HOUSTON INCENTIVES FOR GREEN DEVELOPMENT

Message from the Mayor

August 2019

In the aftermath of Hurricane Harvey, we have taken critical steps to address our flooding and drainage challenges. As Houston has rapidly developed, we have relied on traditional gray infrastructure systems to keep us safe. However, as we build forward, we must consider new and innovative approaches for achieving greater flood resilience in Houston. While we continue to pursue large-scale projects to reduce flood risk, Hurricane Harvey and other floods have highlighted the necessity to employ a holistic stormwater management approach which integrates green infrastructure into our existing drainage systems.

Through the generous support of the Houston Endowment, the City of Houston conducted a one-year study that provides recommendations to encourage the use of green infrastructure by the private sector through incentives. More green infrastructure in private land development projects will bring economic, social, and environmental benefits to our city while enhancing the resilience of our neighborhoods. The proposed incentives are our next step toward achieving our vision of a better Houston.

This report details the work of a team led by Stephen C. Costello, P.E., the City's flood czar and chief recovery officer. This work included engagement with development industry partners and extensive review by City departments. We will work across departments to move forward with the implementation of the Houston Incentives for Green Development, following the proposed schedule. However, these incentives are only the beginning as the City intends to lead by example with a green infrastructure program that focuses on infrastructure projects, training and development, coordination with local agencies, and partnerships with the private sector.

I see the incentives as an integral part of my vision of a sustainable, safer, stronger, and smarter Houston that will complement the goals of the City's forthcoming Resilience Strategy, Climate Action Plan, and Harvey recovery programs.

- Mayor Sylvester Turner

Prepared for:

Stephen Costello, P.E. and Laura Patiño
City of Houston, Mayor's Recovery Office

Prepared by:

Michael F. Bloom, P.E.
R. G. Miller Engineers, Inc.

in association with

Keiji Asakura, PLA and Abigail Phillips, PLA Asakura Robinson Company
Janet Clements, Corona Environmental Consulting
Alisa Valderrama, Neptune Street Advisors

Financial Support Provided by:

HOUSTON
ENDOWMENT

Suggested Citation:

Bloom, M.; Clements, J.; Valderrama, A. Houston Incentives for Green Development. Houston: City of Houston, May 2019.

Acknowledgments

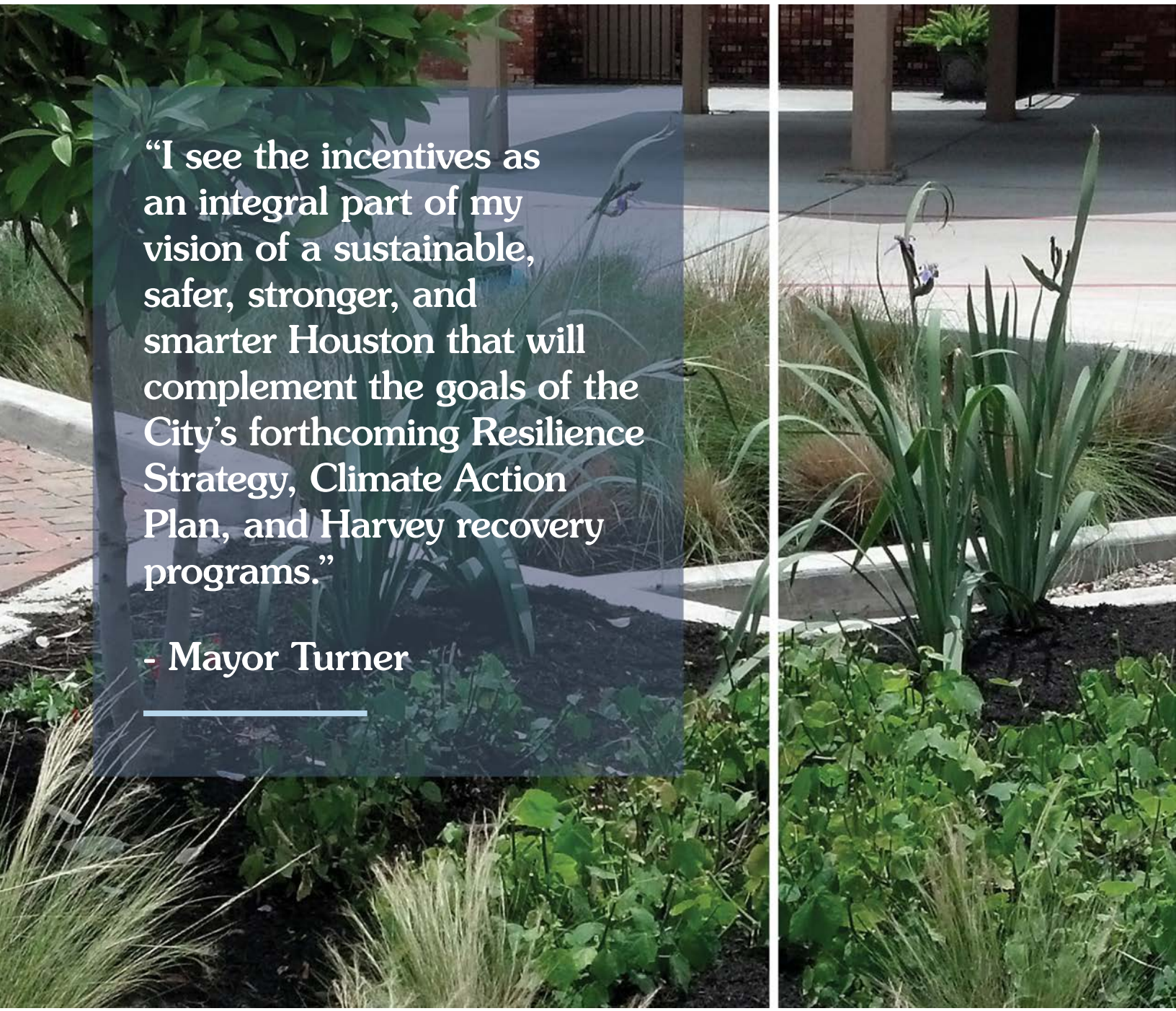
The authors of this report gratefully acknowledge the support, input, feedback, and advice provided by the leadership of the following City of Houston departments:

- Houston Public Works
- Houston Permitting
- Planning and Development Department
- Administrative and Regulatory Affairs Department
- Mayor's Office
- Chief Development Officer
- Chief Sustainability Officer
- Chief Resilience Officer
- Parks and Recreation Department

and by the participating members and leadership of the following external stakeholder groups:

- American Council of Engineering Companies – Houston Chapter
- Bayou City Water Keeper
- Bayou Preservation Association
- Buffalo Bayou Partnership
- Galveston Bay Foundation
- Greater Houston Builders Association
- Houston Advanced Research Center
- Houston Apartment Association
- Houston Audubon Society
- Houston Parks Board
- Houston Real Estate Council
- Houston Wilderness
- Katy Prairie Conservancy
- Houston Land and Water Sustainability Forum
- Urban Land Institute – Houston District Council

We would also like to thank the managers and staff of the cities of Austin, Chicago, Milwaukee, Nashville, New Orleans, New York, Philadelphia, Portland, and Seattle, who took time to answer our questions during the peer city benchmarking effort.



Rain gardens in a private school parking lot. Steve Albert, P.E.

Contents

Greater implementation of green stormwater infrastructure (GSI) in private land development projects will allow project sponsors, the City, and the area around these projects to realize economic, social, and environmental benefits, as well as enhanced resilience.

Green space along Buffalo Bayou. iStock/Davel5957

1.0 Introduction

Purpose

Through funding from the Houston Endowment, the City of Houston's Chief Recovery Office (CRO) commissioned a one-year study to identify and recommend incentives to encourage the use of green stormwater infrastructure (GSI) in private land development within the corporate boundaries of the city. Greater implementation of GSI in private land development projects will allow project sponsors, the City, and the area around these projects to realize economic, social, and environmental benefits, as well as enhanced resilience.

