementation of multiple Actions, often across multiple Scales.

1. Provide at least 500,000 Houstonians with preparedness training by 2025.
2. Offer 20,000 Hire Houston Youth Summer Jobs in 2020.
3. Ensure zero traffic-related fatalities and serious injuries on Houston streets by 2030.
4. Develop 50 neighborhood plans by 2030.
5. Invest $5 million in local artists to create resilience awareness projects across the city by 2025.
6. Plant 4.6 million new native trees by 2030.
7. Build at least 375,000 new homes across every income level by 2050 to welcome new residents to the city of Houston.
8. Remove all habitable structures from the floodway by 2030.
9. Construct at least 500 miles of trails and bike lanes by 2025.
10. Achieve carbon neutrality by 2050 in accordance with the Paris Agreement.
11. Complete 100 new green stormwater infrastructure projects by 2025.
12. Eliminate geographic disparities in life expectancy by 2050.
13. Appoint Department Resilience Officers in every City of Houston Department in 2020.
14. Attract or incubate 50 Energy 2.0 companies in Greater Houston by 2025.
15. Provide 100% of Houstonians access to high-frequency public transportation choices within a half-mile by 2050.
16. Conserve 24% of undeveloped regional lands as natural spaces by 2040.
17. Ensure that 100% of Houstonians and visitors have access to accurate, real-time emergency alerting by 2030.
18. Invest $50 billion in major recovery, mitigation, and modernization projects that increase resilience by 2040.

BENEFITS OF GREEN INFRASTRUCTURE

Green infrastructure reduces and treats stormwater at its source while delivering other environmental, social and economic benefits:

- ✓ Manages stormwater runoff
- ✓ Provides retention
- ✓ Reduces street ponding
- ✓ Minimizes construction footprint
- ✓ Promotes groundwater recharge
- ✓ Contaminant removal as water moves through layers of system
- ✓ Aesthetically pleasing

CHALLENGES OF GREEN INFRASTRUCTURE

- Higher initial construction cost than traditional infrastructure
- Limited flexibility to make field changes
- Longer lead time due to limited suppliers
- Limited certified installers
- Requires recurring maintenance
- Training to City Maintenance team
- Lack of performance and maintenance data

