

Houston Resilient Sidewalks Plan

Donald Buaku, AICP, assoc. AIA | City of Houston



What We'll Discuss

- 1. Background & Goals**
- 2. Processes**
- 3. Highlights**
- 4. Implementation**
- 5. Next Steps**
- 6. Q&A and Discussion**

1. Background & Goals

Not that Word Again?!



What is Urban

RESILIENCE?

The capacity of individuals, communities, institutions, businesses, and systems within an urban area to survive, adapt and thrive no matter what kinds of chronic stresses and acute shocks they experience.

– *Resilient Houston*



RESILIENT HOUSTON

Resilient Houston provides a framework for collective action for every Houstonian...

*...links existing efforts with new ones that will collectively work to protect Houston against future disasters—from hurricanes to extreme heat **[and cold]** waves—and chronic stresses such as aging infrastructure, poor air quality, and flooding.*



Quick Background



- **August 2017:** Hurricane Harvey devastates Houston
- **CDBG DR 17 (Disaster Recovery)** funding received by COH for planning activities.
 - 6 Resilience Planning Studies,
 - 1 modeling effort,
 - 1 Hazard Mitigation Plan, and
 - 3 Housing planning support initiatives

Connection to Resilient Houston

Sidewalks



8

Make our streets 100% safe for all Houstonians.



50

Enable Houstonians to make mobility choices that improve well-being and reduce the cost of living.

Building Codes



36

Advance and modernize building codes and standards.

Stormwater Master Plan



27

Advance research and technology to improve water management.

Equity
Health
Climate
Built Environment
Economy

Hazard Mitigation Plan



58

Leverage disaster recovery efforts to accelerate the implementation of resilience measures.

Neighborhood Resilience Plans



12

Support equitable neighborhoods through community planning and programs.

Lily Pads Plan (Resilience Hubs)



17

Develop "Lily Pads" to serve as Neighborhood Resilience Hubs.

Buy In / Buy Out Plan



25

Make room for water.

Quick Background



February 2018

\$835 M available for Hurricane Harvey Recovery (CDBG-DR 17 program) through the Texas GLO, from HUD.

Local Action Plan released allocating \$23 M for planning efforts

Procurement Processes

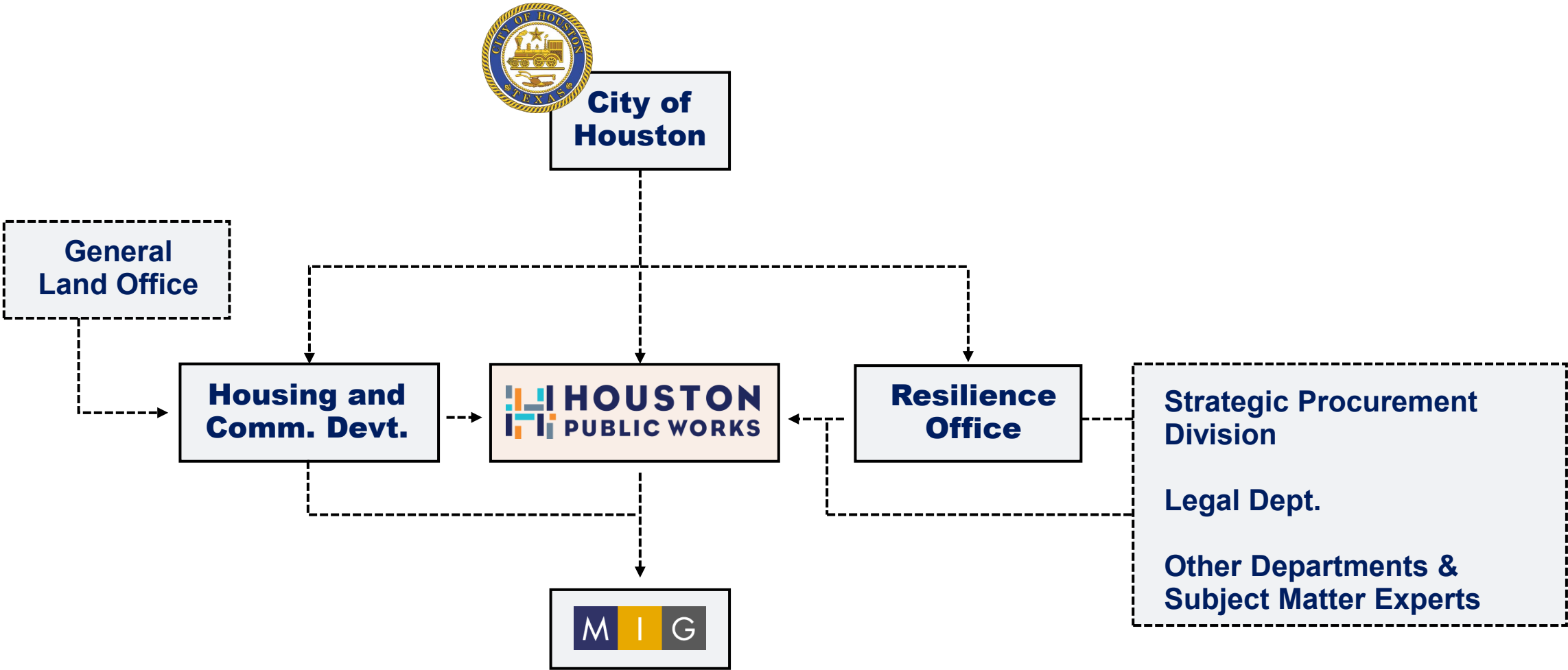
- **Project Awarded to Consulting Team**
- **Council Approval**
- **Project Underway**

Project Completion

We are here!



Project Administration



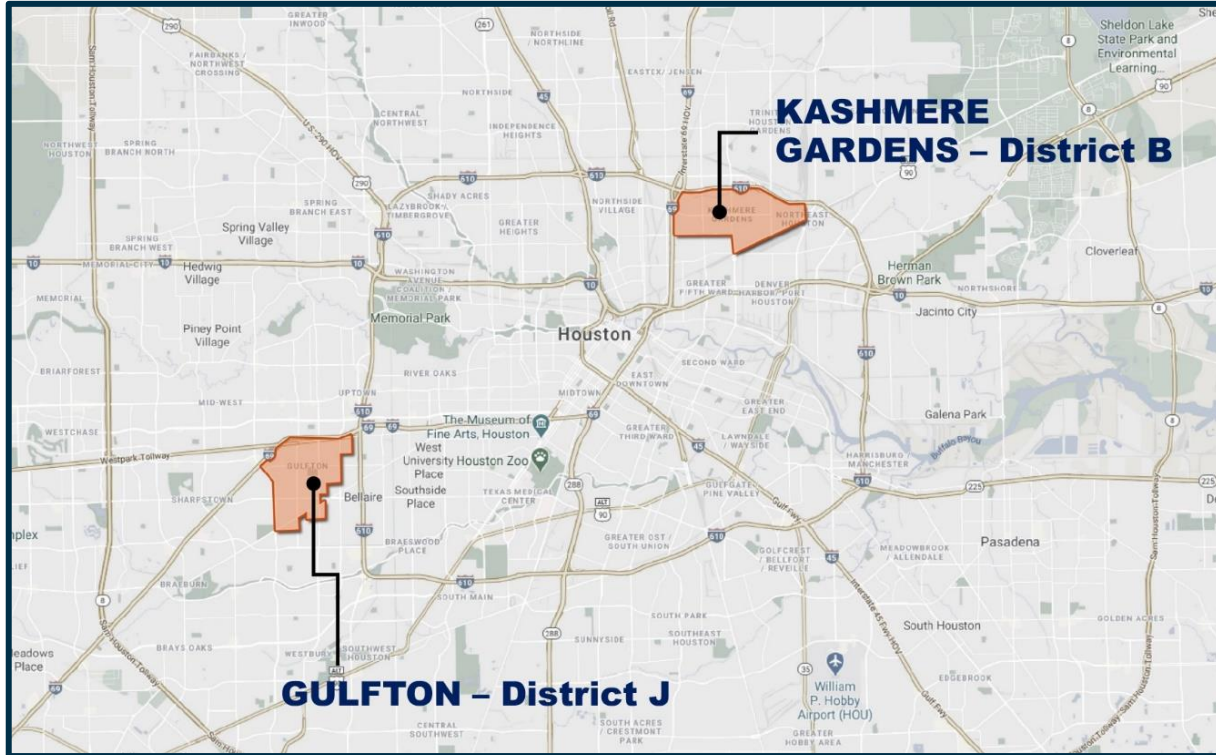
Objectives

*Both **Kashmere Gardens** and **Gulfton** communities were impacted by Harvey and have significant mobility and drainage challenges.*



- Develop a standard for how to address **curb and gutter and roadside ditch** neighborhoods.
- **Replicate and scale solutions** from the two communities into a City-wide toolkit.
- Develop **implementation guidelines** which include funding, policy implications, and timeline.
- Advance the goals of *Resilient Houston* and aim to provide information to improve the sidewalks program.

Project Charge

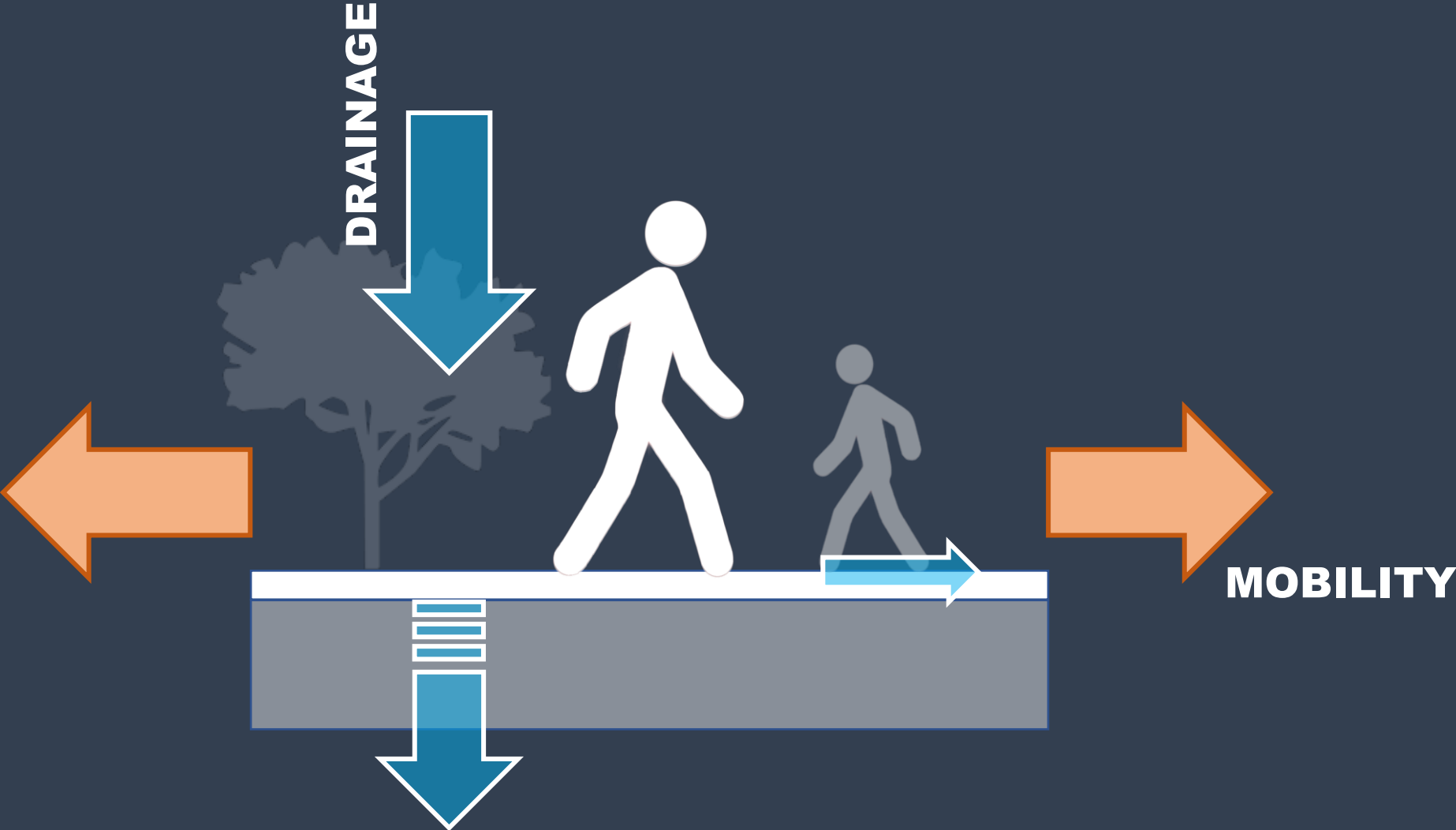


- Two (2) Neighborhood Sidewalk Plans
 - Kashmere Gardens
 - Gulfton
- A City-wide toolkit.
- Address safety, drainage, accessibility, alternative materials, innovative design, **funding**, maintenance requirements, etc.

Principles - considerations



Principles – sidewalk performance



Project Scope

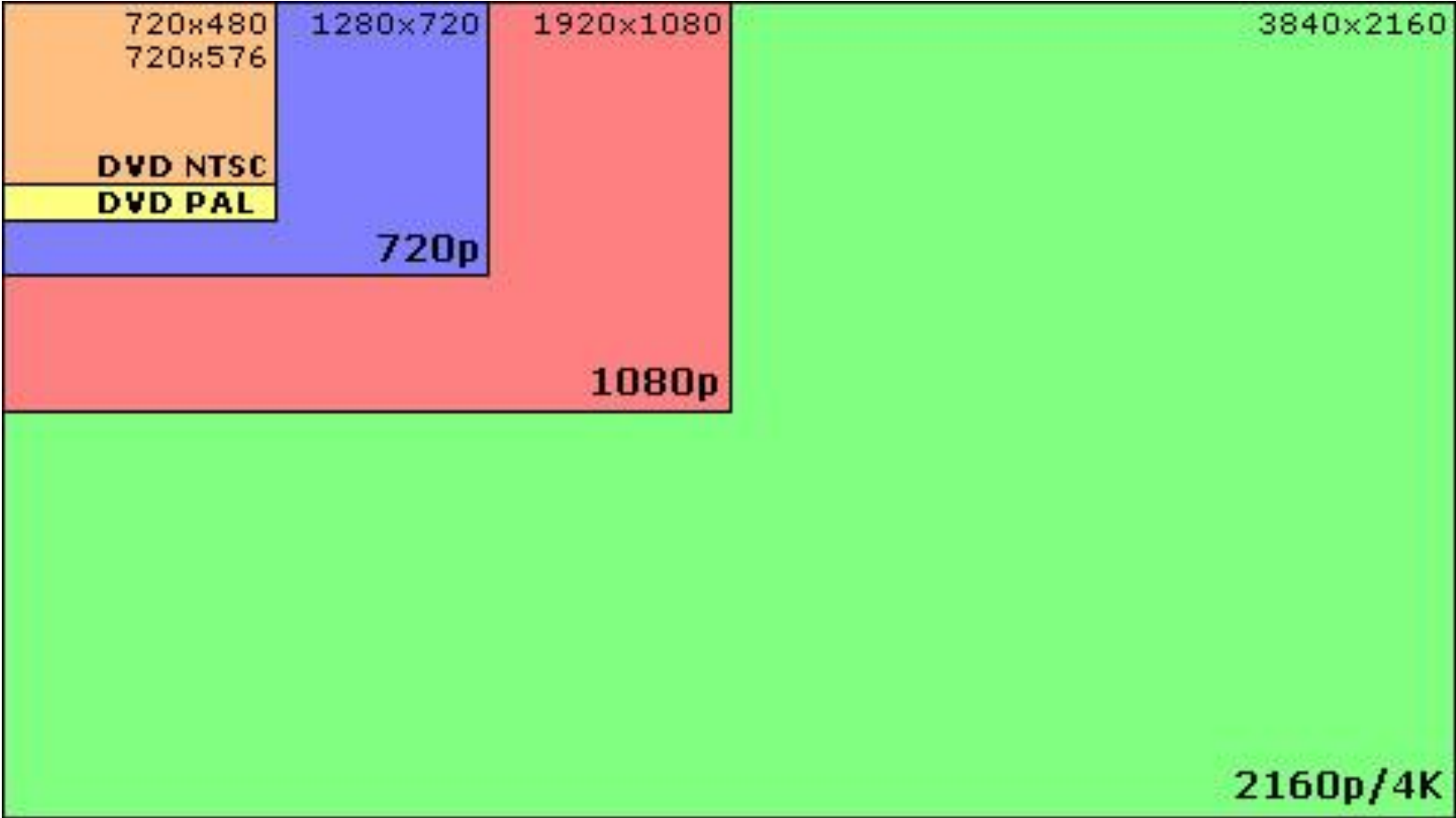
Previous Plans & Status Quo

This Plan!