The CRO retained R. G. Miller Engineers, Inc. in association with Asakura Robinson, Corona Environmental Consulting, and Neptune Street Advisors to perform the work. The team started work in May 2018 and completed work in May 2019.

Work Efforts

With the goal of recommending the most effective and applicable green stormwater infrastructure (GSI) incentives for Houston, the project included the following work products:

Research and Benchmarking

The project team conducted interviews with 9 peer cities across the U.S. to learn more about existing GSI incentive programs, including program successes, challenges, and lessons learned. This exercise also reinforced that the team should identify incentives that will help developers and the City achieve their financial objectives and general welfare objectives, respectively; collaborate with the development community to understand factors that will encourage or discourage participation; and, coordinate with all implementing city departments to set the stage for smooth implementation. Results of this work are available in Appendix A via digital download at http://www.houstontx.gov/igd.html.

Stakeholder Engagement

Through a participatory approach, the project team and the City identified and assembled a development industry stakeholder group. The project team also conducted multiple group stakeholder meetings to obtain feedback about drainage rules, detention requirements, GSI rules, GSI incentives, and project financial information. The team then conducted private interviews with stakeholders, requested redacted financial statements for various types of development or redevelopment projects within Houston limits, and evaluated information to develop initial recommendations for a suite of incentive programs for development industry stakeholders. Results of this work are available in Appendix B via digital download at http://www.houstontx.gov/igd.html.

Evaluation Process

The project team evaluated alternative GSI incentive program models as follows:

- Reviewed redacted financial statements for various types of development or redevelopment projects inside the city.
- Identified costs and benefits of alternative program models.
- Identified potential threshold points that would trigger GSI use by private developers in various types of real estate projects.
- Identified legal, policy, or procedural barriers or challenges to implementing the considered incentives or regulatory approaches.
- Identified possible implementation strategies to overcome barriers and challenges.

Results of this work are available in Appendix C via digital download at http://www.houstontx.gov/igd.html. This work helped guide the team in preparing the final proposed incentives.

Draft Report

The project team developed potential program models and a suite of GSI techniques and facilitated development industry stakeholder group review. The results of this work formed the basis for a draft of the current final report.

Final Report

The team engaged with council members, internal departments, and external stakeholder groups and prepare the current final report with recommended incentives. In addition, the team engaged with external stakeholder groups who reviewed the report and provided comments on the overall study effort. Responses to stakeholder comments are available in Appendix D via digital download at http://www.houstontx.gov/igd.html.

City of Houston Vision

The City of Houston aims to set the stage for the implementation of green stormwater infrastructure (GSI) to become an integrated part of "business as usual" for private property developers in Houston. To accomplish this, the City seeks to create a suite of incentives aimed at motivating developers to use GSI as well as recognize and celebrate five marquee private developments that utilize GSI within the next five years. The GSI incentive programs are the focus of this paper. The City's hope is that recognition of the five marquee projects, in combination with a suite of incentives aimed at motivating developers to use GSI, will set the stage for the private use of GSI to become an integrated part of "business as usual" for property developers in Houston. The City envisions the GSI program as related to and compatible with other current initiatives, including the ***Resilience Strategy*** (in development) as part of the 100 Resilient Cities Program and the ***Climate Action Plan*** (in development).

GSI can provide habitat for turtles. iStock/Karl Spencer.

What Can Green Stormwater Infrastructure (GSI) Bring to Houston?

Green stormwater infrastructure (GSI) is an important stormwater management tool that can enhance economic performance of real estate projects while improving drainage system performance in the project vicinity. GSI can help real estate projects realize higher operating income, faster lease-up or sales, higher occupancy, higher amenity values, greater lot or unit yield, "green" marketing benefits, and reduced drainage system costs. At the same time, GSI can improve neighborhood resilience, reduce drainage concerns from small storms, reduce potable water use, reduce urban heat island impacts, improve neighborhood aesthetics, and improve public health. [1]

Recommended Incentives

After 10 months of effort including interviews with peer cities with GSI programs, multiple meetings and interviews with external stakeholders, interviews with city leadership, and a quantitative analysis of costs and qualitative assessment of benefits, the development and implementation of the following incentive programs is recommended— any of which might be utilized in conjunction with any another to achieve optimum increased developer uptake of GSI:

- Integrated GSI Development Rules
- Property Tax Abatements
- Award and Recognition Program
- Increased Permitting Process Certainty and Speed

Wildflowers can be incorporated into GSI landscaping. iStock/fstop123

[1] See Burgess, Katharine, et. al. Harvesting the Value of Water. Washington DC: Urban Land Institute, 2017; Ring, Justin. Talking Dollars and Sense: LID Construction Costs. Proceeding of the American Society of Civil Engineers, International Low Impact Development Conference, Houston, Texas. Washington DC: ASCE, 2015; US. EPA. City Green: Innovative Green Infrastructure Solutions for Downtowns and Infill Locations. Washington DC: EPA, 2016; Bloom, M. The Business Case for Natural Drainage Systems in Houston Area Land Development Projects. Houston: Realty News Report. January 4, 2017; Clements, Janet, et. al. The Green Edge: How Commercial Property Investment in Green Infrastructure Creates Value. New York: Natural Resources Defense Council. 2013.