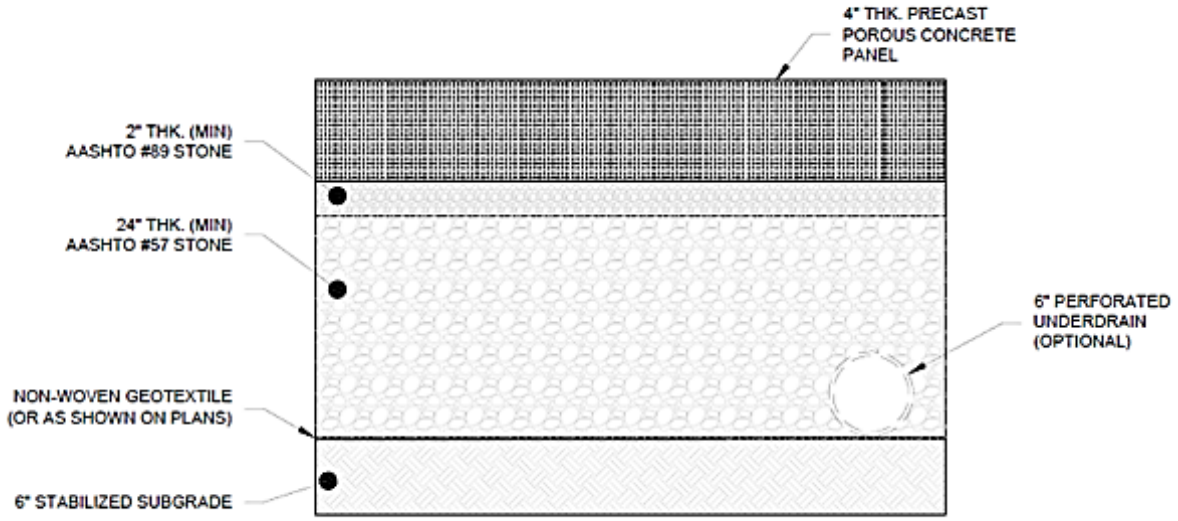
GREEN INFRASTRUCTURE ELEMENTS IN OUR PROJECTS

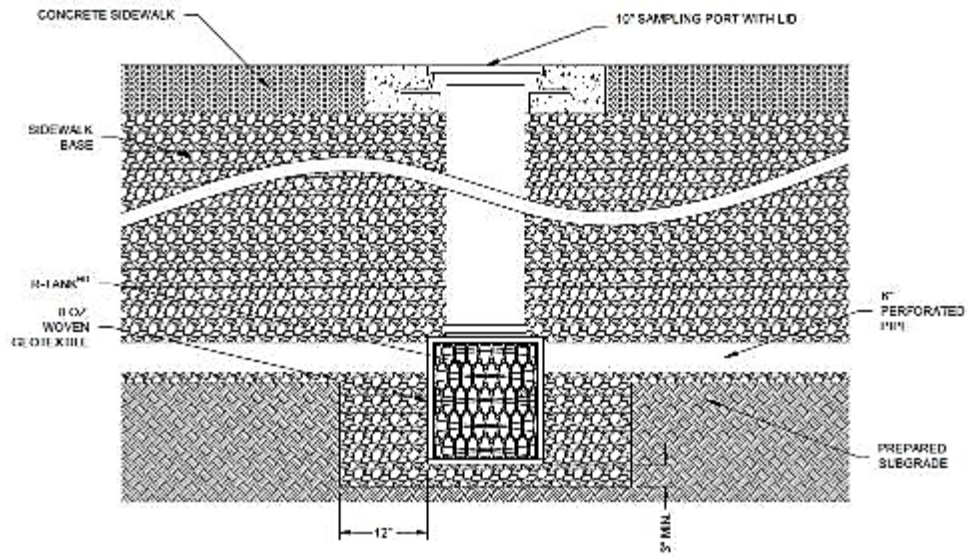
Porous Concrete Sidewalk

Porous Concrete Pavers

Bioswale

POROUS CONCRETE SIDEWALK





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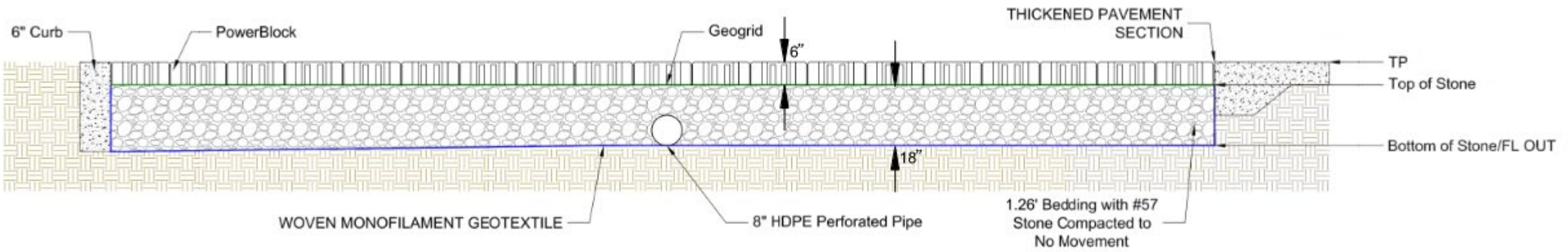
POROUS PAVERS



Permeable pavements infiltrate, treat, and/or store rainwater where it falls.

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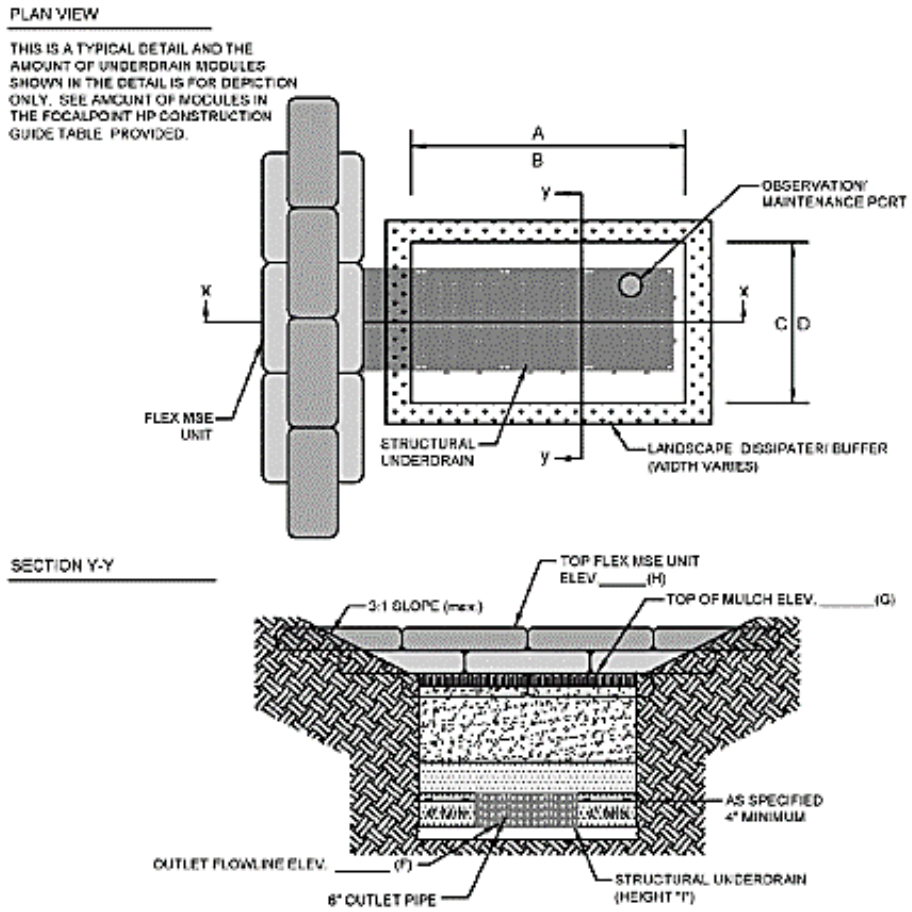
BIOSWALE