Future Offshoots

Further Studies

Specific Plans

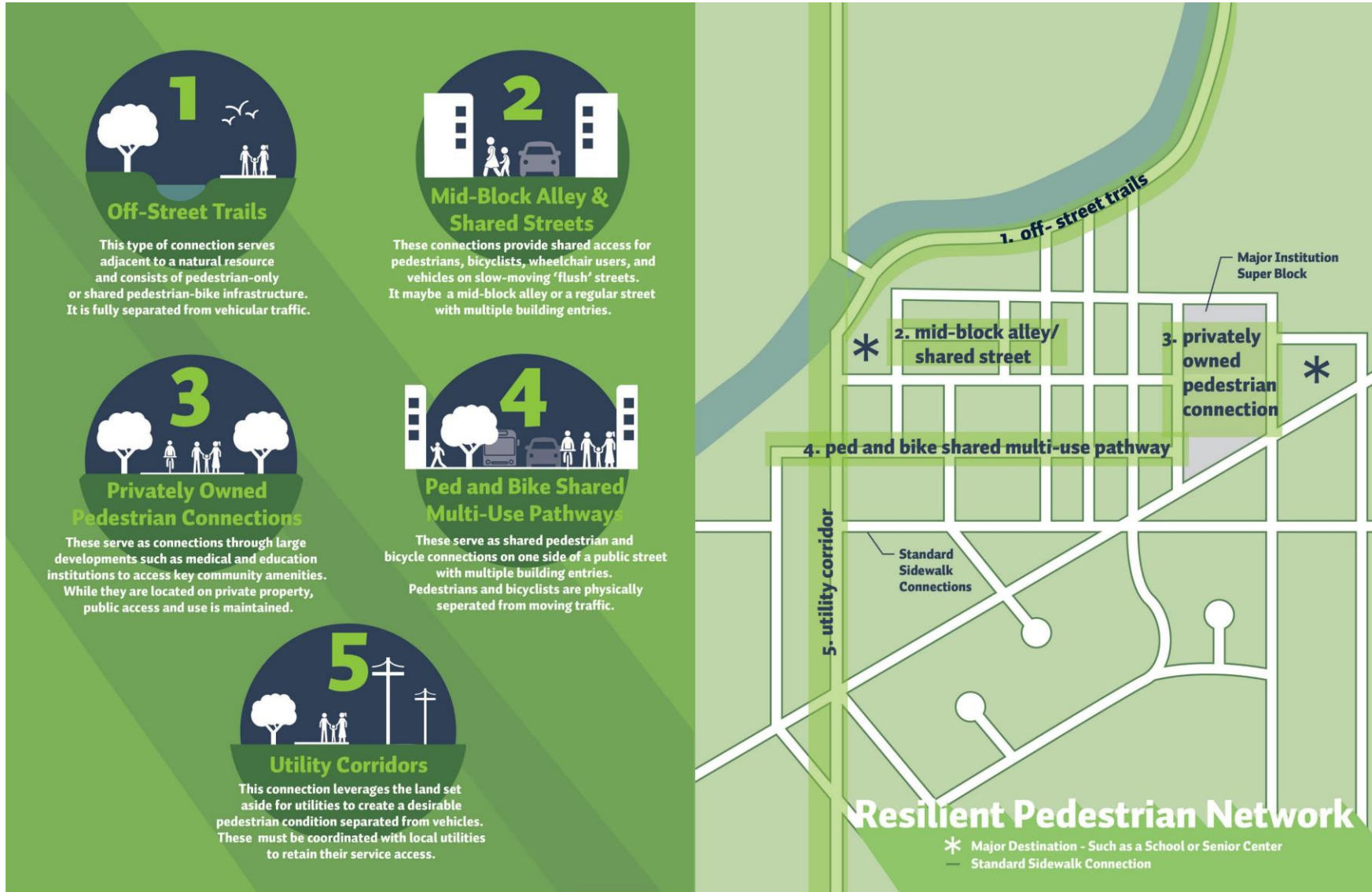


Project Scope



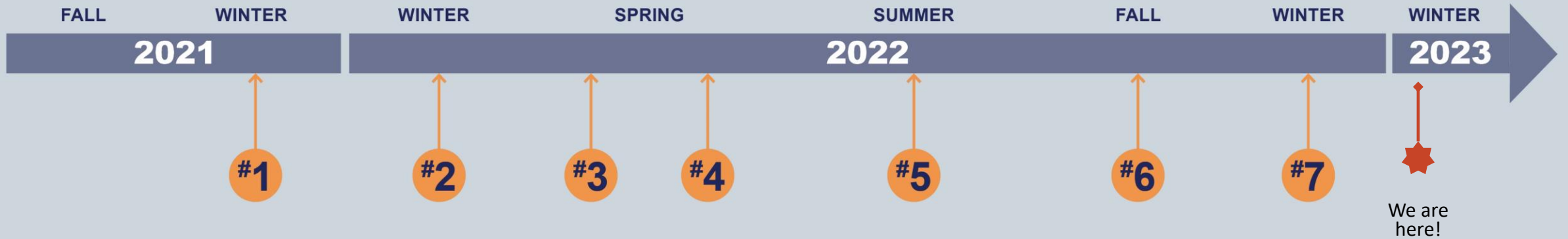
- Planning level
- Examine sidewalks for mobility and drainage
- Create a menu of options
- Contribute to a **Resilient Pedestrian Network**

Resilient Pedestrian Network – beyond the sidewalk



2. Processes

RESILIENT SIDEWALKS | CITY-WIDE TOOLKIT TIMELINE



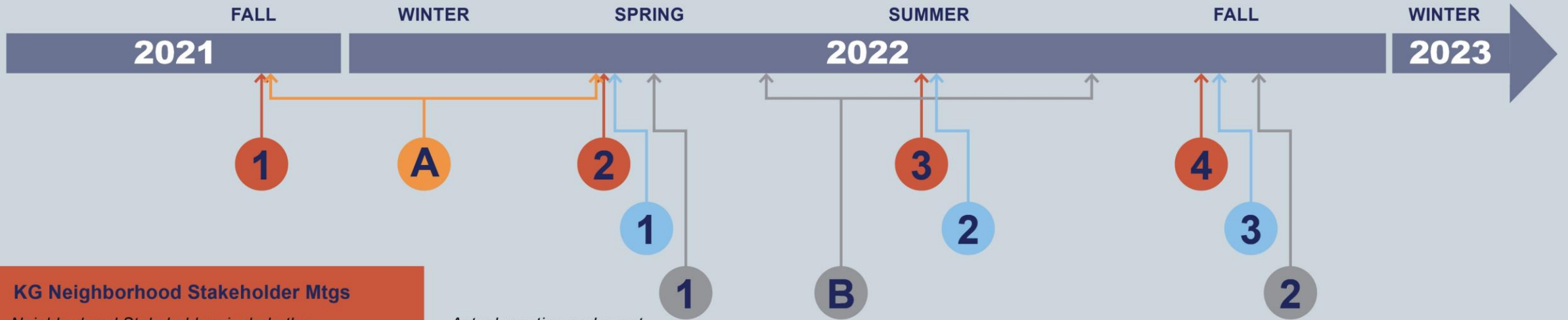
STAKEHOLDER MEETINGS

- | | | | | | | |
|--|---|--|--|--|--|---|
| #1 | #2 | #3 | #4 | #5 | #6 | #7 |
| <p>Kick-off meeting to discuss project goals, project schedule and overall components of the City-wide tool kit.</p> | <p>Sidewalk mobility framework, for existing and new sidewalks – systems, connectivity, accessibility, ADA, interaction with other transportation/mobility systems.</p> | <p>Resiliency, green stormwater Infrastructure, drainage, and flood mitigation, open ditch integration, with Houston-relevant solutions.</p> | <p>Constructability, materials, innovative techniques, and Houston-relevant solutions.</p> | <p>Funding mechanisms, legal implications, cost-benefit implications, potential City policy changes.</p> | <p>Coordination with the City’s Infrastructure Design Manual (IDM), phasing, implementation strategies, coordination with external agencies, overlay with other City initiatives and plans, potential city policy changes.</p> | <p>Review the Draft City-Wide Tool Kit.</p> |

Key Milestones:

- o City-Wide Existing Conditions Analysis: Winter 2021
- o City-Wide Preliminary Concepts: Spring 2022
- o City-Wide Refined Concepts and Strategies: Summer 2022
- o City-Wide Draft and Final Report Documentation: Winter 2022

RESILIENT SIDEWALKS | KASHMERE GARDENS (KG) COMMUNITY ENGAGEMENT TIMELINE



Actual meeting and event dates to-be-determined

KG Neighborhood Stakeholder Mtgs

Neighborhood Stakeholders include the Superneighborhood Council, community champions and community leaders

- 1 FALL 2021: Stakeholder Group Meeting**
Focus: Overall community engagement strategy
- 2 SPRING 2022: Stakeholder Group Meeting**
Focus: Overall community vision
- 3 SUMMER 2022: Stakeholder Group Meeting**
Focus: Emerging alternative concepts
- 4 FALL 2022: Stakeholder Group Meeting**
Focus: Discuss the preferred concepts for different sidewalk and public realm

KG Neighborhood Community Meetings

Neighborhood Community meetings target all residents in the community

- 1 SPRING 2022: Community Group Meeting**
Focus: Overall project goals, project schedule, existing conditions, overall community vision.
- 2 SUMMER 2022: Community Group Meeting**
Focus: Emerging alternative concepts
- 3 FALL 2022: Community Group Meeting**
Focus: Discuss the preferred concepts for different sidewalk and public realm improvements

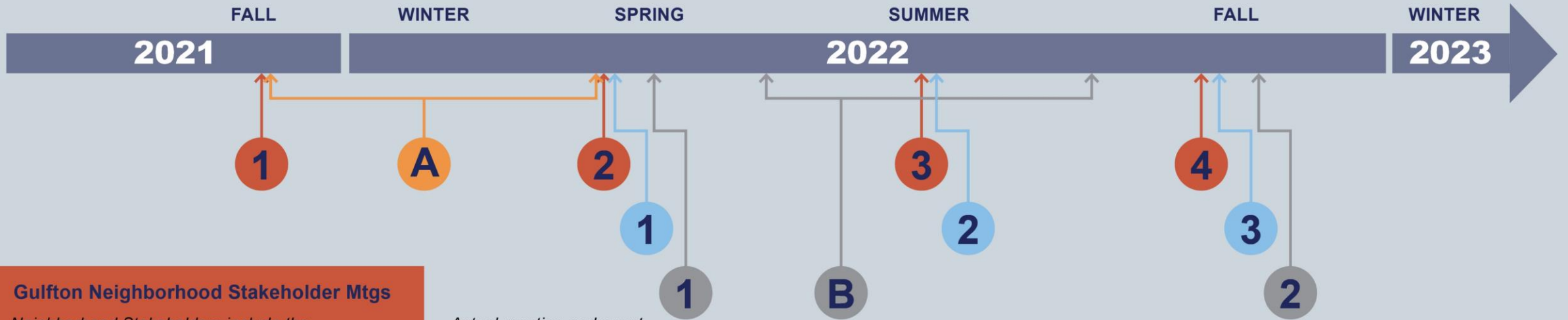
KG Neighborhood Survey

- A** **FALL 2021 - SPRING 2022** Questionnaire to collect input on values, needs, priorities, and issues for the Community Resilient Sidewalk Plan

KG Neighborhood Pop-Up Streetscape Workshop and Outreach Meetings

- 1 SPRING 2022:** Pop up events at an open/public space in the community
- B** **SUMMER 2022:** Fun, in-person pop-up streetscape workshop to model potential public realm streetscape improvements and technical solutions
- 2** **FALL 2022:** Pop up events at an open/public space in the community

RESILIENT SIDEWALKS | GULFTON COMMUNITY ENGAGEMENT TIMELINE



Actual meeting and event dates to-be-determined

Gulfton Neighborhood Stakeholder Mtgs

Neighborhood Stakeholders include the Superneighborhood Council, community champions and community leaders

- 1 FALL 2021: Stakeholder Group Meeting**
Focus: Overall community engagement strategy
- 2 SPRING 2022: Stakeholder Group Meeting**
Focus: Overall community vision
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Focus: Discuss the preferred concepts for different sidewalk and public realm

Gulfton Neighborhood Community Meetings

Neighborhood Community meetings target all residents in the community

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- 2 SUMMER 2022: Community Group Meeting**
Focus: Emerging alternative concepts
- 3 FALL 2022: Community Group Meeting**
Focus: Discuss the preferred concepts for different sidewalk and public realm improvements

Gulfton Neighborhood Survey

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Gulfton Neighborhood Pop-Up Streetscape Workshop and Outreach Meetings

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Literature Review & Mapping

Houston Public Works Sidewalk Program constructs new sidewalks and ramps along streets leading to schools, major thoroughfares and improves accessibility for people with disabilities*.

*The Pedestrian Accessibility Review process is managed through the Mayor's Office for People with Disabilities

CODE

The Sidewalk Program is governed by [Code of Ordinances Article III, Sections 40-83 & 84](#)

PROGRAMS

The Sidewalk Program has three types of requests.