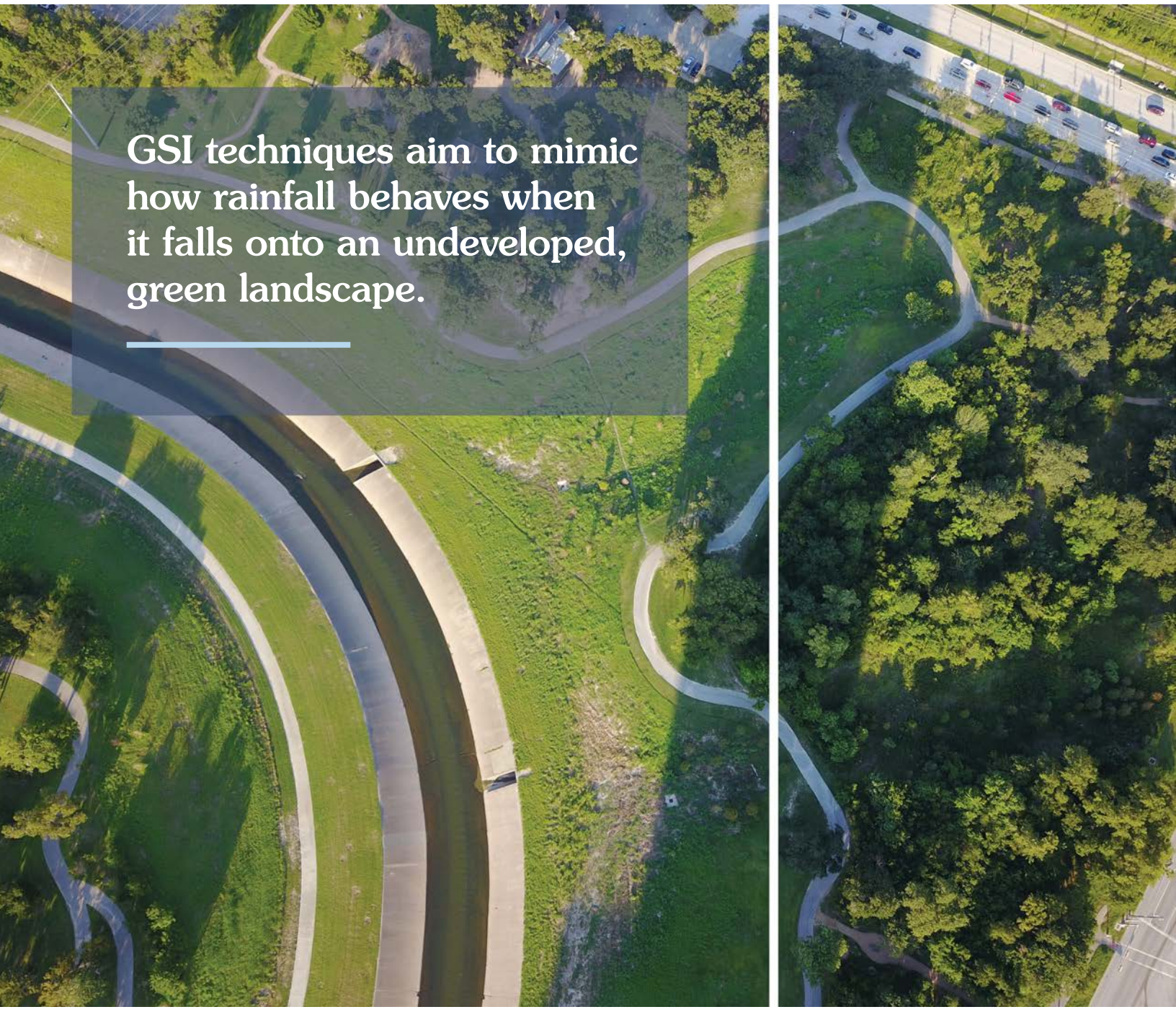
Organization of This Report

This document includes the following sections:

- **PART 2.0:**
  What is Green Stormwater Infrastructure (GSI)?
  Provides an overview of the GSI techniques recommended for use in the City's GSI program.
- **PART 3.0:**
  Houston Incentives for Green Development
  Summarizes the recommended GSI incentive programs as a result of this study.
- **PART 4.0:**
  Integrated Green Stormwater Infrastructure Development Rules
  Presents the proposed program, implementation considerations, and proposed implementation schedule.
- **PART 5.0:**
  Property Tax Abatements
  Presents the proposed program, implementation considerations, and proposed implementation schedule.
- **PART 6.0:**
  Award and Recognition Program
  Presents the proposed program, implementation considerations, and proposed implementation schedule.
- **PART 7.0:**
  Increased Permitting Process Certainty and Speed
  Presents the proposed program, implementation considerations, and proposed implementation schedule.
- **PART 8.0:**
  Summary
  Summarizes the steps undertaken in this study, restates the recommended incentives, and discusses considerations for future green infrastructure program development.

The following appendices provide additional supporting details and information and are available via digital download at http://www.houstontx.gov/igd.html.

- **APPENDIX A:**
  Research and Benchmarking
  Presents a detailed summary of findings from interviews with other cities implementing GSI programs.
- **APPENDIX B:**
  Stakeholder Engagement
  Presents a detailed summary of project cost data provided by developers and the results of interviews with developers engaged in development and redevelopment in Houston.
- **APPENDIX C:**
  Evaluation Process
  Presents the detailed results of an incentive screening process, an evaluation of legal or policy authorities and limitations, project and incentive program financial performance information, threshold points that would motivate private use of GSI, and implementation challenges and strategies.
- **APPENDIX D:**
  Response to Comments Document
  Presents a detailed summary of stakeholder comments and consulting team responses.

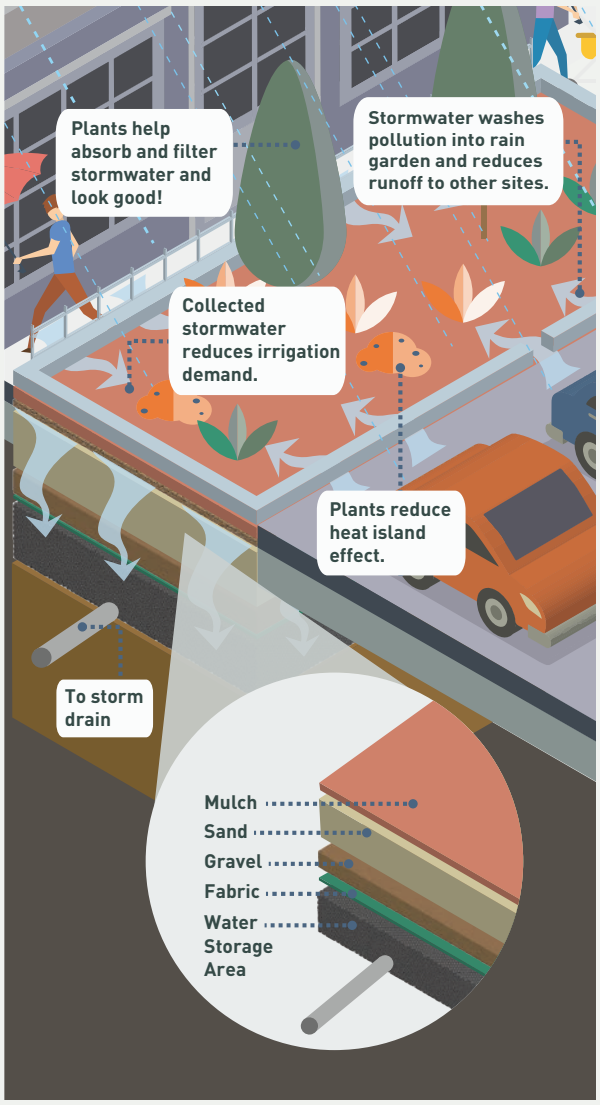


Trail and landscaping along Brays Bayou. Asakura Robinson

2.0 What is Green Stormwater Infrastructure (GSI)?

Green stormwater infrastructure (GSI) is a design philosophy and a toolbox of techniques for stormwater management that can be applied in real estate development projects (including redevelopment and retrofitting projects). GSI techniques aim to help minimize the downstream impacts of development and mimic how rainfall behaves when it falls onto an undeveloped, green landscape. These techniques include green roofs, rain gardens, bioretention systems, vegetated filter strips, permeable pavements, rainwater harvesting, urban forests, constructed wetlands, soil amendment practices, and other strategies to manage rainwater on or near the site where the rain falls. The techniques that are most applicable to Houston are described in more detail in the following pages.

This report uses the term green stormwater infrastructure (GSI); however, the term is synonymous with other terms such as low impact development (LID), green infrastructure (GI), sustainable urban drainage (SUDs), and natural drainage systems. These other terms may appear in cited sources or in other publications.



Bioretention

Bioretention systems, also called rain gardens in the Houston region, are shallow, vegetated depressions in the ground that are used to slow and sometimes infiltrate stormwater runoff to native soils or, often, to a nearby storm sewer. They change the timing and volume of stormwater runoff while adding a beautiful landscaped amenity to a development project. Bioretention can help achieve detention volumes requirements while enhancing the aesthetics of a project.

DEVELOPER BENEFITS

- Reduces stormwater runoff rate and detention volume
- Achieves city imposed stormwater pollution control requirements
- Reduces stormwater management costs
- Reduces site development costs
- Enhances site aesthetics
- Increases lease-up or sales rates
- Increases retail establishment sales
- Increases property value
- Achieves open space requirements

PUBLIC BENEFITS

- Improves stormwater management
- Reduces burden on public drainage system
- Reduces pollutant loads to local waterways
- Reduces heat island effect
- Enhances wildlife habitat
- Improves neighborhood aesthetics
- Increases resilience
- Increases property tax revenue

DESIGN

Bioretention systems typically consist of hard wood mulch, a layer of engineered soil media, planted with native vegetation, some separation gravel and fabric, and an underdrain. Impermeable areas of a development are designed to divert runoff to the bioretention system, where it is allowed to pond and filter through the system. These systems should be designed by a professional engineer.