- Bioswales use vegetation or mulch to slow and filter stormwater flows.
- Bioswales are essentially rain gardens placed in long narrow spaces such as the space between the sidewalk and the pavement.



COST COMPARISON

SIDEWALK COST COMPARISON

Material Type	Cost per SF	Regular Maintenance Required?
Regular Concrete Sidewalk (including excavation, sand bedding and expansion joints)	$32.00	No
Precast Porous Concrete Sidewalk (Includes excavation, stabilized subgrade, non-woven geotextile, 6" perforated pipe, and No. 89 & 57 crushed stone per detail)	$65 - $80	Yes

PAVER COST COMPARISON

Material Type	Cost per SF	Regular Maintenance Required?
Street or Sidewalk Pavers(including excavation, paver base and misc. items)	$30 - $50	No
PowerBlock Permeable Paver(Includes excavation, curb, crushed stone, 6" perforated pipe and geotextile fabric base)	$65	Yes

- **Cost estimated to be reduced in future once more Green Stormwater Infrastructure projects in place.**
- **Benefits from these Green Stormwater Infrastructure elements will be quantified for future cost-benefit analysis.**

STORAGE VOLUME (DETENTION BENEFIT)

Project	Green Stormwater Infrastructure	Volume of voids (cu.ft.)	Volume of voids (gallons)	Volume of voids (cu.yd.)	Equivalent number of coffee cups (16 oz)	Equivalent number of coke cans (12 oz)
Malone Park	Sidewalk	13,640	102,023	505	816,188	1,088,250
Winter St	Sidewalk	1,631	12,198	60	97,587	130,116
	Pavers	3,054	22,842	113	182,733	243,645

Detention Benefits:

- ✓ Provides temporary storage of stormwater runoff
- ✓ Prevents flash flood during normal rain event
- ✓ Minimizes gutter ponding

MALONE PARK - DRAINAGE & PAVEMENT REHAB

Current Phase: Construction

Estimated Construction Cost: $1.5M

Construction Start Date: January 2022

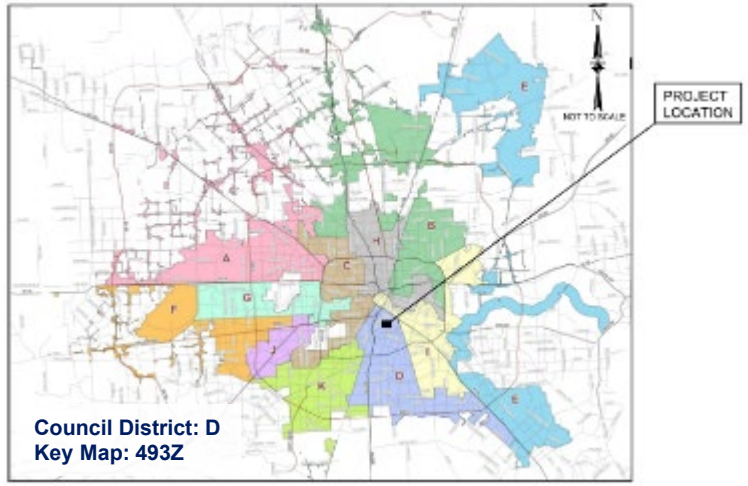
Construction Completion: May 2023

Location: South Central Houston, close to University of Houston

Project Limit: Nettleton St – from Elgin St to Tuam St

Tuam St and Anita St – from Nettleton St to Tierwester St

Scope: Upgrade existing undersized inlets and storm sewer leads, remove and replace existing pavement, provide **porous concrete sidewalk** throughout the project limits.