PROGRAM REQUEST	SIDEWALK UP TO	ELIGIBILITY
Pedestrian Accessibility Review	1,500 feet	Person with disability has no safe path to travel to: <ul style="list-style-type: none"> - bank - bus stop - educational facility - employment - grocery store - place of worship - home - medical facility - METROLift - pharmacy - vehicle
School Sidewalk	4 blocks	Used by students to walk to school Not around school perimeter Not on dead-end street
Major Thoroughfare	4 blocks	Along designated thoroughfare No existing sidewalk Evidence of pedestrian traffic No future reconstruction or improvements planned within the next 5 years

Pedestrian Accessibility Review

The highest priority projects come from the Mayor's Office for People with Disabilities Pedestrian Accessibility Review process. The request provides up to 1,500 feet of improved sidewalk accessibility for people with disabilities to safely travel to the bank, bus stop, educational facility, employment, grocery store, home, medical facility, METROLift, pharmacy, vehicle or place of

KASHMERE GARDENS COMPLETE COMMUNITIES ACTION PLAN

Mayor Sylvester Turner
City of Houston
Planning and Development Department
December 2020

Kashmere Gardens Livable Centers Study

HOAO

LIVABLE CENTERS STUDY
PREPARED BY ASAKURA ROBINSON
WITH: GOLDNER & ASSOCIATES

HEALTHY LIVING MATTERS

BUILT ENVIRONMENT & FOOD

Connecting Policy to the Future

RESILIENT HOUSTON

CITY OF HOUSTON HOUSTON PUBLIC WORKS

INFRASTRUCTURE DESIGN MANUAL

CAROL ELLINGER HADDOCK, P.E., DIRECTOR

HOJIN LIM, P.E., CFM CITY ENGINEER

JULY 2020

Walkable Places Rules

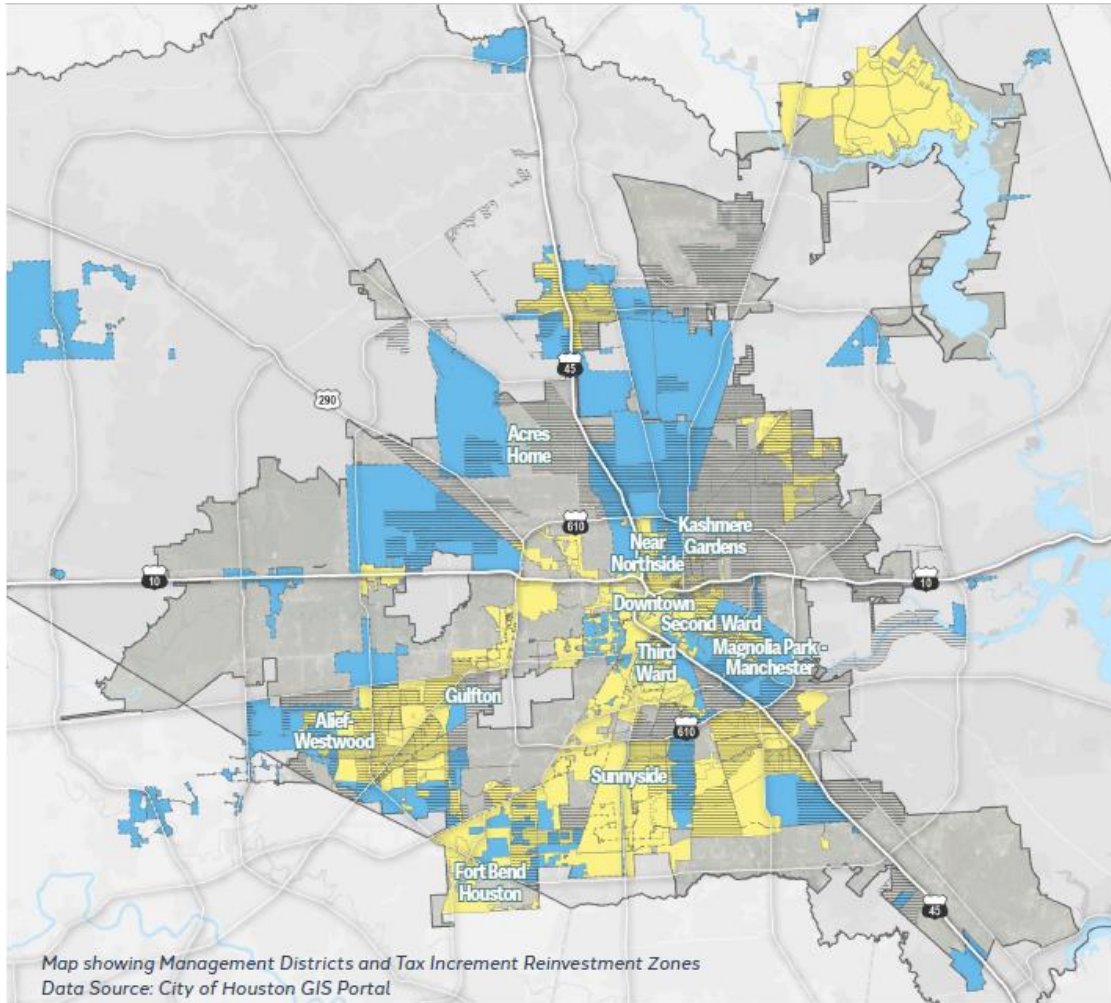
Learn how you can create a Walkable Place

Living With Water™ Houston

January 2020

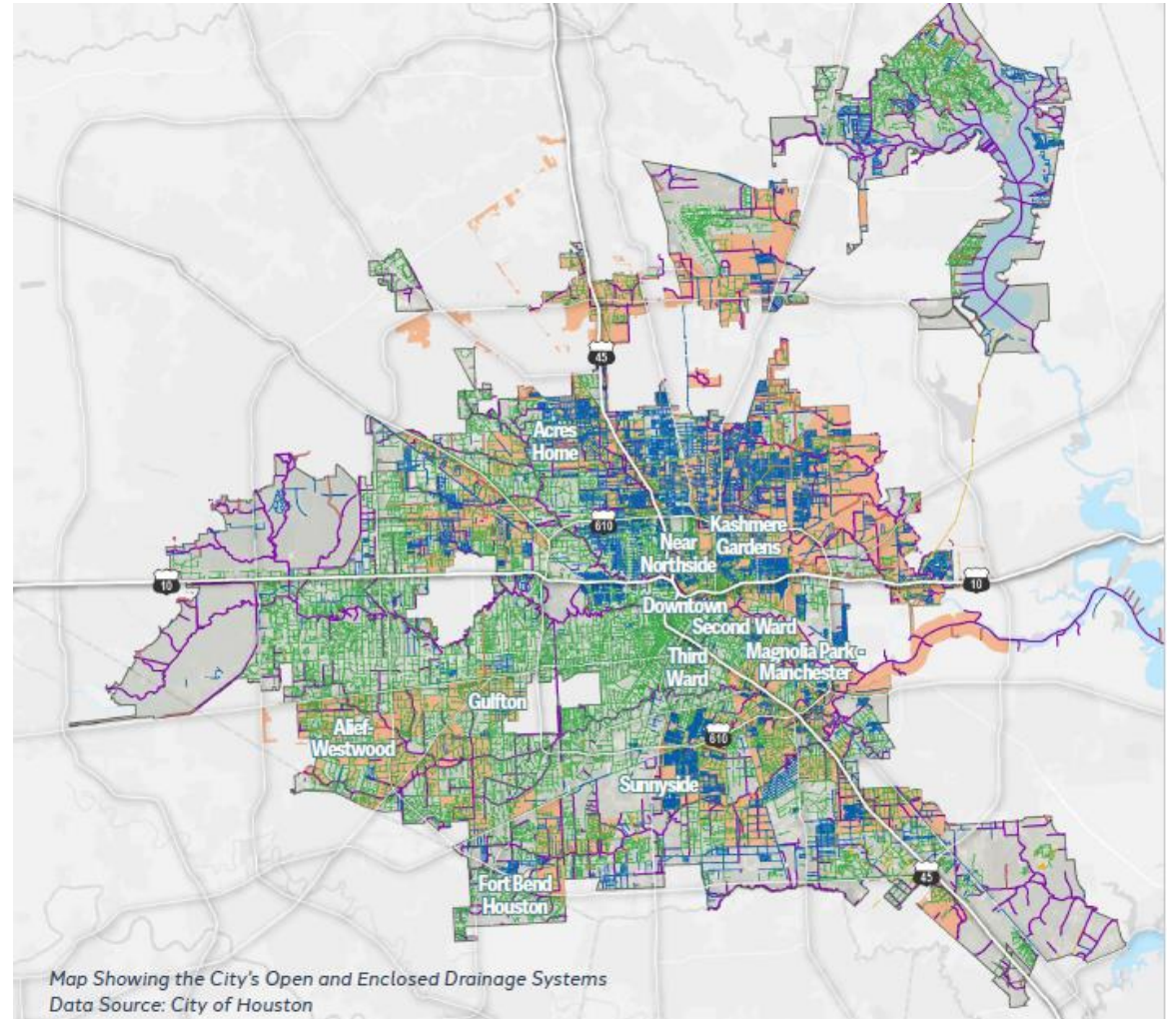
WAGGONNER & BALL
THE WATER INSTITUTE OF THE GULF
etd/rufid/rubinKon
RICE KINDER

Literature Review & Mapping



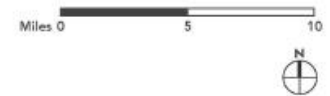
TIRZs and Management Districts Map Legend

- Harris County Boundary
- City of Houston
- Lakes and Rivers
- TIRZs
- Management Districts
- Management Districts Boundary
- ▨ Socially Vulnerable Communities



Open & Enclosed Drainage Systems Map Legend

- Harris County Boundary
- City of Houston
- Other Type Open Channels
- Roadside Ditches
- Enclosed Systems
- Offroad Channels
- Socially Vulnerable Communities
- Lakes and Rivers



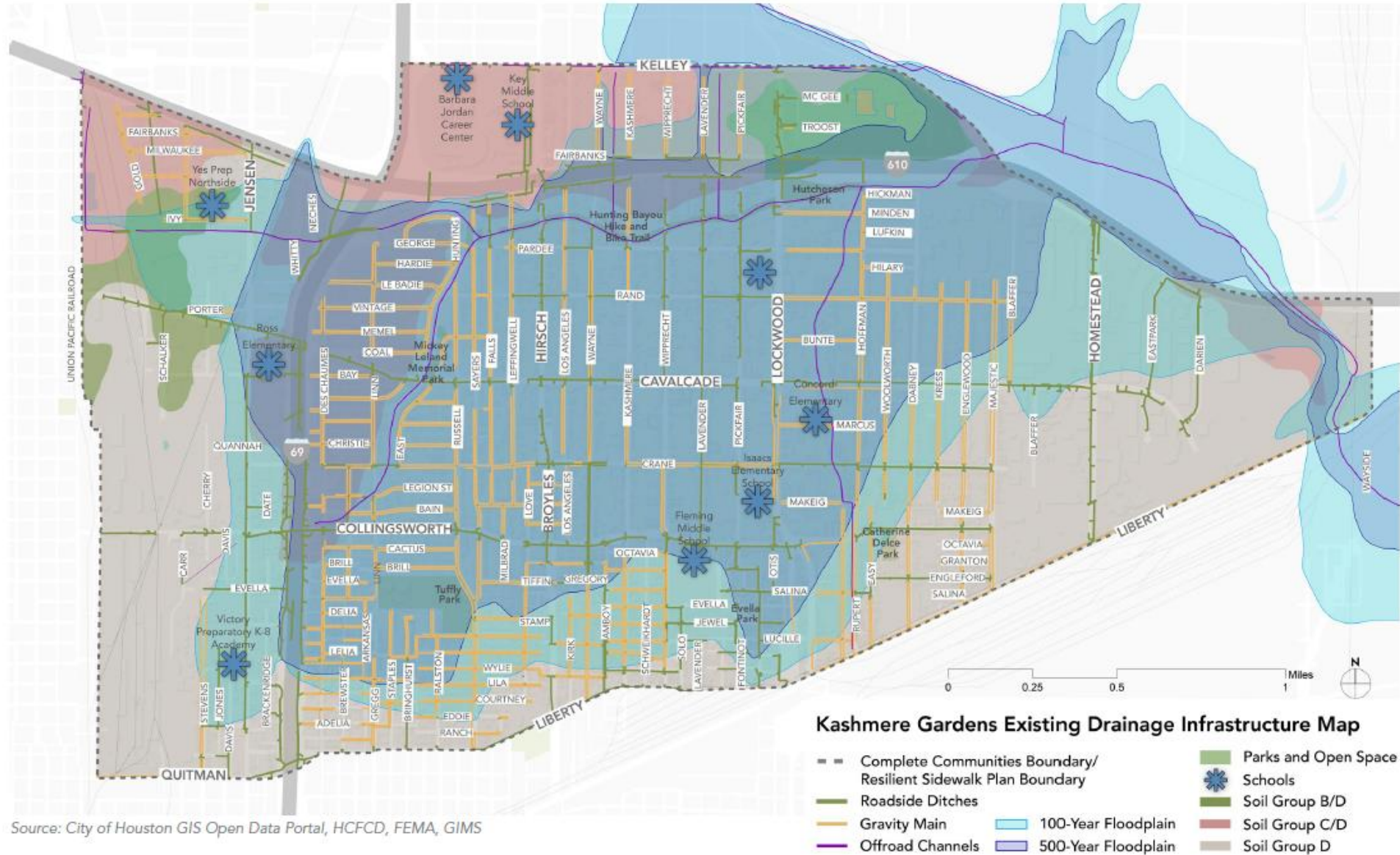
Literature Review & Mapping

Sidewalk Infrastructure Map



Literature Review & Mapping

Drainage Infrastructure and Flooding Map

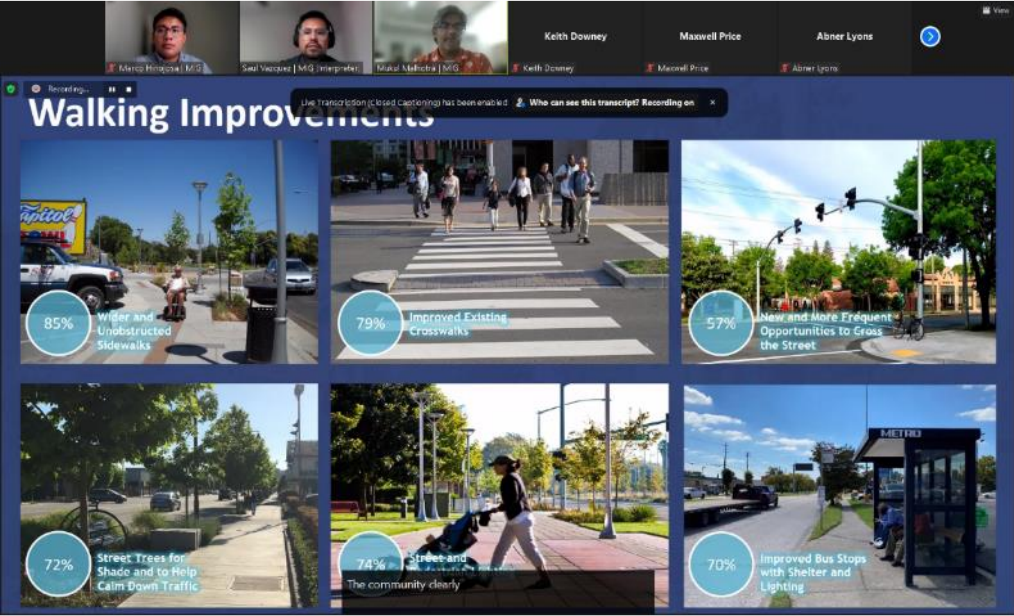


Equitable Engagement Process

- Started With the Creation of an **Equitable** Engagement Plan
 - Identified Potential Partners
 - Outlined Engagement Activities
 - Laid Out the Goals for Each Phase of Engagement
 - Remained **Flexible and Adaptable**
- Created Partnerships with Community Based Organizations



Community Involvement



**Over
1000
Respondents!**

Existing Conditions



Existing Conditions

Open Ditch



Open ditch next to roadway with no sidewalks



Open ditch next to property line with no sidewalks



Open ditch next to roadway with sidewalk on one side



Open ditch next to property line with sidewalk on one side



Open ditch next to roadway with sidewalk on both sides



Open ditch next to property line with sidewalk on both sides



Open ditch between narrow roadway or property line

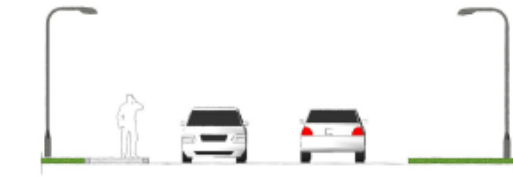
Curb & Gutter



Curb and gutter in a local street with no sidewalks



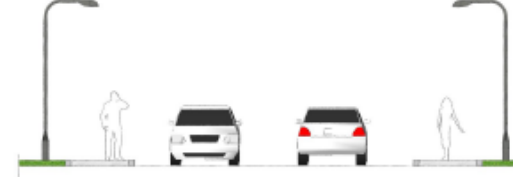
Curb and gutter in a major thoroughfare with no sidewalks