INSTALLATION

Installation elevations of all components are important for correct operation. The top of the media should be wrapped with an impermeable liner until the site is completely stabilized and no additional construction generated sedimentwill be generated. The infiltration rate of the installed soil media should be tested for quality control.

LIMITATIONS

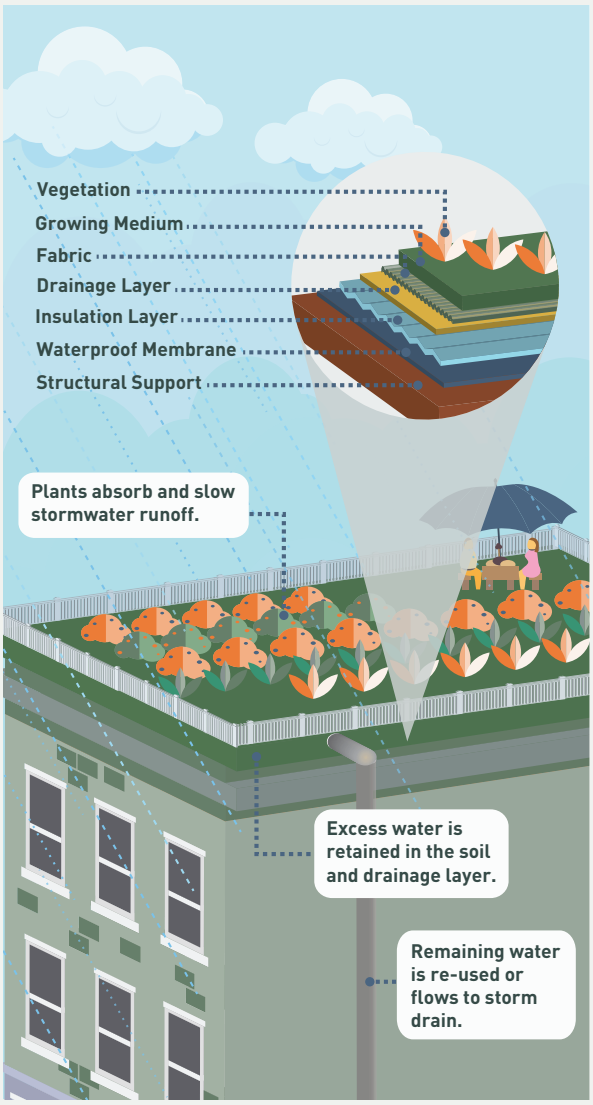
Bioretention systems in Houston generally will require an underdrain system that routes filtered stormwater to a nearby storm sewer, bayou, or channel.

RELATIVE COST ($-$$$)

Costs of bioretention systems can vary depending on multiple factors, including the size and design of the system, the location (parking lot, road median, near buildings), and depth of water table.

Green Roofs

Green roofs, also known as living roofs, are layers of growing medium and vegetation installed on top of a conventional roof. Green roofs function to reduce stormwater runoff, filter pollutants, reduce the carbon footprint, reduce energy costs, and add aesthetic quality. While initial installation costs are higher for green roof systems, the long-term benefits and savings surpass conventional roofs.



DEVELOPER BENEFITS

- Reduces building operation cost
- Decreases roof replacement and repair frequency
- Reduces stormwater runoff rate and detention volume
- Achieves city imposed stormwater pollution control requirements
- Enhances site aesthetics
- Increases lease-up or sales rates
- Increases retail establishment sales
- Increases property value
- Achieves open space requirements

PUBLIC BENEFITS

- Improves stormwater management
- Reduces burden on public drainage system
- Reduces pollutant loads to local waterways
- Reduces heat island effect
- Enhances wildlife habitat
- Improves neighborhood aesthetics
- Increases resilience
- Increases property tax revenue

DESIGN

There are two main types of green roofs: extensive and intensive. Extensive green roofs are much more shallow, less than 6 inches, and support low growing plants, like sedums. Intensive green roofs have a soil or growing medium depth from 6 inches to 4 feet, accommodating grasses, shrubs, and trees. The structural support for these systems should be designed by professional engineers.

INSTALLATION

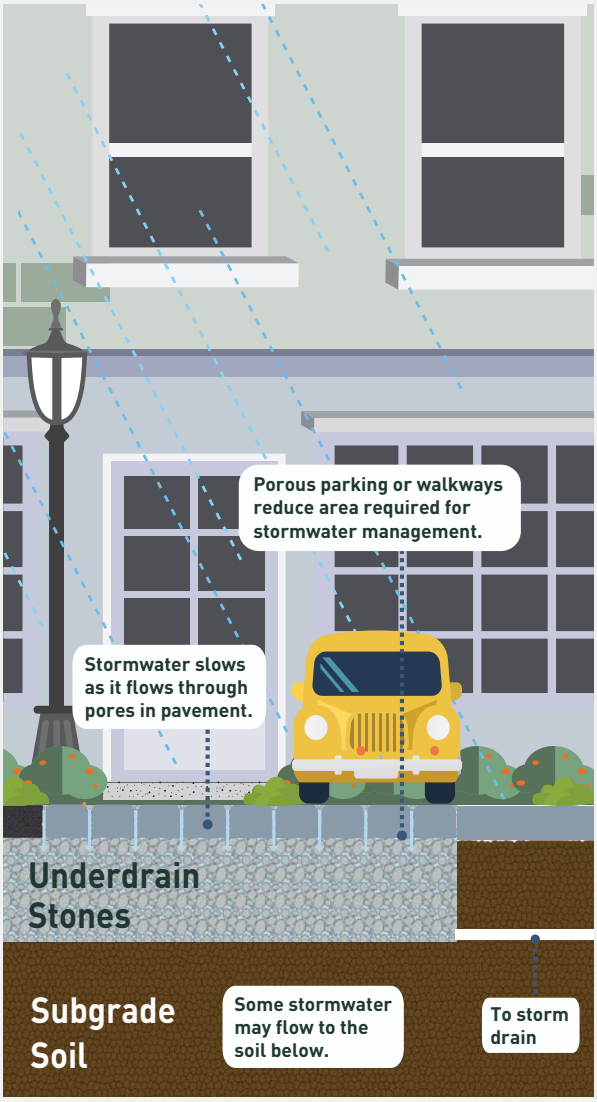
Green roofs may be specified and built layer by layer or pre-engineered, modular green roof systems can be utilized. Installed elements include: water proofing, a separation layer, a drainage layer, a soil matrix, and plants

LIMITATIONS

There are some limitations to consider when using green roofs. The structural design of the building must accommodate the extra weight of a green roof. Plants should be carefully chosen in order to thrive in the rooftop environment.

RELATIVE COST ($-$$$$)

Costs of green roofs vary greatly depending on multiple factors, including but not limited to, new or existing development, type of roof system, and desired size. Long term savings include reduced utility costs and flood control measures.



Permeable Pavement

Permeable pavement a layer of concrete, asphalt, or paver stones designed to allow stormwater to flow through the material to the underlying material. Permeable pavement replaces conventional impervious materials. It reduces the volume of stormwater runoff, alters the timing of runoff, and can reduce site development detention requirements. Where soil conditions are unfavorable for infiltration, permeable pavement is frequently combined with an underdrain or below grade detention storage.

DEVELOPER BENEFITS

- Reduces stormwater runoff rate and detention volume
- When combined with parking, detention, and landscaping reduces site development costs

PUBLIC BENEFITS

- Improves stormwater management
- Increased resilience

DESIGN

Design should accommodate anticipated traffic loads, sediment loading, and the contributing drainage area. Large drainage areas tend to require more frequent maintenance than permeable systems that only receive direct rainfall. Pretreatment of runoff may be required for larger drainage areas with heavy leaf litter or other solids loadings. Underdrain system must be designed to accommodate anticipated flows and should flow to a public storm sewer, bayou, or channel.