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CONSTRUCTION PHOTOS

PRE/POST PHOTOS

BEFORE

AFTER

WINTER STREET- DRAINAGE & PAVEMENT REHAB

Current Phase: Construction

Estimated Construction Cost: $680,102.36

Construction Start Date: October 2022

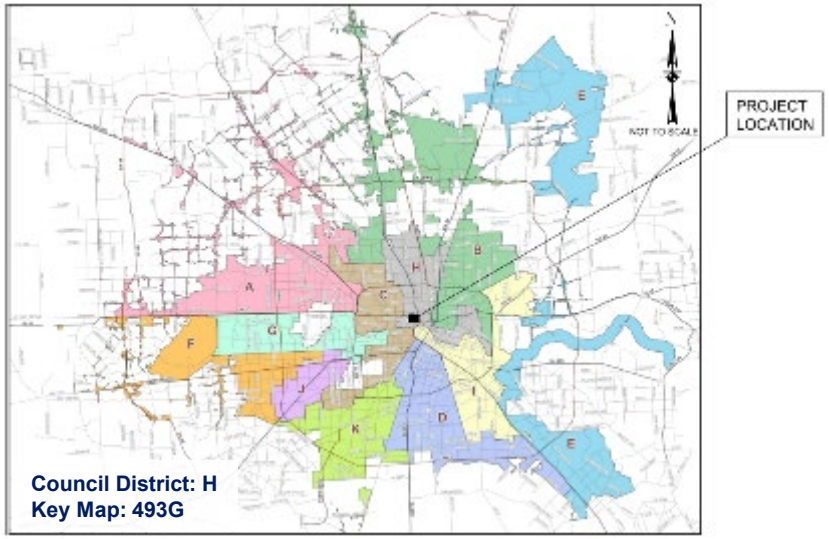
Construction Completion: May 2023

Location: Southwest of I-10 and I-45 intersection, close to Downtown Houston

Project Limit: Winter St– from Houston Ave to Hickory St

Hickory St – from Winter St to Summer St

Scope: Improve drainage on Winter St and Hickory St. Provide **porous pavement** on Winter St, asphalt pavement with **porous concrete sidewalk** on Hickory St.



CONSTRUCTION PHOTOS

PRE/POST PHOTOS

BEFORE

AFTER

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POROUS PAVERS PERFORMANCE & CLEANING DEMO VIDEOS

WINZER PARK- DRAINAGE & PAVEMENT REHAB

Current Phase: Construction

Estimated Construction Cost: $2.2M

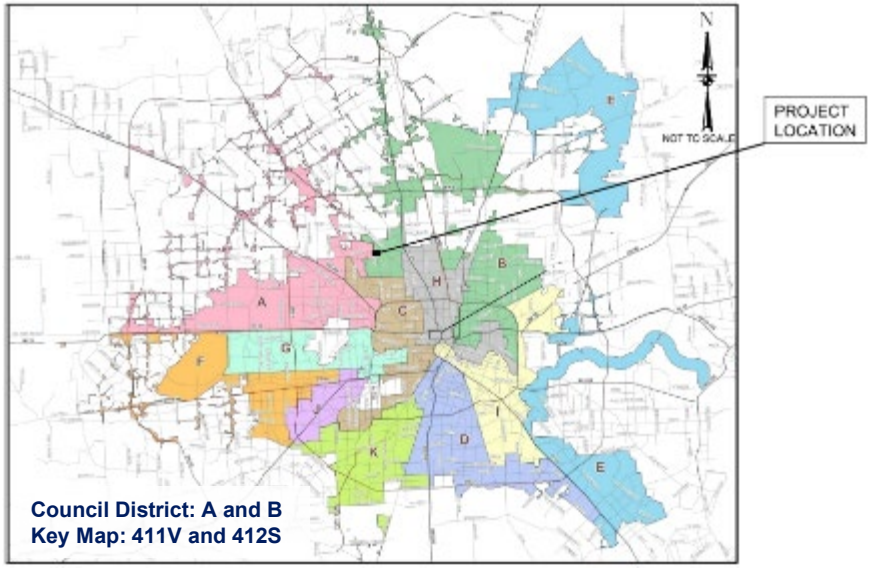
Construction Start Date: May 2023

Anticipated Completion: May 2024

Location: Acres Homes

Project Limit: Carver Rd – from Walcott Ln to Dolly Wright St
Dolly Wright St and Walcott Ln – from MST Park to Carver Rd

Scope: Improve drainage on Dolly Wright St, Carver Rd and Walcott Ln within project limits. The project will also include **porous concrete sidewalk and bio-swales** within roadside ditches. The project will provide pedestrian and bikeway connectivity between Winzer park and MST park.



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COLLABORATION WITH UNITED STATES GEOLOGICAL SURVEY (USGS)

- USGS approached City of Houston to collaborate and perform Stormwater sampling for the Green Stormwater Infrastructure installed within City Right of Way (ROW)
- USGS will collect the water sample to test the water quality for Winter St project
- Right-of-Entry Agreement already executed with USGS to access the sampling points within City ROW
- The duration of sampling plan is 18 months
- Stormwater Quality results will be shared with City of Houston at no cost to the City and will help verify and quantify GSI benefits

thank you!

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