Curb and gutter in a local street with buffered sidewalk on one side



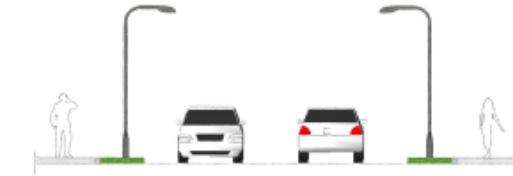
Curb and gutter in a major thoroughfare with buffered sidewalks on both sides



Curb and gutter in a local street with unbuffered sidewalks on both sides



Curb and gutter in a major thoroughfare with unbuffered sidewalks on both sides



Curb and gutter in a local street with buffered sidewalks on both sides



Curb and gutter in a major thoroughfare with buffered sidewalk on one side

Existing Success Stories



Bagby Street Green Stormwater Infrastructure, Houston

Existing Success Stories



Bagby St, Houston



Nagle & Rosalie St, Houston

3. Highlights

City-wide Toolkit

Draft

Under review as of 03/08/23

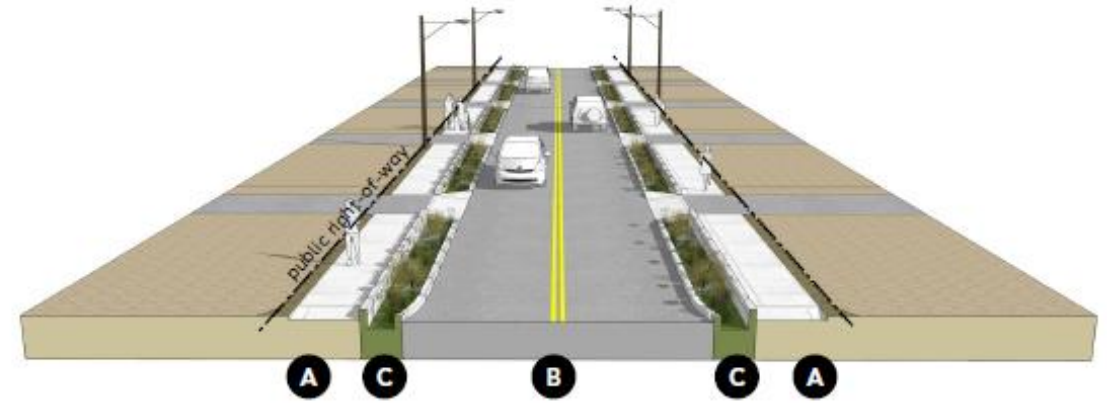
Proposed Design Concepts Legend

Each of the proposed design concepts are illustrated with the following streetscape components:

Street with an Open Ditch



Street with Curb and Gutter



A	Sidewalk/ Pedestrian Zone	This area is the primary ADA accessible pathway for people to walk or use a wheelchair. It can be adjacent to the public ROW or roadway. If next to public ROW, it may include a public easement. If wide enough, it is occasionally used as a bicycle facility shared with pedestrians. It also contains bus stops and utilities such as street lights, utility poles, etc. It is generally referred to as 'Sidewalk' in key City documents such as the IDM. In well established neighborhoods with constrained ROW, this zone may also include the 'Frontage Buffer', as defined by the IDM, if next to the ROW.
B	Vehicular and Bike Access Zone	This area is where a paved roadway is located and is a designated space for vehicles to travel and park on. Bike facilities such as bike lanes can also be found here. These roadways can be either undivided or divided with a raised or planted median.
C	Drainage Amenity Zone	This area is either behind the edge of the roadway or the edge of Sidewalk/Pedestrian zone. In some solutions, this area could also be in the middle of the ROW. This area provides the drainage function for the street that is characterized by an open ditch, bioswale or some other green infrastructure element. It may also contain some amenities such as trees, signposts, etc.. When next to the edge of the roadway, it generally corresponds to the term 'Safety Buffer', as defined in key City documents such as the IDM.

A	Sidewalk/ Pedestrian Zone	This area is the primary ADA accessible pathway for people to walk or use a wheelchair. It is usually adjacent to the public ROW and may include a public easement. It is occasionally used as a bicycle facility shared with pedestrians. It may also contain bus stops and utilities such as street lights, utility poles, etc. It is generally referred to as 'Sidewalk' in key City documents such as the IDM. In well established neighborhoods with constrained ROW, this zone may also include the 'Frontage Buffer', as defined by the IDM.
B	Vehicular and Bike Access Zone	This area is where a paved roadway is located and is a designated space for vehicles to travel and park on. Bike facilities such as bike lanes can also be found here. These roadways can be either undivided or divided with a raised or planted median.
C	Drainage Amenity Zone	This area is behind the back of curb and the edge of Sidewalk/Pedestrian zone. Usually used as a safety buffer from vehicles. This area is paved or landscaped and contains different amenities such as seating, pedestrian light, street lights, utility cabinets, sign posts, parking meters, trees and green infrastructure elements like stormwater planters. It is generally referred to as 'Safety Buffer' in key City documents such as the IDM.

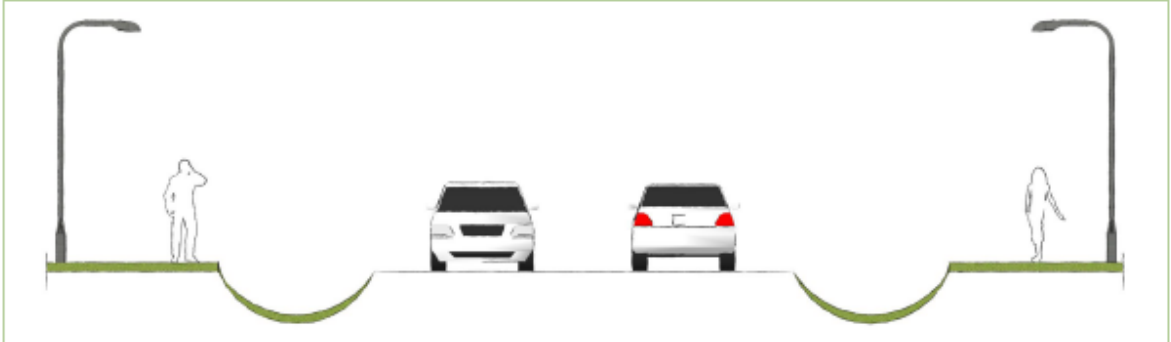
Open Ditch Next to Roadway

Scenario OD-1: Existing

Open Ditch Next to Roadway

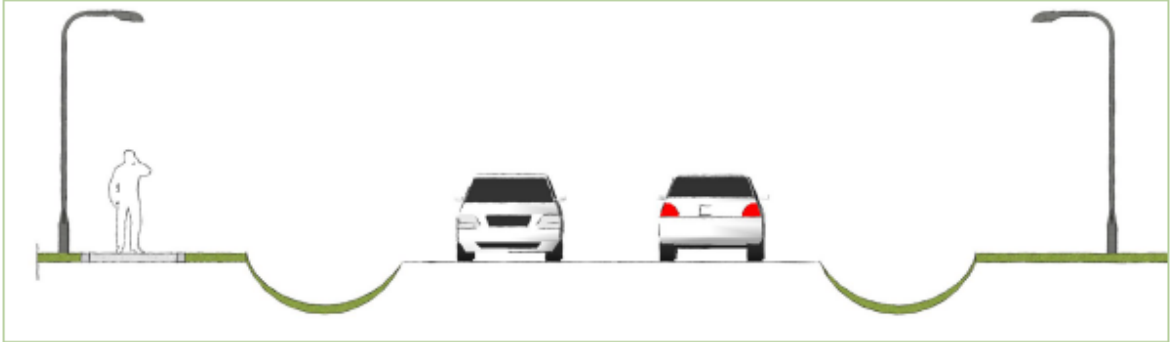
Prototypical Existing Conditions Section

Section 1: No Sidewalks on Both Sides of Street



Sketch courtesy of the City of Houston

Section 2: Sidewalks on One Side of the Street



Sketch courtesy of the City of Houston



Rendering of an existing condition with no sidewalks on both sides of the street

City-wide Toolkit

Scenario OD-1: Existing

Open Ditch Next to Roadway

Existing Context

Primarily observed in local residential streets, this existing condition involves an open ditch on at least one side, directly adjacent to the roadway. The space between the open ditch and property line may include a sidewalk or completely lack pedestrian infrastructure. The roadway may contain parking on one or both sides of the street. Overhead and at-grade utilities are generally located at the edge of the ROW.



Typical existing conditions on local residential streets

Scenario Applicability Criteria

Right-of-Way (ROW)	40' – 80'
Travel Lanes	Two minimum
Drainage	Open Ditch
Pedestrian Infrastructure	No sidewalks; sidewalk on one side; sidewalk on both sides in poor condition



Scenario OD-1: Proposed

Open Ditch Next to Roadway

Preferred Solution OD-1.0

The proposed improvements include adding a sidewalk on at least one side of the ROW. Additional improvements include converting the open ditch into a bioswale to mitigate potential flooding created by adding additional impervious pavement. No change is proposed to the existing roadway.

Scenario Improvement Criteria

Sidewalk/ Pedestrian Zone*	5' minimum (6' preferred) standard concrete sidewalk	A
Vehicular and Bike Access*	18' minimum with two bi-directional lanes (20' preferred) Refer to the City of Houston Bike Plan	B
Drainage/ Amenity Zone	8' minimum open ditch repurposed as bioswale	C

Cost Estimates

Construction: \$3,300 per linear foot
Operation and Maintenance: \$10 per linear foot

Alternative Solutions

OD-1.1	Provide permeable sidewalk on at least side of the street. Maintain existing open ditches and roadway.
OD-1.2	Provide standard concrete sidewalk on at least one side of the street. Convert part or all of the roadway to porous asphalt to mitigate drainage issues. Maintain existing open ditches.
OD-1.3	Regrade entire street and provide one consolidated bioswale in middle of ROW. Provide standard concrete sidewalks (raised or with slotted curbs) on both sides of the street.

Draft

Under review as of 03/08/23



* Will require modification approval if located on a TOD Street, Major Thoroughfare, or within the Central Business District. May require modification approval if identified in the Walkable Places Plan.

Scenario OD-1: Proposed

Open Ditch Next to Roadway

Proposed Conditions: Renderings and Built Examples



OD-1.0 Rendering of proposed improvement on one side of street



OD-1.0 Rendering: of proposed improvement on both sides of the street



OD-1.0 Built example in Seattle, WA
Photo courtesy of Mark Holema



OD-1.0 Built example in Eagle Creek
Photo courtesy of Ecologic

Scenario OD-1: Proposed

Open Ditch Next to Roadway

Proposed Conditions: Renderings and Built Examples



OD-1.1 Rendering of permeable sidewalk on one side of the street next to open ditch



OD-1.1 Built example of permeable sidewalk in Seattle, WA



OD-1.2 Built example of porous asphalt in Seattle,
Photo courtesy of Mithun



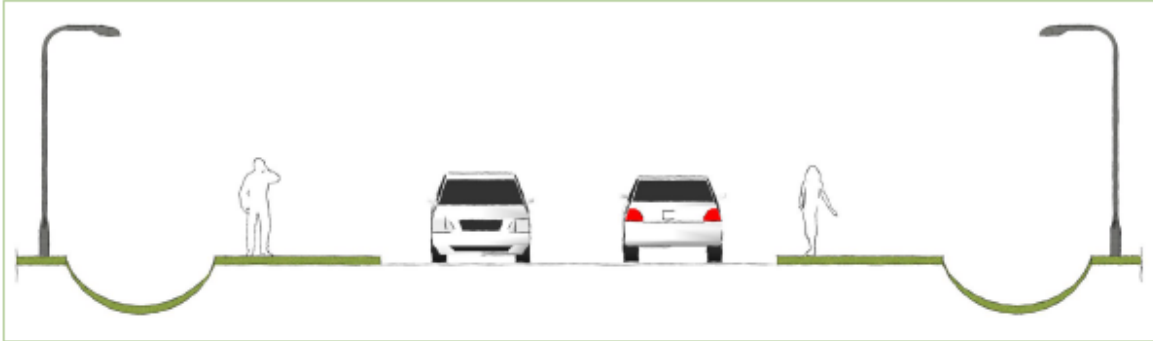
OD-1.2 Built example of porous asphalt in Pringle Creek; Photo courtesy Greenworks

Scenario OD-2: Existing

Open Ditch Next to Property Line

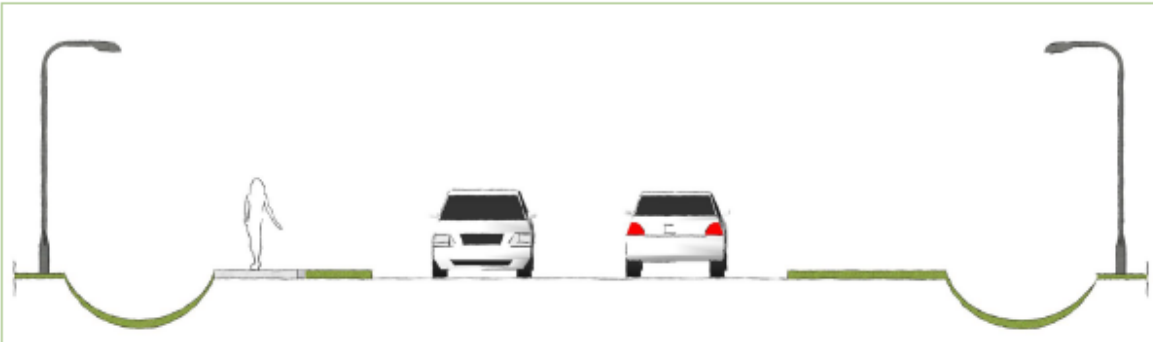
Prototypical Existing Conditions Section

Section 1: No Sidewalks on Both Sides of the Street



Sketch courtesy of the City of Houston

Section 2: Sidewalk on One Side of the Street



Sketch courtesy of the City of Houston

Open Ditch Next to Property Line



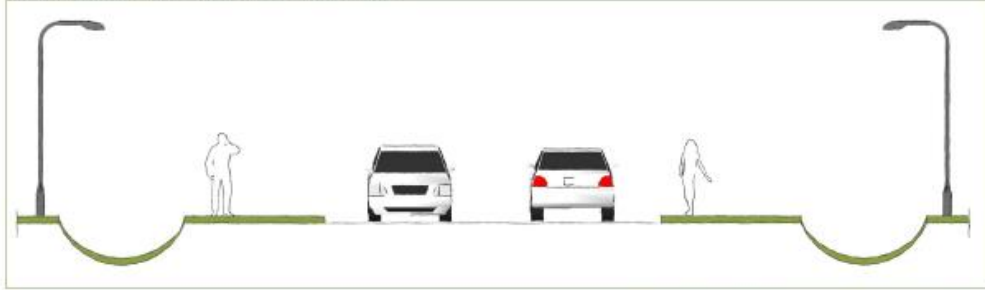
Rendering of an existing condition with no sidewalks on both sides of the street

Scenario OD-2: Existing

Open Ditch Next to Property Line

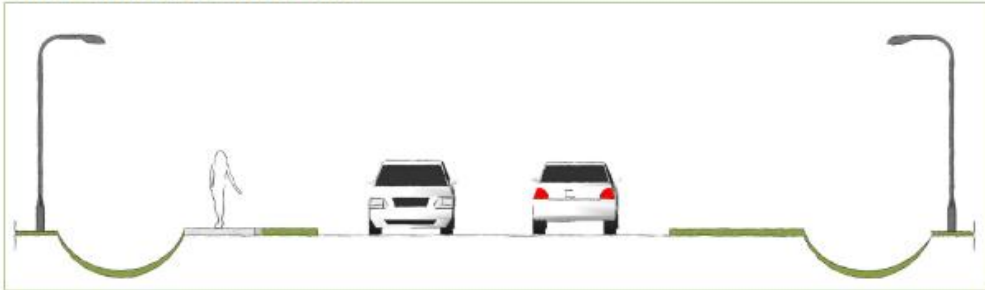
Prototypical Existing Conditions Section

Section 1: No Sidewalks on Both Sides of the Street



Sketch courtesy of the City of Houston

Section 2: Sidewalk on One Side of the Street



Sketch courtesy of the City of Houston



Rendering of an existing condition with no sidewalks on both sides of the street

Scenario OD-2: Proposed

Open Ditch Next to Property Line

Preferred Scenario Solution OD-2.0

Proposed improvements include adding a sidewalk on at least one side of the roadway with a six-inch vertical concrete slotted curb for protection allowing water to drain to the bioswale. This curb satisfies the safety buffer requirement of the IDM. Additional improvements include converting the open ditch into a bioswale or bioretention planter to mitigate potential flooding created by the addition of impervious pavement.