INSTALLATION

Permeable paving installations should be conducted by installers and contractors credentialed to do so by the American Concrete Institute, the National Asphalt Pavement Association, or similar national organizations.

LIMITATIONS

The ratio of the contributing drainage area to the permeable pavement area should be less than 3 to 1, to avoid excessive loading and maintenance requirements. Underdrains will likely be required in most parts of Houston, unless field infiltration testing demonstrates adequate native soil infiltration.

RELATIVE COST ($$-$$$)

Installation costs are generally higher than traditional paving in the Houston region because of the need to provide an underdrain system connected to the storm sewer. When both pavement costs and detention costs are compared together, permeable paving can sometimes be more cost effective.

Rainwater Harvesting

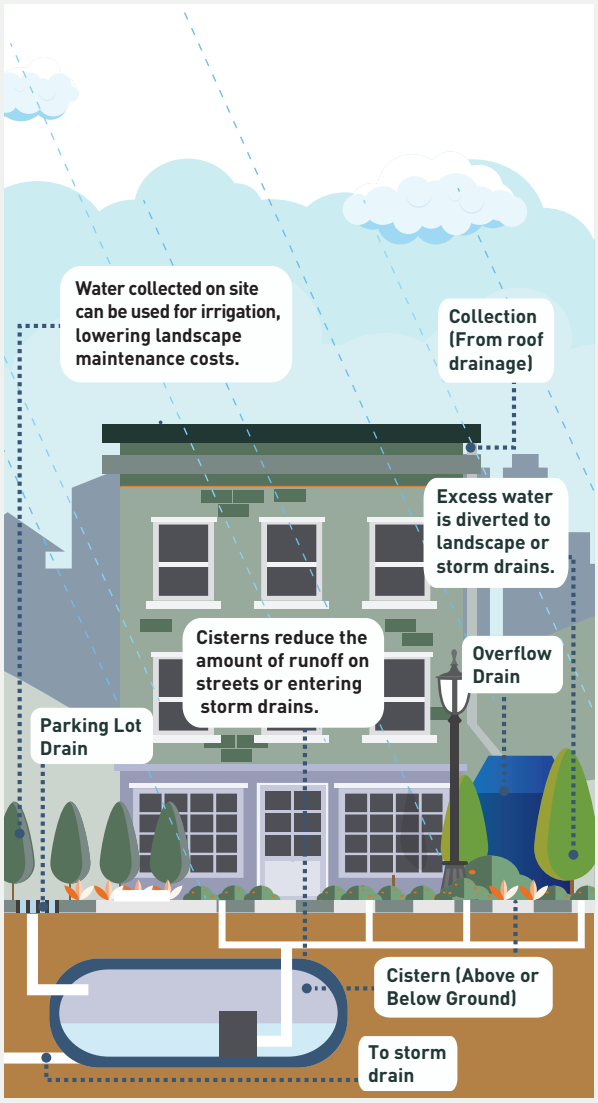
Rainwater harvesting uses cisterns, rain barrels, and other storage tanks to capture and store stormwater runoff for non-potable water uses such as irrigation, toilet flushing, or industrial processes. Rainwater capture is ideal for urban areas since it reduces stormwater runoff and potable water use. There are numerous sizes and styles of rainwater harvesting systems to meet different goals.

DEVELOPER BENEFITS

- Reduces building operation cost
- Reduces stormwater runoff rate and detention volume
- Reduces potable water consumption and costs

PUBLIC BENEFITS

- Improves stormwater management
- Reduces burden on public drainage system
- Conserves water



DESIGN

Runoff is channeled from impervious surfaces to cisterns and rain barrels, where the storage and release of water is controlled by valves. The systems are simple to install and use, and can be put in almost anywhere. Rainwater harvesting systems are great to use in conjunction with other GSI techniques, such as bioretention systems, that improve infiltration and remove runoff pollutants.

INSTALLATION

Always check with city or county permitting for underground cistern installations. There are a variety of options when it comes to choosing a rainwater harvesting system, including above and below ground storage tanks, different sized tanks, and systems to mitigate peak runoff

LIMITATIONS

Cisterns and rain barrels require an overflow system to be installed in order to accommodate large rainfall events when the tank reaches capacity. Because of the amount of pollutants that are found in runoff, harvested rainwater cannot be consumed or used as a potable source unless treated.

RELATIVE COST ($-$$)

Rainwater harvesting costs depending on the size of the barrel or cistern being used, as well as the set up. Because of the simplicity of these systems, it is a more affordable BMP option for urban areas with limited space.

Soil Amendments

Soil amendments are added to native site soils to improve stormwater management, landscaping, plant health, and aesthetics. Amendments such as organic materials, sand, woodchips, compost, shredded bark, and timber product residuals are added to existing site soils using traditional excavation or farm equipment, using processes such as cutting and filling, tilling, blending, and mulching. Soil amendments seek to increase water storage and infiltration as opposed to engineering amendments, such as lime, which seek to increase soil strength and bearing capacity.

DEVELOPER BENEFITS

- Reduces stormwater runoff rate and detention volume

PUBLIC BENEFITS

- Improves stormwater management
- Reduces burden on public drainage system

DESIGN

Amendments are made using soil organic matter, which comes from various sources, including compost, composted woody material, biosolids, forest product residuals, etc. It is best to reduce disturbance to the topsoil as much as possible, but graded topsoil from the site can be held and reapplied when a project is finished. Planting native vegetation improves the quality and maintains the soil health with reduced maintenance.

INSTALLATION

When using soil amendments, the depth of soil and quality should be established post-construction. It is important to limit the use of heavy machinery once the soil is in place. If topsoil is being imported from another source, making sure it has only a small amount of clay will help with infiltration.

LIMITATIONS

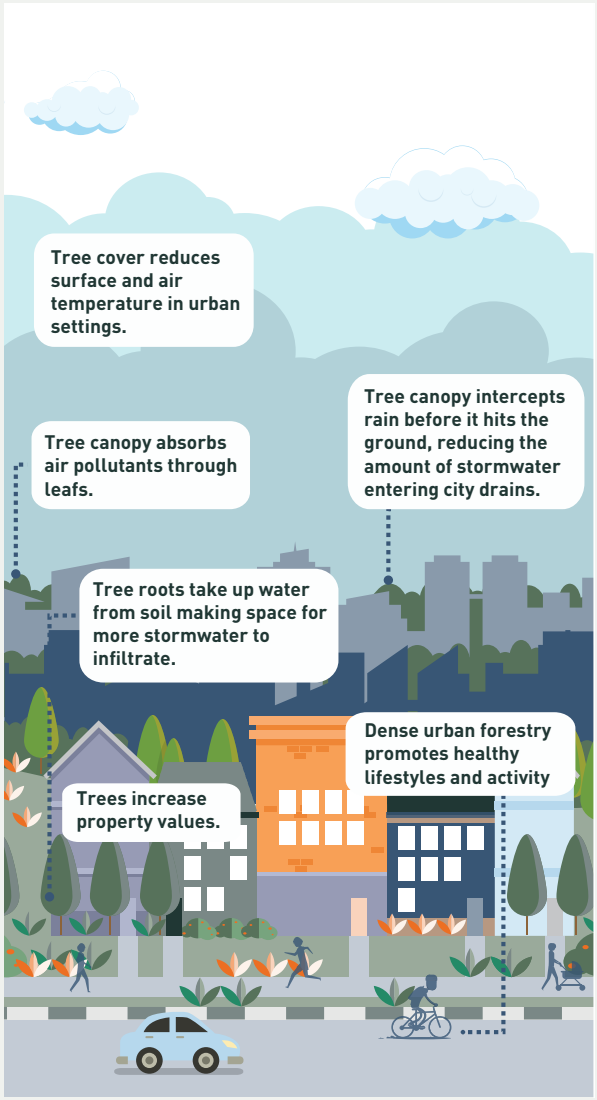
Existing soil infiltration characteristics, storage properties, and the high clay content of soils in the Houston area presents challenges. This means that a larger volume of amendments may be needed to achieve desired soil properties. This may increase the overall cost of the materials and the blending process used.

RELATIVE COST ($-$$$)

Costs associated with soil amendments depend on the project size, type of amendments used, need for machinery, and soil tests. These costs are mitigated by the improved management of stormwater runoff.

Urban Forestry

Urban forestry is the management of trees and other vegetation in developed areas. Maintaining and enhancing the population of trees intercepts rainfall, reduces stormwater runoff volumes, increases evaporation, increases plant use of stormwater, improves air quality, and reduces the urban heat island effect. Incorporating native trees into urban developments is an easy way to add aesthetic value and mitigate the effects of increasing impervious cover.



DEVELOPER BENEFITS

- Reduces stormwater runoff rate and detention volume
- Achieves city imposed stormwater pollution control requirements
- Enhances site aesthetics
- Increases lease-up or sales rates
- Improves retails sales
- Increases property value
- Achieves open space requirements

PUBLIC BENEFITS

- Improves stormwater management
- Reduces burden on public drainage system
- Reduces pollutant loads to local waterways
- Reduces heat island effect
- Enhances wildlife habitat
- Improves neighborhood aesthetics
- Increases resilience
- Increases property tax revenue

DESIGN

The most effective way to maintain urban forests is to minimize the impact of construction on existing vegetation as much as possible. Planting trees and allowing them to establish can improve air quality and provide cooling to adjacent buildings and impervious surfaces. This in turn reduces stormwater runoff and improves water quality. The more trees that are planted or maintained, the greater the effect on stormwater management and environmental health.

INSTALLATION

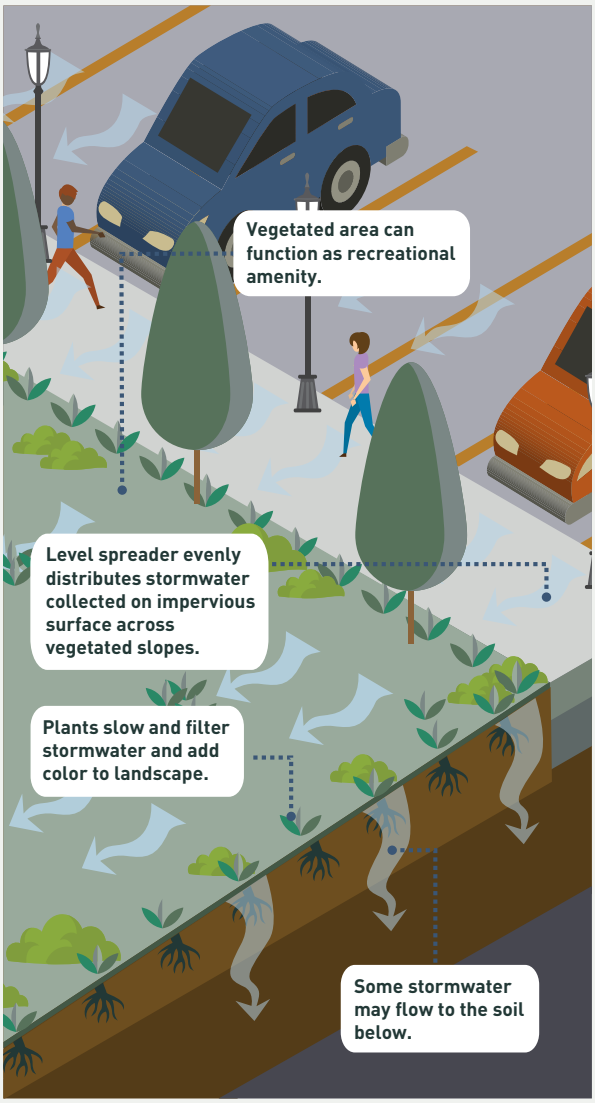
Space is a factor when using an urban forestry approach. Soil depth and properties, utility lines, space, and sunlight should be evaluated. Native species are desirable since they will generally require less maintenance than non-native species.

LIMITATIONS

While low maintenance, urban forests still require long-term care in order to see high survival rates. Poor quality soils may require amendments before trees can be established, and young trees take time to mature.

RELATIVE COST ($-$$)

Maintaining or restoring urban forests is relatively inexpensive, especially if trees are already established. Costs associated with tree plantings depend on soil health, location, maintenance requirements, and survival rate.



Vegetated Filter Strips

Vegetated filter strips are gently sloping, planted areas located between a source of stormwater runoff, like a parking lot, and a stormwater inlet, conveyance, or bayou. Filter strips are designed so that stormwater runoff travels across them in a shallow layer. This type of flow path is known as "sheet flow." Sheet flow conveyance slows stormwater runoff down, promotes infiltration and evaporation. The filter strip also removes particulates through physical barriers and by attracting and holding sediment, pollutants, and particles to the surfaces of soils and organic material.

DEVELOPER BENEFITS

- Reduces stormwater runoff rate and detention volume
- Achieves city imposed stormwater pollution control requirements
- Reduces stormwater management costs
- Enhances site aesthetics
- Increases lease-up or sales rates
- Improves retails sales
- Increases property value
- Achieves open space requirements

PUBLIC BENEFITS

- Improves stormwater management
- Reduces burden on public drainage system
- Reduces pollutant loads to local waterways
- Reduces heat island effect
- Enhances wildlife habitat
- Improves neighborhood aesthetics
- Increases resilience
- Increases property tax revenue

DESIGN

The lower end of the contributing drainage area must include a level-spreader, which is an engineered border constructed at a consistent elevation. This is required to achieve consistent sheet flow conditions and to avoid uneven flow that can lead to discrete erosion problems and gullies. Filter strip slopes should be minimized to avoid high flow velocities (less than 3%). Native vegetation is preferred however any dense grasses can be used.

INSTALLATION

Maintain detailed grade control for impermeable area, level spreader, and filter strip area. Protect area from heavy equipment to avoid soil compaction. Use construction erosion and sedimentation control practices to avoid adverse impacts to the filter strip. Develop and implement appropriate construction phasing to avoid adverse impacts from sediment, equipment traffic, or material laydown practices.

LIMITATIONS

Vegetated filter strips should not be used on steep slopes. They should not intercept runoff from an impermeable area that does not generate sheet flow, unless a level-spreader is provided. The filter strip flow path should exceed the impervious surface flow path draining to it. If soil characteristics are not favorable to promote infiltration, consider using soil amendments in the filter strip area.