Scenario Improvement Criteria

Sidewalk/ Pedestrian Zone*	6' minimum (7' preferred) standard concrete sidewalk	A
Vehicular and Bike Access	18' minimum (20' preferred) with two bi-directional lanes Refer to the City of Houston Bike Plan	B
Drainage/ Amenity Zone	8' minimum open ditch repurposed as bioswale	C

Cost Estimates

Construction: \$3,360 per linear foot

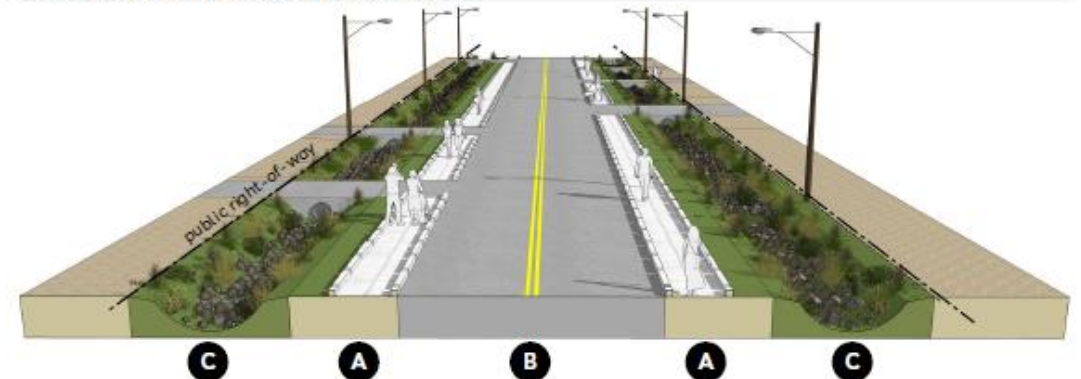
Operation and Maintenance: \$20 per linear foot

Alternative Solutions

OD-2.1	Provide permeable sidewalk with slotted curbs on at least side of the street. Maintain existing open ditches.
OD-2.2	Provide standard concrete sidewalk with slotted curbs on at least one side of the street. Convert part or whole of roadway to porous asphalt. Maintain existing open ditches.
OD-2.3	Regrade entire street and provide one consolidated open ditch bioswale on one side of the ROW. Provide standard concrete sidewalk that is raised or with slotted curbs.

Draft

Under review as of 03/08/23



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Scenario OD-2: Proposed

Open Ditch Next to Property Line

Proposed Conditions: Renderings and Built Examples

Draft

Under review as of 03/08/23



OD-2.0 Rendering of proposed improvement on both sides of street



OD-2.1 Rendering of permeable paving sidewalk on one side of the street



OD-2.0 Built example in Houston



OD-2.3 Built example of reggraded street with concrete sidewalk and a consolidated bioswale on one side of the street



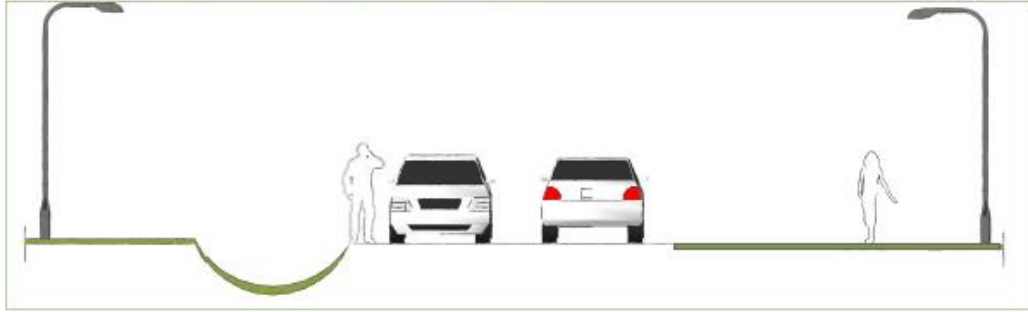
Scenario OD-3: Existing

Open Ditch between Narrow Roadway and Property Line

Narrow Roadway

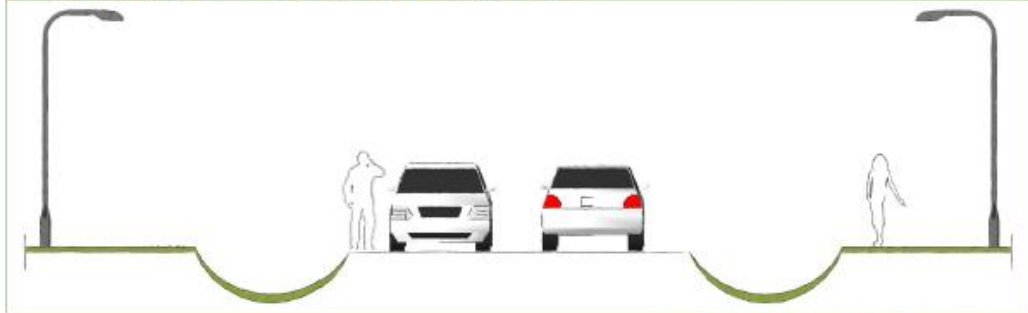
Existing Conditions Sections

Section 1: No Sidewalks and Open Ditch on One Side of the Street



Sketch courtesy of the City of Houston

Section 2: No Sidewalks and Open Ditches on Both Sides of the Street



Sketch courtesy of the City of Houston



Rendering of an existing condition with no sidewalks on both sides of the street

Scenario OD-3: Proposed

Open Ditch between Narrow Roadway and Property Line

Preferred Scenario Solution OD-3.0

The proposed improvement includes adding a sidewalk with a slotted curb on one side of the roadway. Additional improvements include converting at least one open ditch into a bioswale and making it a one-way street. The proposed one-way system would require further studies for the impact on traffic flow and access on intersecting and parallel streets.**If the traffic study does not warrant a one-way system, then an underground drain must be installed to create enough space for at least one sidewalk as described in OD-3.3.

Alternative Solutions

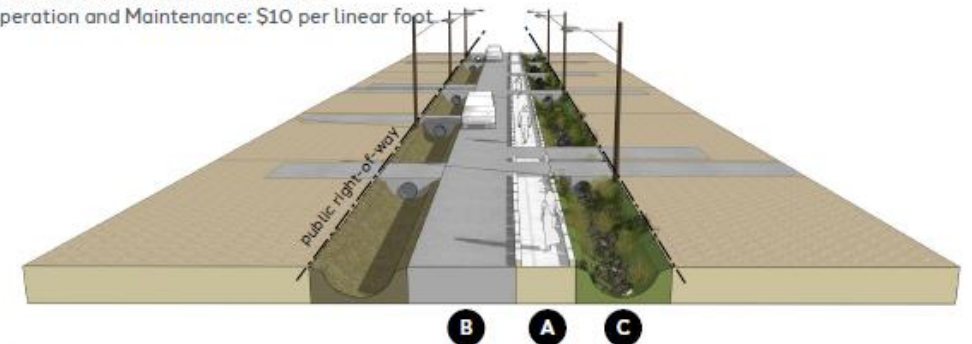
OD-3.1	Provide permeable sidewalk with a slotted curb on one side of the street. Maintain existing open ditches. Convert roadway to a one-way street.
OD-3.2	Provide standard concrete sidewalk with slotted curb on one side of the street. Maintain existing open ditches. Convert roadway to a one-way street with pervious asphalt.
OD-3.3	Convert one open ditch into a standard underground stormwater pipe with catch basins. Provide a landscape-buffered standard concrete sidewalk on top of the underground drainage. Maintain roadway as a two-way street.

Scenario Improvement Criteria

Sidewalk/ Pedestrian Zone*	6' minimum (7' preferred) standard concrete sidewalk	A
Vehicular and Bike Access	10' minimum with a one-way conversion Refer to the City of Houston Bike Plan	B
Drainage/ Amenity Zone	8' minimum open ditch redesigned as bioswale	C

Cost Estimates

Construction: \$2,510 per linear foot
Operation and Maintenance: \$10 per linear foot



Draft

Under review as of 03/08/23

* Will require modification approval if located on a TOD Street, Major Thoroughfare, or within the Central Business District. May require modification approval if identified in the Walkable Places Plan.

** Weblinks that provide preliminary direction to one-way conversion: [Pedestrian Safety Guide and Countermeasure Selection System](#), [City of New Orleans](#), and [FHWA](#).

Scenario OD-3: Proposed

Open Ditch between Narrow Roadway and Property Line

Proposed Conditions: Renderings and Built Examples

Draft

Under review as of 03/08/23



OD- 3.0 Rendering of proposed sidewalk along one side of a one-way street



OD-3.1 Built example of permeable sidewalk on one side of a one-way street



OD-3.3 Rendering of open ditch converted to a standard underground drainage system with a sidewalk and planting strip on top

Scenario CG-1: Proposed

Curb and Gutter on a Local Street

Proposed Conditions: Renderings and Built Examples



CG-1.0 Rendering:
Proposed improvement on both sides of street



CG-1.0 Built example of bioretention planter in Houston



CG-1.1 Built example of landscape buffered standard concrete sidewalk in Houston



CG-1.2 Built example of multi-use pathway one side of the street in Houston

Scenario CG-2: Proposed

Curb and Gutter on a Major Thoroughfare

Proposed Conditions: Renderings and Built Examples



CG-2.0 Rendering of proposed improvement on both side of the street



CG-2.2 Built example of permeable sidewalk with tree boxes



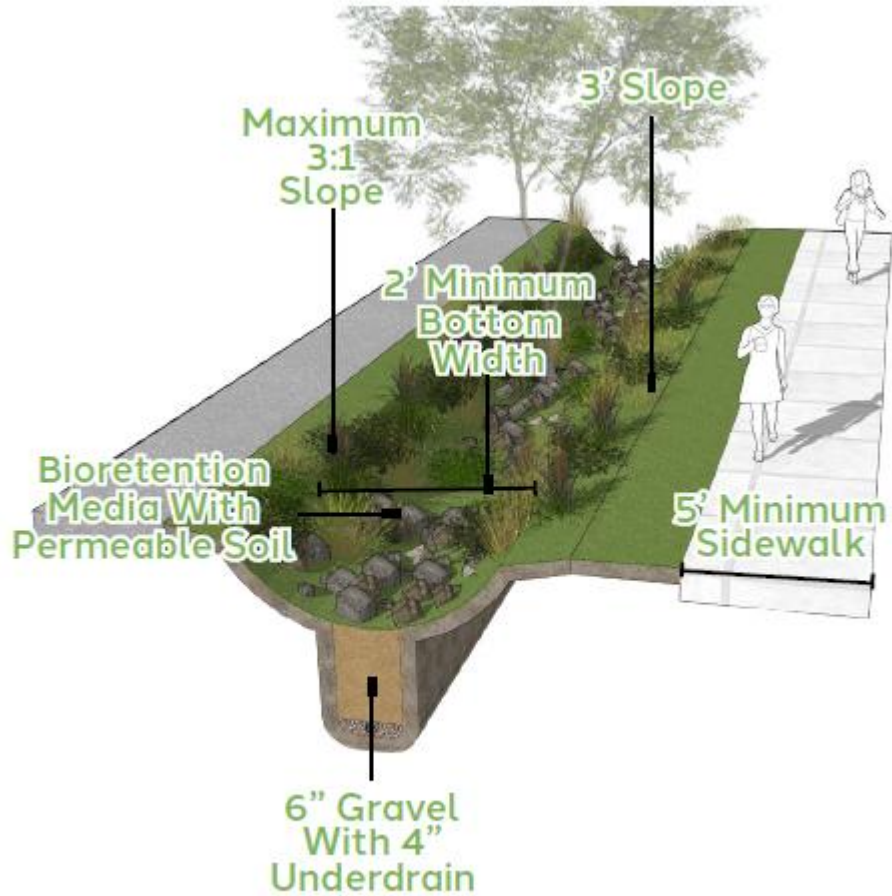
CG-2.1 Built example: Houston



CG-2.2 Built example in Oakland

Draft

Under review as of 03/08/23



Vegetated swale diagram

Maintenance Indicator	Corrective Action
Clogged surface; ponding	Remove sediment, debris from drains, inlets, and downspouts Rake, till, or amend soil surface with approved soil mix to restore infiltration rate Remove and replace sediment
Broken inlet or outlet	Repair or replace broken features
Dead or stressed vegetation	Replant per original planting plan
Weeds, tall grass/vegetation	Manually remove, trim grass
Season Maintenance Needs	
Summer	Make structural repairs Clean culverts, remove any buildup of debris
Fall	Replant exposed soils and replace dead plants Remove sediment and plant debris
Winter	Clear culverts
Spring	Remove sediment and plant debris Replant exposed soil and replace dead plants
All Seasons	Weed as needed

Simplified O&M plan for bioswales

Draft

Under review as of 03/08/23



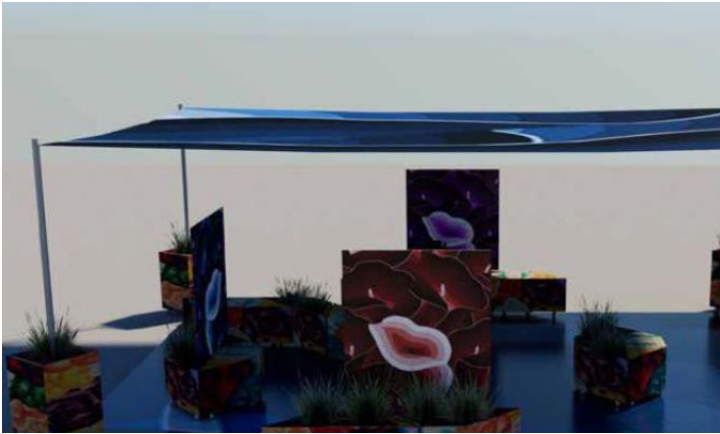
Bioretention planter diagram

Maintenance Indicator	Corrective Action
Clogged surface; ponding	Remove sediment and debris from catch basins, drains, curb inlets, and pipes Rake, till, or amend soil surface with approved soil mix to restore infiltration rate Remove and replace sediment
Broken inlet or outlet	Repair or replace broken features
Check dams missing or broken	Maintain or replace rock check dams per design specifications
Perforated liner	Replace or repair liner as needed
Dead or stressed vegetation	Replant per original planting plan
Weeds, tall grass/vegetation	Manually remove, trim grass
Gullies, erosion, sedimentation	Fill in and compact areas of erosion Replant according to planting plan
Scouring at inlets	Ensure splash guards are working as intended
Slope slippage	Stabilize slopes with plantings from the original planting plan
Season Maintenance Needs	
Summer	Make structural repairs Clean inlets, remove any buildup of debris
Fall	Replant exposed soils and replace dead plants Remove sediment and plant debris
Winter	Clear inlets
Spring	Remove sediment and plant debris Replant exposed soil and replace dead plants
All Seasons	Weed as needed

Simplified O&M plan for bioretention

Special Considerations

Shade Network



Pedestrian Lighting



A mindset of equal and safe use of sidewalks at all times of the day and during all seasons.