RELATIVE COST ($-$$$)

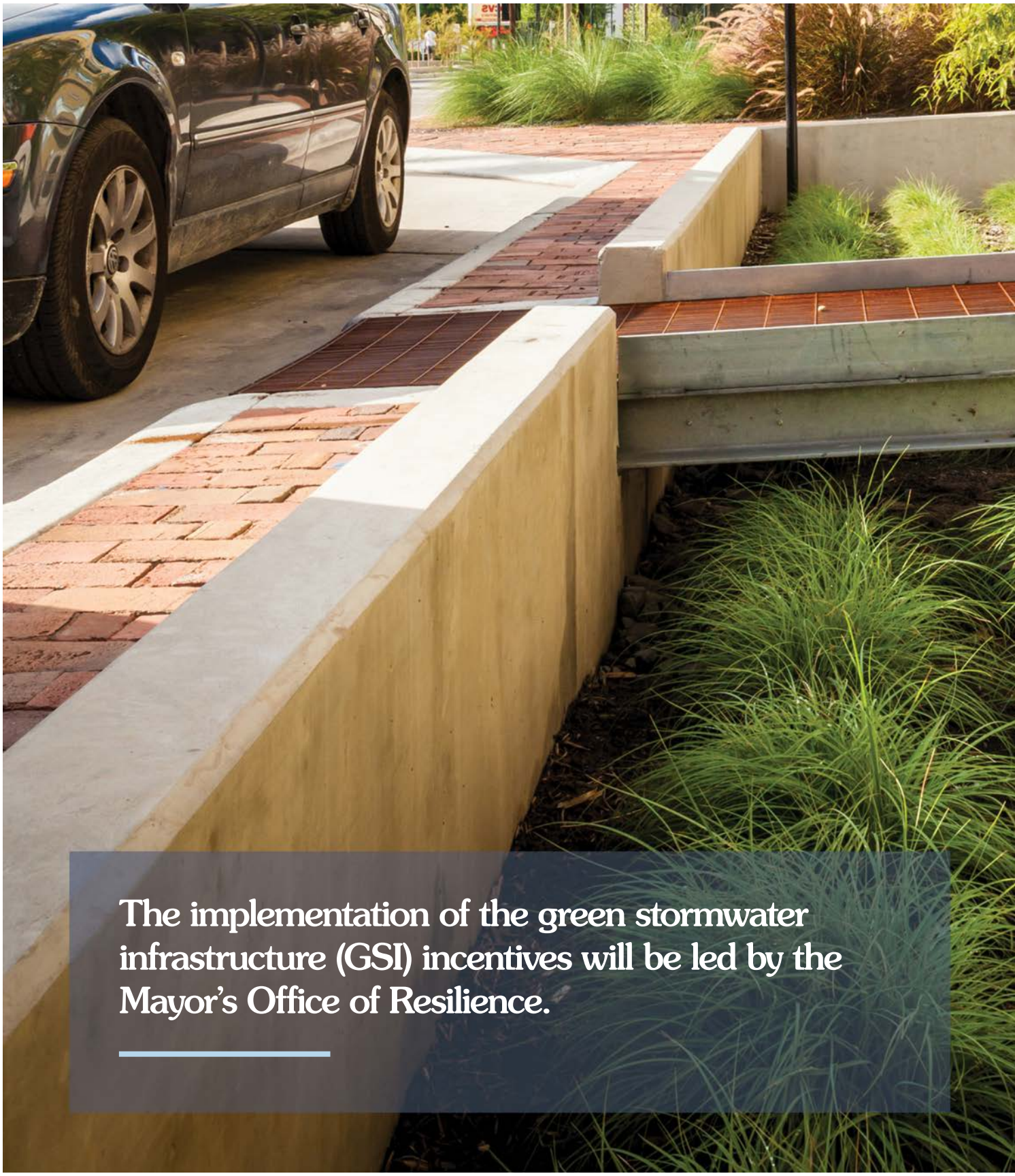
Vegetated filter strips are relatively low cost to install, especially when using native plants. Costs will vary depending on the size of the filter strip and the conditions of the site location (slope, soils, impervious surfaces).

3.0 Houston Incentives for Green Development

The four recommended incentive programs are:

- Integrated Green Stormwater Infrastructure (GSI) Development Rules
- Property Tax Abatements
- Award and Recognition Program
- Increased Permitting Process Certainty and Speed

These four incentives programs are the core of Houston's Incentives for Green Development. They should be an integral part of the City's Resilience Strategy (in development) and a key element of Build Houston Forward (www.buildhoustonforward.org). Although this study presents four incentive programs, they are only the first step towards achieving a more robust green infrastructure program. The incentives and their implementation plans outlined in this report are considered the beginning and can be further expanded on as the City takes a more active leadership role with respect to green infrastructure.



The implementation of the green stormwater infrastructure (GSI) incentives will be led by the Mayor's Office of Resilience.

Urban bioretention design in Midtown. Asakura Robinson

As the program is launched, the new incentives can be marketed as an opportunity for developers, who will benefit from enhanced economic performance of their projects, while, at the same time, providing additional public benefits as outlined in the fact sheets presented in the prior section.

In order to evaluate effectiveness and to improve the programs, they should be implemented with a "monitor, assess, and revise" strategy, that includes stakeholder input.

Lastly, the Mayor's Office of Resilience will continue to lead and drive implementation of green stormwater infrastructure incentives to effectively coordinate cross-departmental actions.

The following four sections outline the details of these four incentive programs.

The alternative set of GSI development rules should seek to encourage the planning and design of development features that provide more than one function through the use of GSI.

Green space along Buffalo Bayou. iStock/Sean Pavone

4.0 Integrated Green Stormwater Infrastructure (GSI) Development Rules

Extensive developer stakeholder engagement determined that current development rules and design criteria are not perceived as conducive to green infrastructure implementation. By enacting an integrated set of green stormwater infrastructure (GSI) development rules that harmonize parking, landscaping, open space, drainage design, detention design, and stormwater quality design requirements the City would be able to incentivize developers to use green stormwater management techniques more often.

Developers could be offered the option of applying for a development permit using the existing set of rules or, if green stormwater approaches are implemented, the City would then allow the developer to proceed using an alternative set of rules.

The alternative set of green stormwater infrastructure (GSI) development rules seeks to encourage the planning and design of development features that provide more than one function through the use of GSI. The integrated GSI rules can provide both inherent cost savings and benefits to the project because design elements that perform more than one function can reduce costs while increasing benefits. For example, under current rules, a project developer might need to provide a minimum number of parking spaces, a certain area of landscaping with a specific number of trees, a minimum volume of detention, and a stormwater treatment device at the end of underground pipe system. Under the envisioned GSI rules the developer might be able to provide a smaller number of parking spaces with a permeable[2] surface and underdrain, a landscaped bioswale with bioretention and trees that would serve to convey and treat stormwater as well as meet open space and landscaping requirements, a smaller volume of detention, a shorter lengths of underground piping, and no end-of-pipe stormwater treatment device.

While the exact details of the proposed integrated rules will need to be considered by all relevant city departments and interested stakeholders, the following general provisions should be achieved by the GSI development rules.

Landscaping and Open Space

- Impose a lower or no open space fee for sites that utilize GSI.
- Grant credit for GSI techniques towards open space requirements.
- Omit the perimeter shrubs requirement if the parking lot is served by GSI along the interface between the public right of way and the private parking area.

Parking

- Offer reduced parking requirements if GSI is implemented onsite.
- Allow permeable paving systems including asphalt, concrete, stone aggregate, and pavers (all with underdrains) in parking bays and driveways.

Drainage and Stormwater Quality

- Allow beehive inlets and other specialty inlets to accommodate GSI systems.
- Allow smaller diameter private storm sewer leads to accommodate shallower and more visible GSI flowlines.
- Include consideration of Atlas 14, Volume 11, Version 2.0 rainfall depths, frequencies, and intensities.
- Allow the use of a hydrological analysis of the pre-development and post-development conditions to determine peak flows, total runoff volume, and detention requirements, down to a minimum detention rate of 0.35 acre-feet of volume for each acre of impervious area (within the disturbed area), if technically demonstrated as sufficient.
- Explicitly allow drainage design calculations to consider GSI features designed to retain, detain, convey, or infiltrate stormwater to be permeable.

[2] IDM, Chapters 9 and 13 use the word "porous pavement" instead of permeable pavement. This report uses the term "permeable surface" or "permeable pavement" or "permeable paving systems" to refer to porous paving systems made with asphalt, concrete, stone, or blocks

- Harmonize drainage and stormwater quality design provisions with Harris County.
- Allow bioretention to be sized and designed in a manner similar to that required by Harris County.
- Require an underdrain connected to a storm sewer below all permeable paving.
- Require an operations and maintenance plan for all private GSI facilities, as currently required for stormwater quality devices.
- Require annual certification of private GSI facilities by a professional engineer, as currently required for stormwater quality devices.