Special Considerations

Draft

Under review as of 03/08/23

Walking Surfaces

Pedestrian Safety

Decomposed Granite (Small Crushed Gravel)



Walkway made of decomposed granite

Applicability: Best used in a wide variety of areas including walking paths with low pedestrian volume (local streets), damaged pavement has to be replaced due to conflict with existing tree roots, and where new sidewalks need to be created next to trees that will have extensive root zones. Most applicable for preferred solutions proposed for street scenarios OD-1, CG-1 and CG-2. Compared to concrete sidewalks, it is more flexible. However, it requires more regular maintenance than asphalt or concrete pavement materials.

Estimated Cost: \$12/linear foot

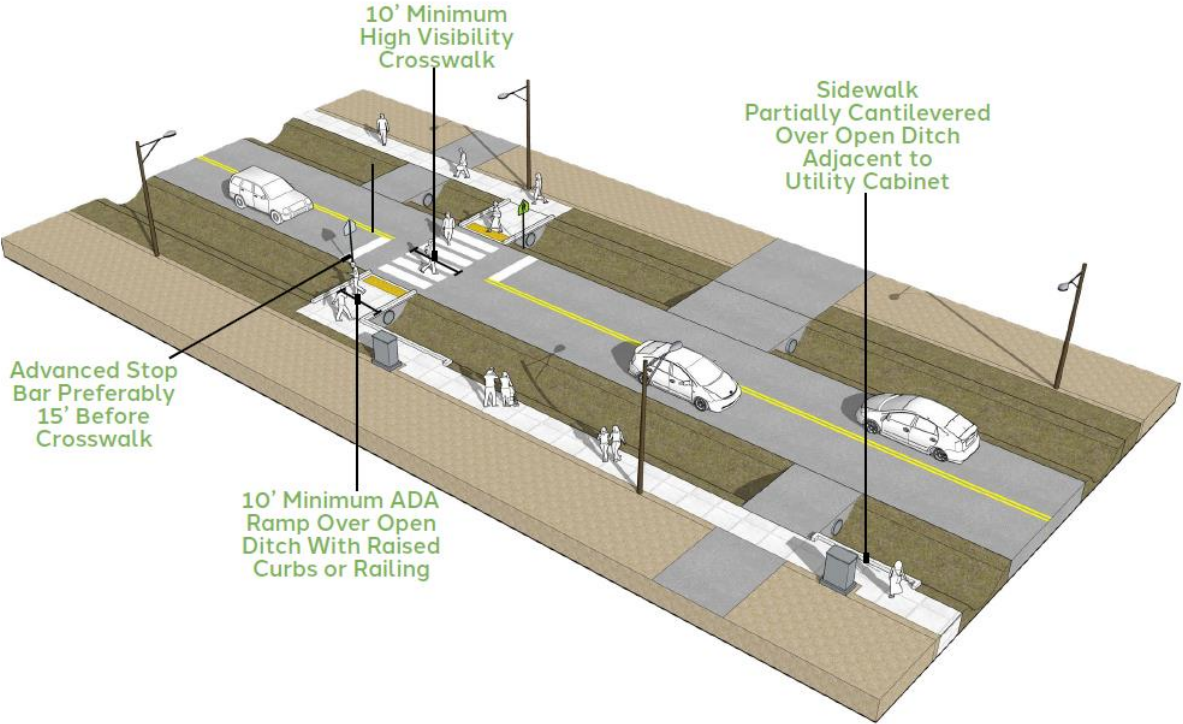
Rubber Walkways



Rubber sidewalk in Berkeley, CA
Photo Courtesy of Carlo Rubberway

Applicability: Best used in areas to replace damaged pavement due to conflict with existing tree roots, and where new sidewalks need to be created next to trees that will have extensive root zones. Generally made with recycled materials, their cushioned surface is friendly to walking and jogging. Most applicable for preferred solutions proposed for street scenarios OD-1, CG-1, and CG-2. Compared to concrete sidewalks, rubber walkways are more flexible. However, they require more regular maintenance and may need to be replaced or reset due to pressure from tree roots.

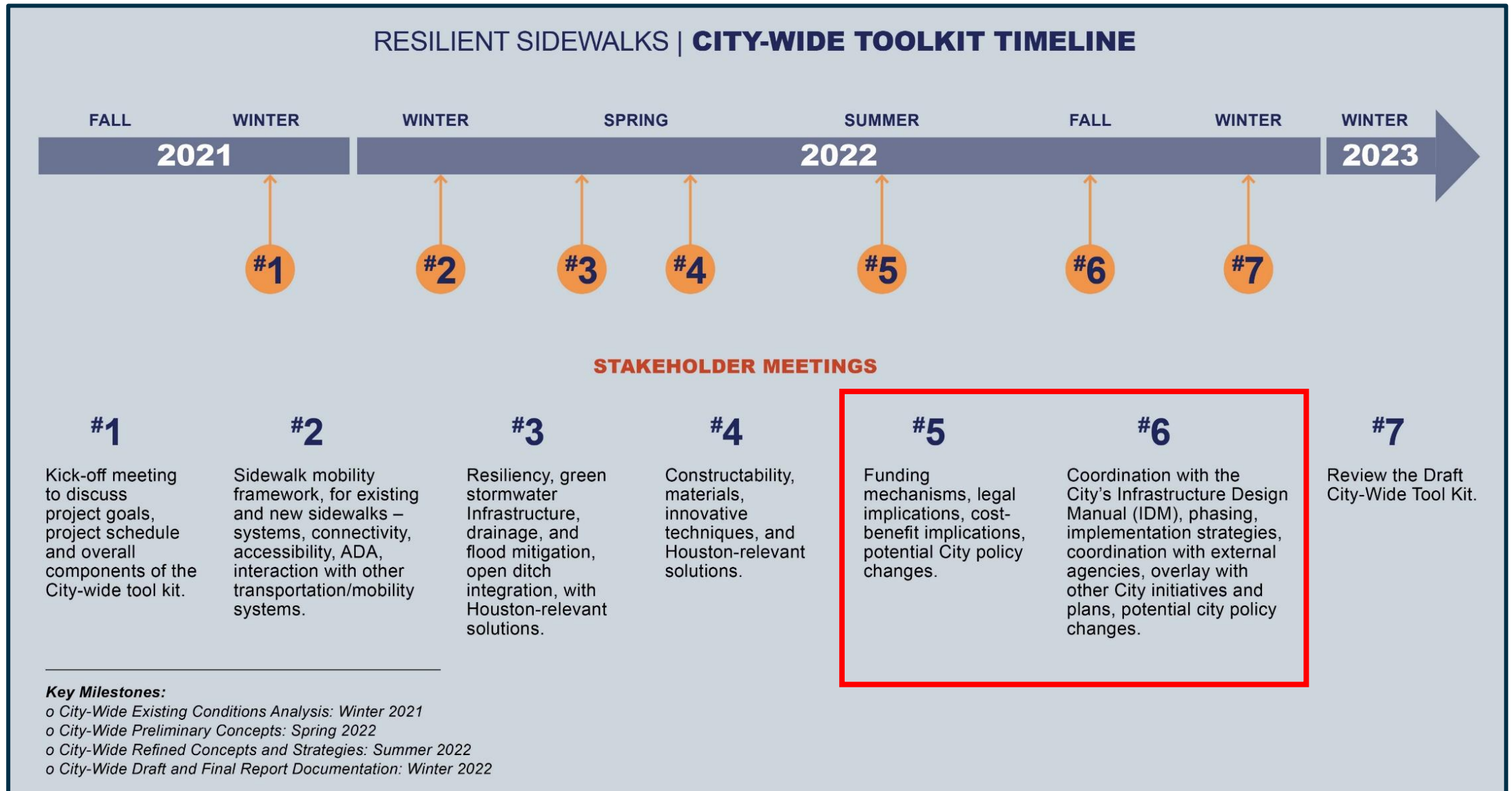
Estimated Cost: \$20/square foot



Safety at mid-block and intersection crossings

4. Implementation

Resiliency is Funding Too!



Resiliency is Funding Too!



While our toolkit will produce an actionable plan, without funding, ... implementation is not likely.

We have to elevate the many barriers observed, including but not limited to, lack of neighborhood scale funding mechanisms, for further action.

Existing Funding Sources



- Sidewalk Program
 - Pedestrian Accessibility Review Program (MOPD & TDO-HPW-PDB)
 - School Sidewalk Program (HPW)
 - Major Thoroughfare Program (HPW)
- Council District Service Fund Program
- Complete Communities Improvement Fund
- Tax Increment Reinvestment Zones
- Management Districts
- Dedicated Drainage and Street Renewal Fund (DDSRF)
- Drainage Utility Charge
- Developer Impact Fee
- Portions of property Taxes

Existing Funding Sources



■ Metro

- Federal transit Administration (FTA)
- Boost Network

■ Harris County

- CIP
- CDBG

■ Texas Water Devt. Board

- CWSRF

■ FEMA

- Flood Mitigation Assistance
- Building Resilient Infrastructure and Communities (Bric)

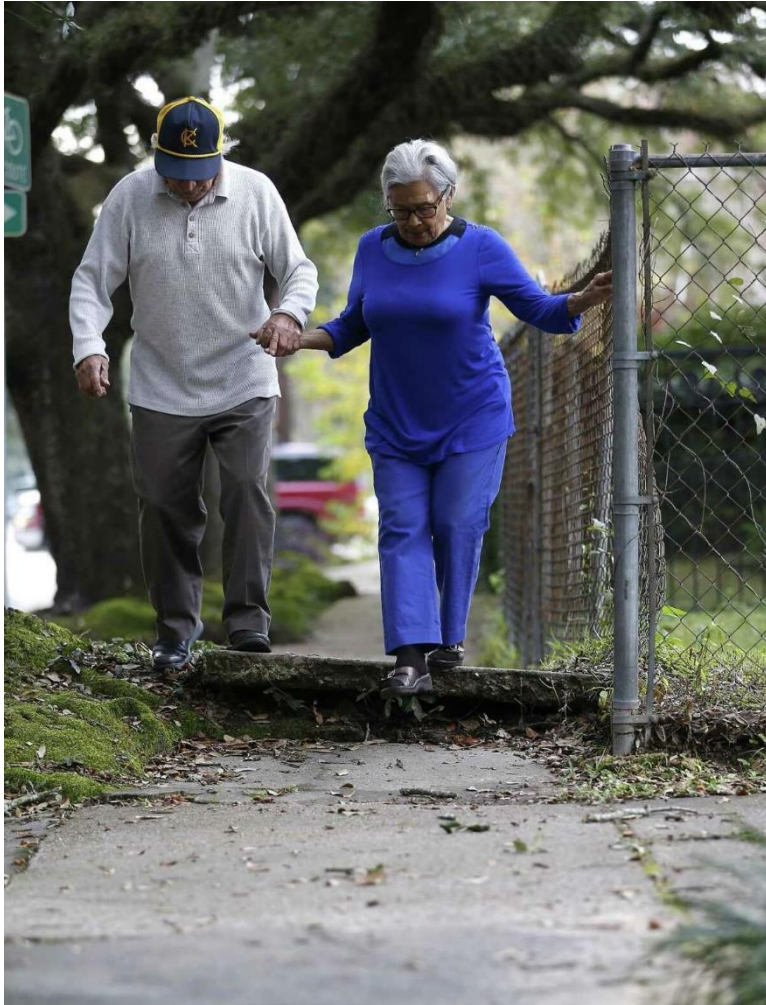
■ TxDOT

- Governor's Community Achievement Awards
- Transportation Alternatives Set-Aside (TA) Program
- Congestion Mitigation and Air Quality Improvement (CMAQ)
- Unified Transportation Program (UTP)

■ Federal Funding

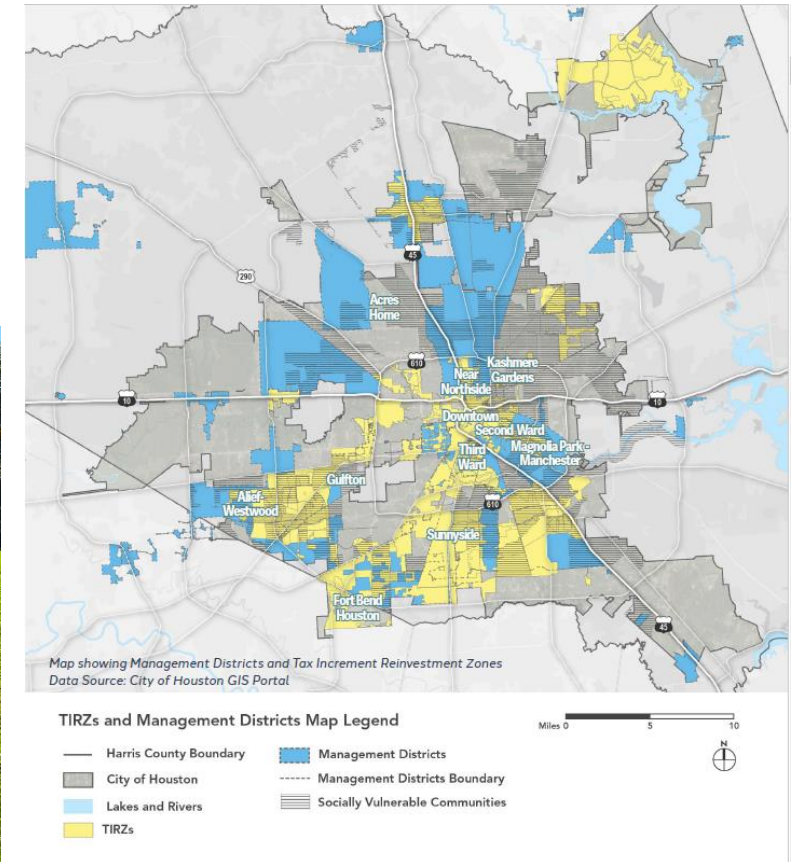
- Reconnecting Communities Pilot Program (BIL)
- Safe Streets for All (SS4A)

Resiliency is Funding Too!

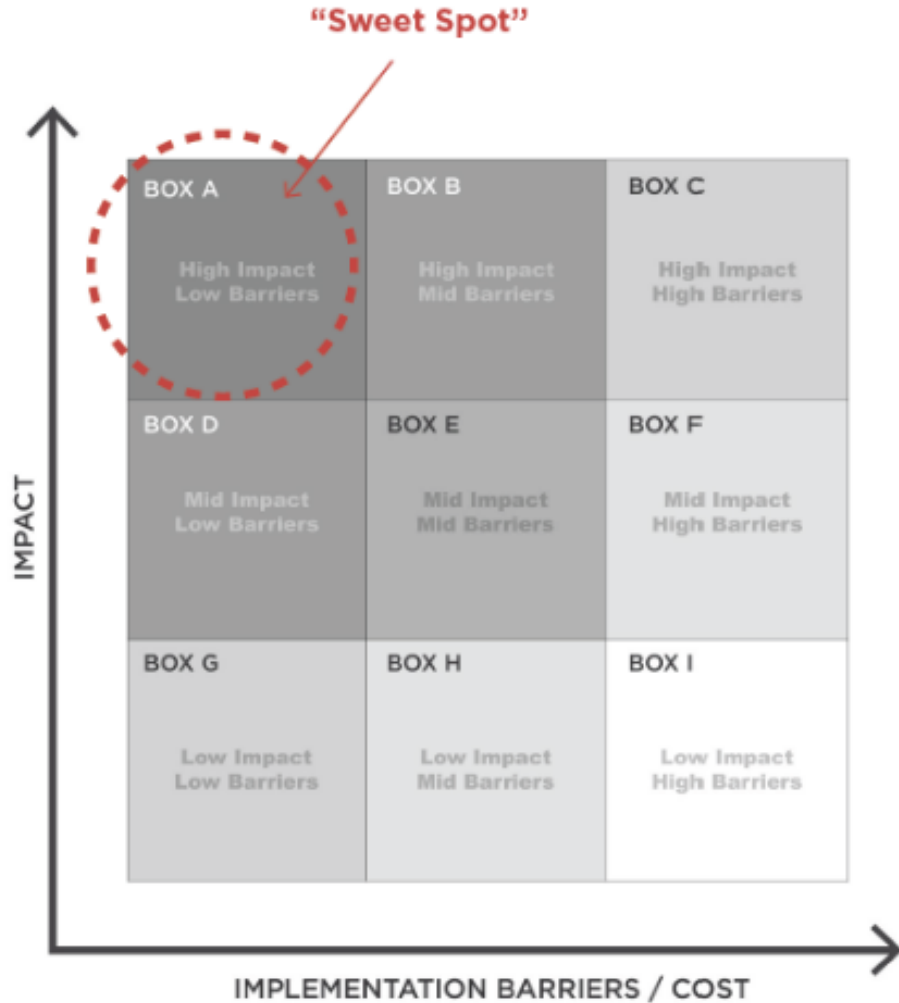


The case of “Funding Deserts”

- Lack of awareness and/or coverage of existing funding

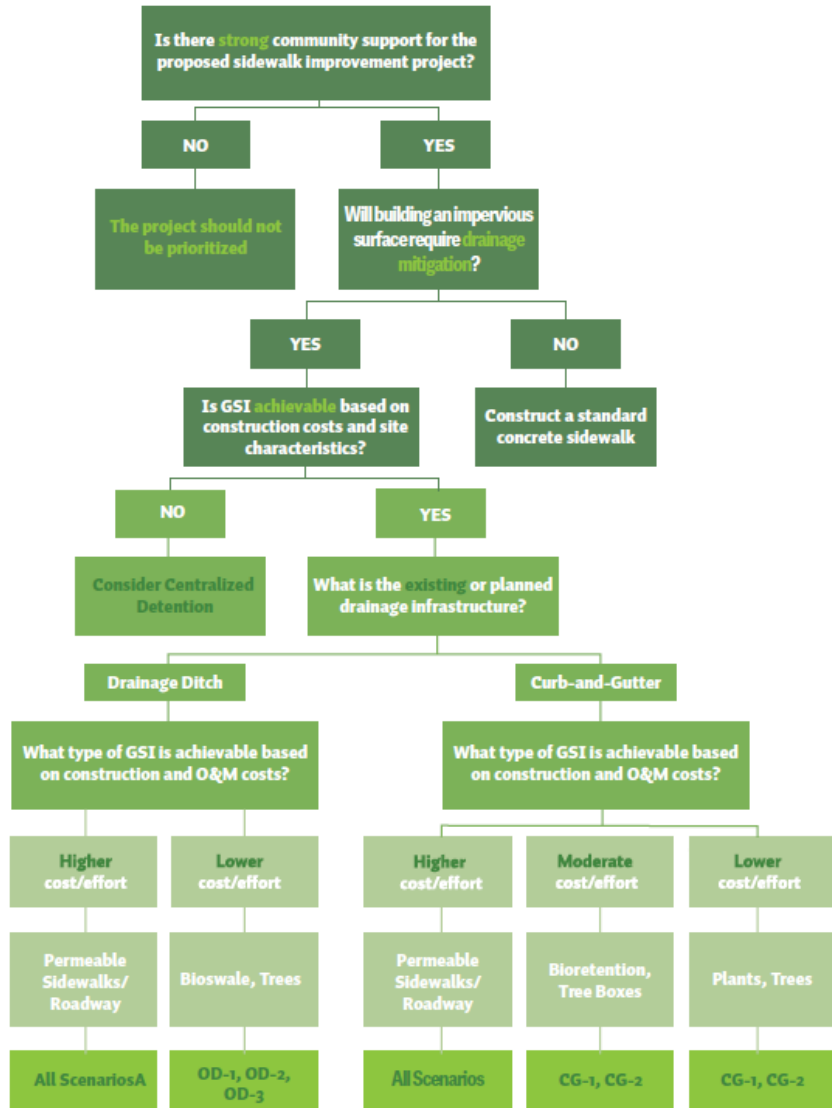


Prioritization & Phasing

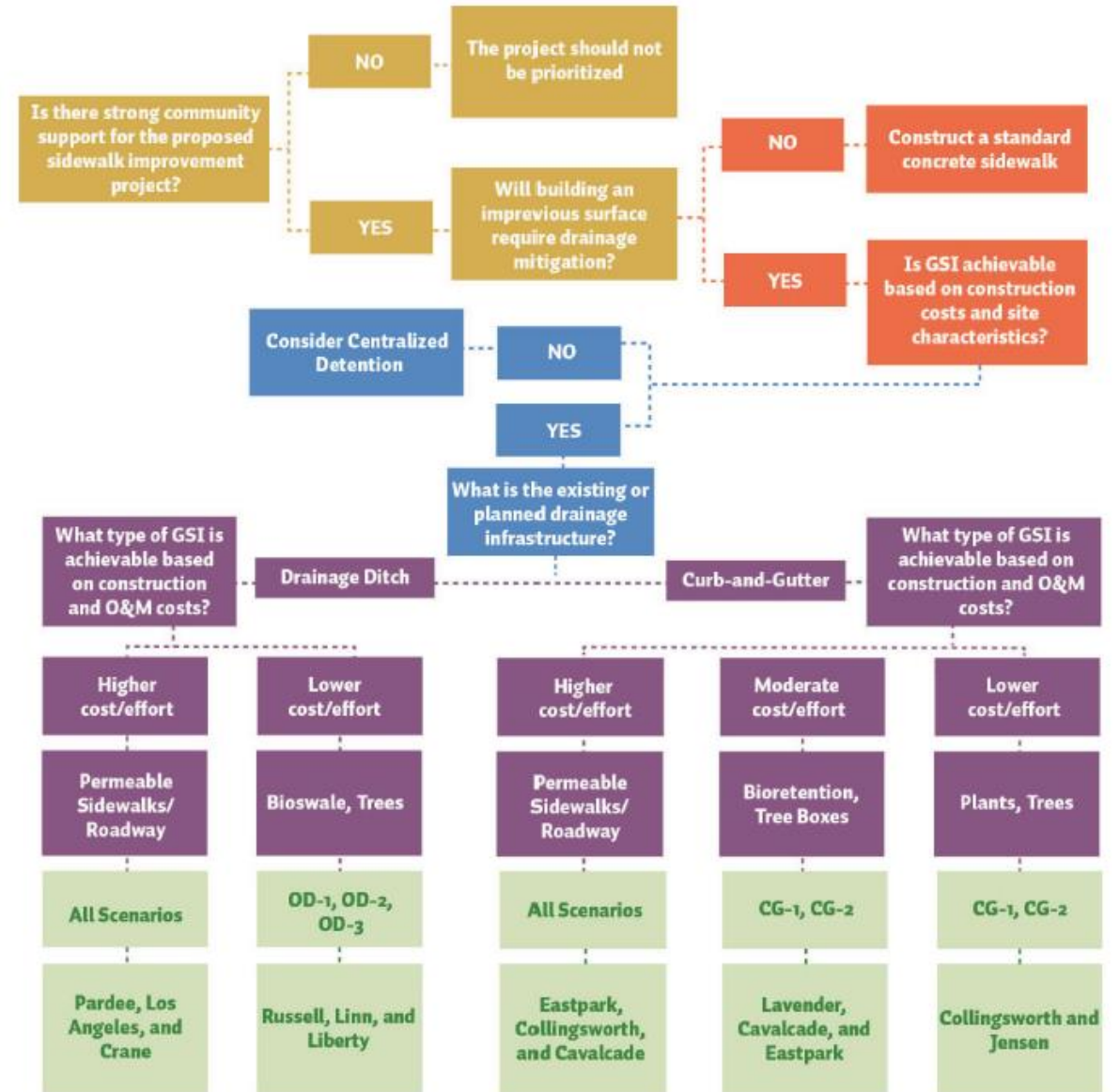


- Develop a prioritization matrix to identify sidewalk scenarios/corridors that can be implemented first
- Identify ways to phase sidewalk projects to offer immediate mobility
 - Near Term – safe & accessible tactical solutions
 - Long Term – permanent capital projects as more funding becomes available

Decision Matrices



Community Level



Decision Matrices

Action Items

The Kashmere Gardens Resilient Sidewalks Plan is the first step towards creating a resilient pedestrian network in the neighborhood. However, there are several action items that the City must pursue to implement the concepts and recommendations outlined in this document.

Action Item #1: Advocate and Monitor Plan Implementation

The City should advocate and consistently monitor the implementation of this plan. It starts with presenting the plan to all key elected City and County officials, key decision-making staff from City and partner agencies like METRO and neighborhood groups like the Super Neighborhood Council (SNC) of Kashmere Gardens. In addition, it is important to reach out to schools, churches and other religious organizations, major private destinations like LBJ, local community-based organizations like NEHRC, and city community advocacy groups like LinkHouston to present and maximize ownership of this plan. Finally, the implementation progress for five action items proposed in this document should be evaluated every six months. The findings should be presented to the Sidewalk Implementation Task Force proposed by the Resilient Sidewalks Plan City-Wide Toolkit Task Force as well as the SNC.

Goals

- Educate and maximize ownership of the Kashmere Gardens Resilient Sidewalks Plan.
- Monitor regular progress of plan implementation.

Responsible Party

- To be led by HPW Transportation and Drainage Operations and the Planning Department.
- To be undertaken by City staff.

Action Item #2: Develop Designs and Refined Cost Estimates for 3 High-Priority Projects

The City should select three high-priority projects from Phase I and II and further develop their designs and corresponding cost estimates. The three selected projects should represent different design scenarios and at least two of these projects should be for streets with ditches. Design development of these projects will help the City understand which of the preferred and alternative solutions are most appropriate. The cost estimates proposed in this report respond to prototypical scenarios. The design development will help develop context-sensitive cost estimates. Lessons learned from this exercise can help

inform the remaining five priority projects and better position all eight projects for future local, regional, and federal grant opportunities.

Goals

- Develop designs and detailed cost estimates for three high-priority projects that also improve all priority projects.
- Position priority projects for future grant-funding opportunities.

Responsible Party

- To be led by HPW Transportation and Drainage Operations with support from other relevant City departments.
- To be undertaken either in-house by City staff or by consultants.

Action Item #3: Improve Awareness of Existing Funding Sources

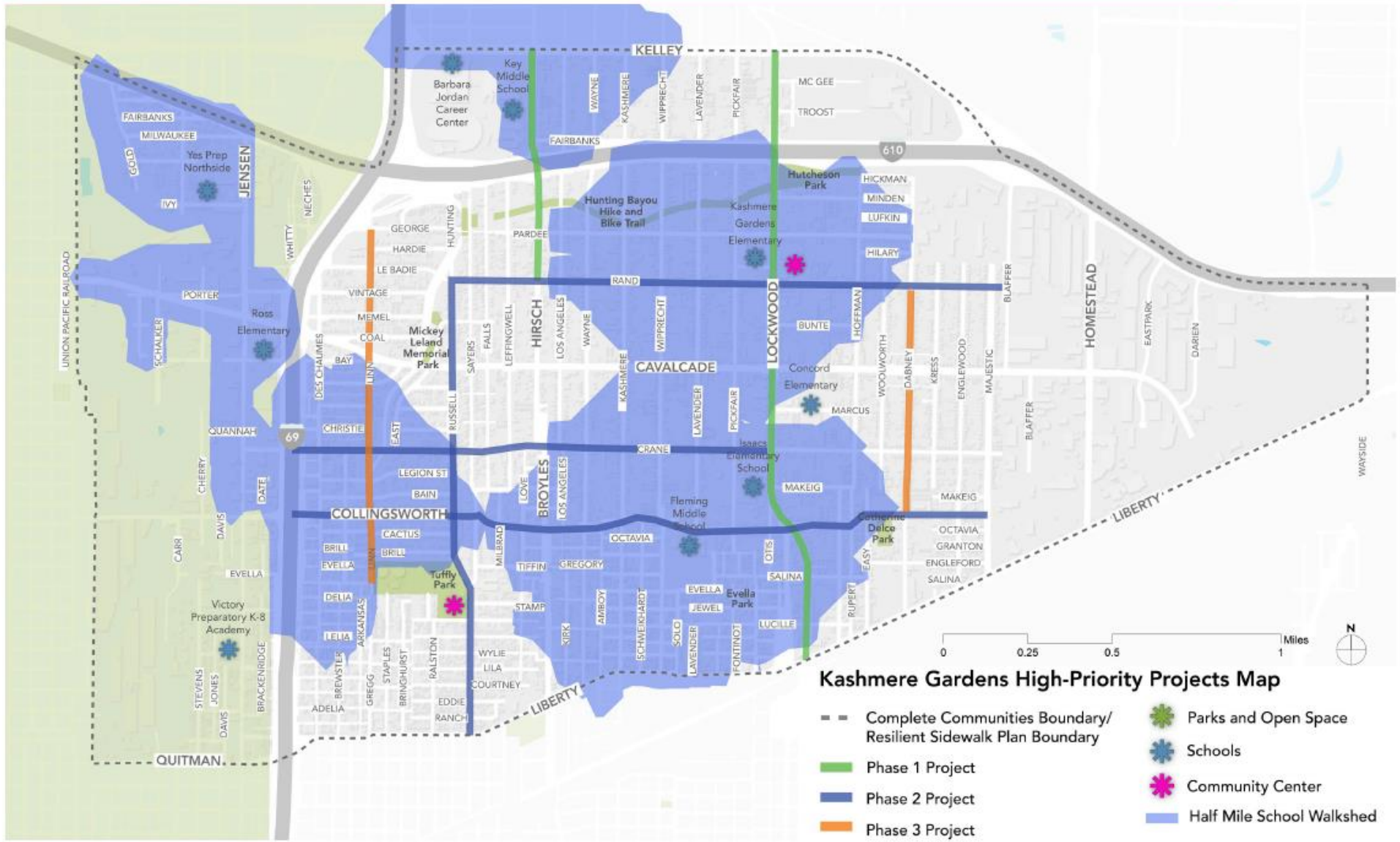
The City offers a wide range of well established funding sources. Based on feedback from key Kashmere Garden residents who are part of their neighborhood group is limited awareness of funding sources. The City, in collaboration with the SNC, should annually



STORMWATER MANAGEMENT OBJECTIVES

GS	Slow Runoff	Add Vegetation	Stormwater Detention	Increased Evaporation	Improve Water Quality
Bioswale	✓	✓	✓	✓	✓
Bioretention	✓	✓	✓	✓	✓
Tree Box	✓	✓	✓	✓	✓
Vegetated Strip	✓	✓	✓	✓	✓
Permeable Pavement	✓	✓	✓	✓	✓

High-Priority Projects Map



Source: City of Houston GIS Open Data Portal

Kashmere Gardens High-Priority Projects Map

- Complete Communities Boundary/
Resilient Sidewalk Plan Boundary
- Phase 1 Project
- Phase 2 Project
- Phase 3 Project
- Parks and Open Space
- Schools
- Community Center
- Half Mile School Walkshed
- Greater Northside
Management District

Prioritization & Phasing



Before and after rendition, Majestic St., Kashmere Gardens

Proposed Priority Street	Proposed Improvements (Preferred Scenario Solution)	Cost Estimate*	Potential Funding Sources	Potential Partner Agencies
Phase 1				
Lockwood (Kelley to Liberty)	Sidewalks with bioswales along sections with open drainage system (OD-1 & OD-2) and sidewalks with landscape buffer along underground drainage system (CG-2)	\$31.9M	BOOST Program; School Sidewalk Program; Major Thoroughfare Program; SS4A	METRO; HGAC; TxDOT
Hirsch (Kelley to Rand)	Sidewalks with landscape buffer (CG-2)	\$13.3M	BOOST Program, School Sidewalk Program; Major Thoroughfare Program; BRIC; CMAQ	METRO; HGAC; TxDOT
Phase 2				
Crane (I-69 to Lockwood)	Sidewalks with bioswales along sections with open drainage system (OD-1 & OD-2) and sidewalks with landscape buffer along underground drainage system (CG-1)	\$23.1M	School Sidewalk Program; Fee-in-Lieu Program; Greater Northside MD; Reconnecting Communities Grant	HGAC; TxDOT Greater Northside MD;
Collingsworth (I-69 to Majestic)	Sidewalks with landscape buffer (CG-2)	\$38.1M	Major Thoroughfare Program; Reconnecting Communities Grant; Greater Northside MD	HGAC; TxDOT Greater Northside MD
Russell (Rand to Liberty)	Sidewalks with bioswales along property line (OD-1)	\$22.7M	Fee-in-Lieu Program; CDBG	HGAC
Rand (Russell to Blaffer)	Sidewalks with landscape buffer west of Lockwood (CG-1) and sidewalks with bioswales along property line east of Lockwood (OD-1)	\$28.4M	TA Program; Fee-in-Lieu Program	HGAC; TxDOT
Phase 3				
Dabney (Rand to Collingsworth)	Sidewalks with bioswales along property line (OD-1)	\$12.2M	CDSF Program; Fee-in-Lieu Program	HGAC
Linn (George to Roland)	Sidewalks with bioswales along property line (OD-1) north of Collingsworth and sidewalks on converted one-way street system south of Collingsworth (OD-3)	\$13.5M	CMAQ Program; CDSF; BRIC	HGAC

* Cost estimates are an approximate order of magnitude planning-level costs calculated by extrapolating the unit linear foot costs of preferred design concepts.

Future Funding Strategies



- **Sidewalk Fee-in-Lieu (COH)**
 - City Council approved January 2023
 - Developers of new construction to pay a fee instead of providing sidewalks (\$12 per sq. foot) where applicable
 - Projected revenue of \$1.7m annually
 - City divided into sidewalk service areas – 70% spent in generating area, rest city-wide
- Target Infrastructure Grants (IRA, IIJA)
- Other Strategies

Future Funding Strategies

Bond Measures



In 2020, Austin voters approved a \$460 M Safety and Active Transportation Bond for transportation infrastructure.

Partnership Programs



Neighborhood cost-sharing: build on existing community partnerships to fund, develop, and implement their projects on City-owned property and, in turn, local groups help with cost-sharing (labor, maintenance etc.)

Facility Districts



Community Facility District (CFDs) are a legal authority, when voted on by affected property owners, that create and collect a special tax to construct specified facilities. This revenue can also go towards maintenance and operations.

5. Next Steps

Actionable Next Steps



- Wrap up this Plan with an actionable toolkit
 - Plug into city docs like the IDM
 - Create a working document
 - Menu of options for all to work with
 - Inform & coordinate with city pilot projects
- Create a robust sidewalk inventory and a priority list
- Identify offshoot projects to be tackled
- Identify grant funding and partnerships

COH Pilot Projects

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

GREEN INFRASTRUCTURE PRECAST POROUS PANEL SIDEWALKS

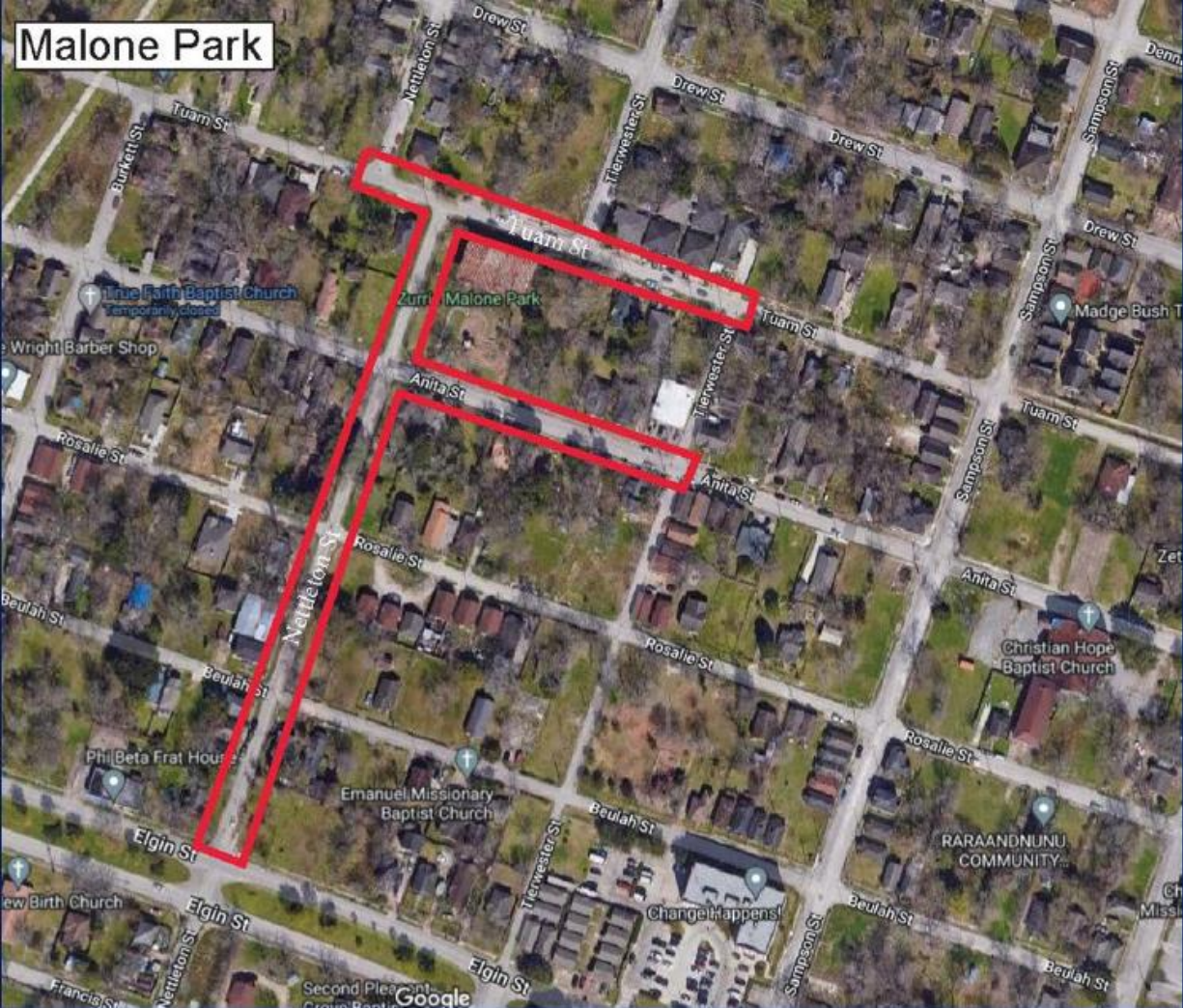
BENEFITS

- ✓ Enhances stormwater quality by reducing pollution in city waterways
- ✓ Improves street drainage through natural filtration
- ✓ Leverages sustainable materials to regulate heat
- ✓ Prevents puddles, ponds and downstream flooding

DO NOT THROW TRASH OR LITTER ON THESE PANELS

Labels in diagram:
- PRECAST POROUS CONCRETE PANEL
- WATER QUALITY MONITORING WELL
- #8 STONE LEVELING COURSE
- #57 STONE LEVELING COURSE
- GEOTEXTILE FABRIC
- MODULAR SUMP
- PERFORATED PIPE

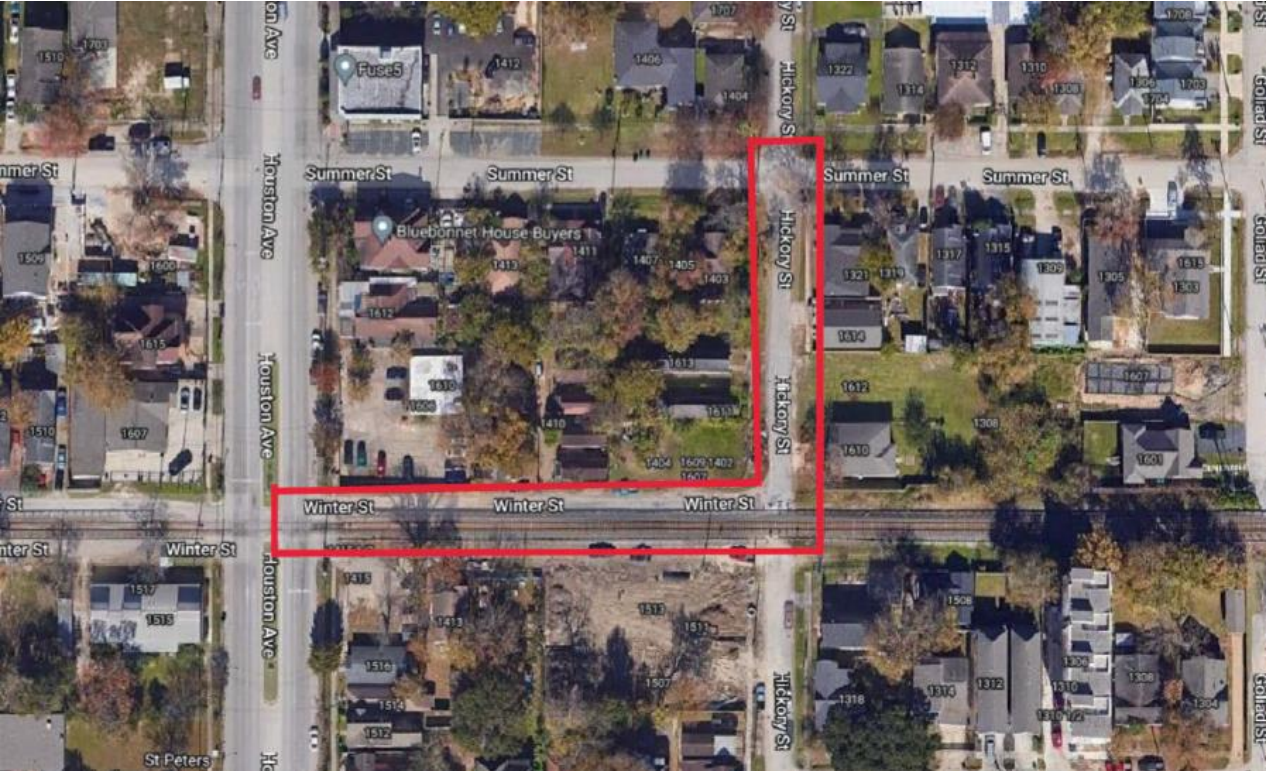
COH Pilot Projects – Malone Park, Winter St., Winzer Park



MALONE PARK

- Construction
- Estimated Construction Cost \$1M
- Construction Start: Jan 2022
- Completion: March 2023
- Scope: Upgrade existing undersized inlets and storm sewer leads, remove and replace existing pavement, **provide porous concrete sidewalk**

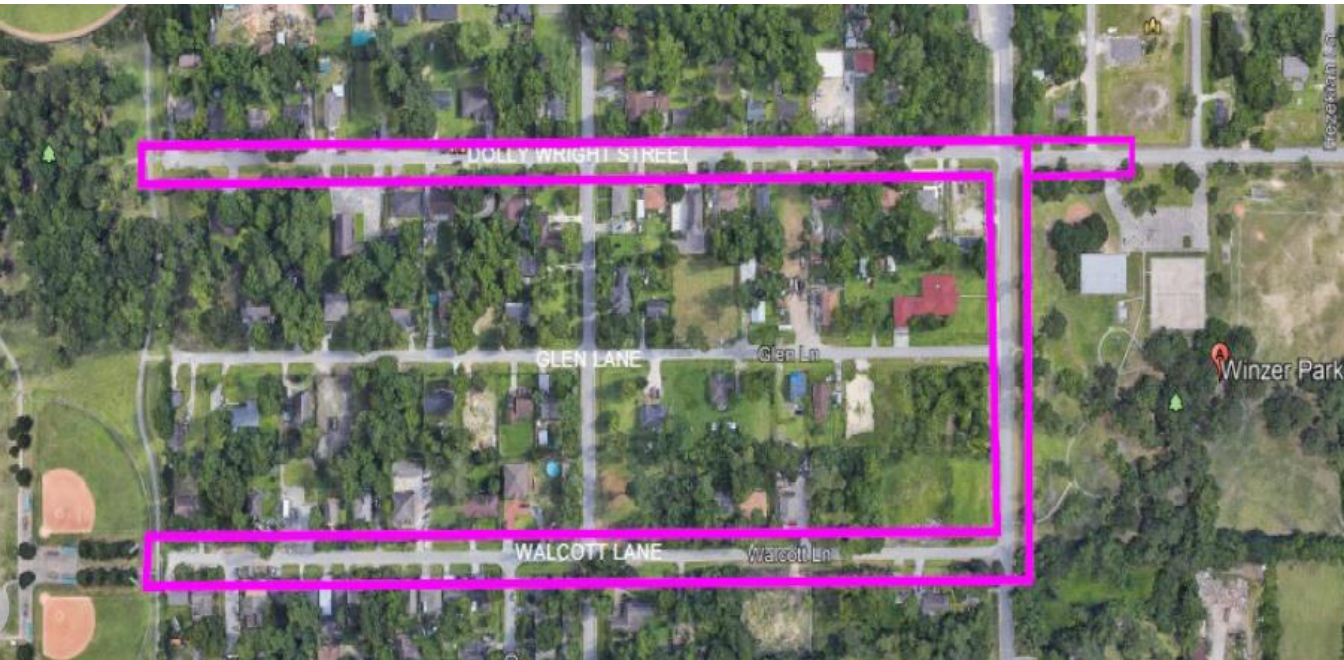
COH Pilot Projects – Malone Park, Winter St., Winzer Park



WINTER STREET

- Construction
- Estimated Construction Cost \$800 K
- Construction Start: Oct 2022
- Duration: 6 months
- Scope: Improve drainage on Winter St and Hickory St. Provide **porous pavement** on Winter St, asphalt pavement with **porous concrete sidewalk** on Hickory St

COH Pilot Projects – Malone Park, Winter St., Winzer Park



WINZER PARK

- Design Phase
- Estimated Construction Cost \$2.2 M
- Duration: 12 months
- 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

COH Pilot Projects – Malone Park, Winter St., Winzer Park



Contact – Resilient Sidewalks Plan on *Engage Houston*



Home / Resilient Sidewalks Plan

Resilient Sidewalks Plan



LOCATION Kashmere Gardens, Gulfton, and City-wide

COUNCIL DISTRICT [B](#), [J](#)

TYPE Plan

START [Fall 2021](#)

COMPLETION [Winter 2023](#)

Thank You | Q&A