Design Criteria for GSI Techniques

- Develop detailed design criteria for GSI techniques allowed in private development;
- Define specific criteria that must be met for any site design feature to be considered GSI for the purposes of receiving any incentive; and,
- Allow the use of real-time weather data controlled "smart" stormwater systems to facilitate the operation of both rainwater harvesting systems to reduce potable water consumption and stormwater detention systems.

Green roof on the Houston Permitting Center building. Asakura Robinson

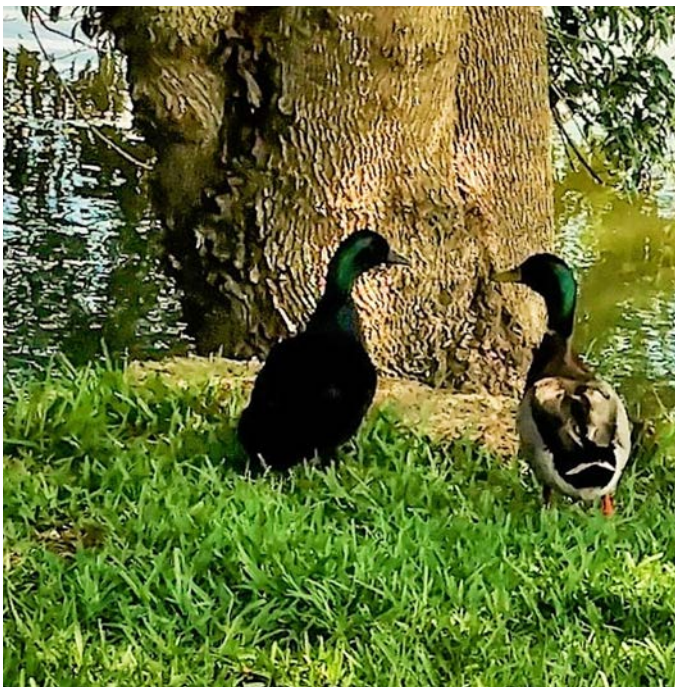
No legal, policy, or procedural issues were identified that would preclude the implementation of the proposed integrated GSI rules. This incentive should be implemented in parallel with the others outlined in this report to maximize the benefits of the green incentives program.

Detailed cost estimates were prepared for a conventional design using current rules and a GSI design using an assumed set of GSI development rules for a 2.6-acre mixed use development with surface parking and a two-story building.

The exercise demonstrated that implementation of the GSI development rules could reduce ***overall project costs*** (land acquisition, soft costs, financing costs, site work, and building construction) by about 2% while also providing aesthetic enhancements (Appendix C). The use of the GSI rules reduced ***site costs*** (landscaping, paving, and stormwater management) by 34%; therefore the implementation of an integrated set of GSI development rules would serve to motivate developers to use GSI.

The City will encounter several challenges in implementing this incentive. First, adoption of ordinance and design criteria requirements will take time and consensus-building across various stakeholder groups. Second, once adopted, staff training will likely be required. Third, developers and various real estate professional service firms will need to learn the new procedures and requirements.

These challenges can be addressed as outlined below. First, consensus for the adoption of ordinance and design criteria requirements could be accomplished using the Redevelopment and Drainage Task Force established before Hurricane Harvey.



GSI can provide habitat for water fowl. iStock/Citysqwirl

The stakeholder group is very well versed in drainage and development issues and represents a broad group of community advocates, engineers, architects, contractors, and developers. Stakeholder agreement can be facilitated through this task force while leveraging City expertise and the Infrastructure Design Manual revision process. Lastly, staff training and industry education can be accomplished at a reasonable cost or low cost, especially with the involvement of entities such as the Houston Land and Water Sustainability Forum, the Urban Land Institute, the Houston District Council, the Houston-Galveston Area Council, and the American Council of Engineering Companies, and the Greater Houston Builders Association.

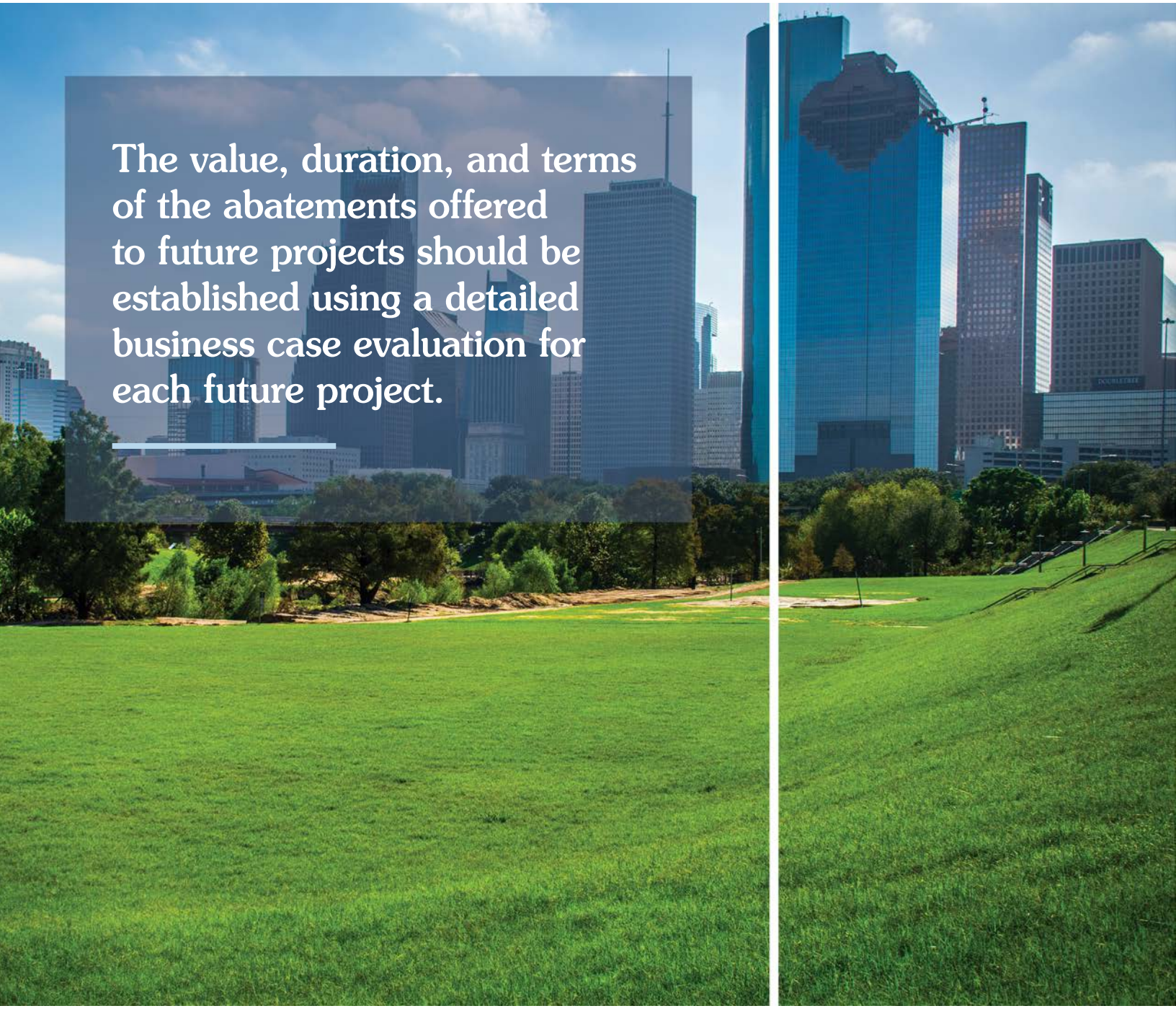
As noted for each incentive program, this incentive program could be bundled with others presented in this report because a combined set of incentives will motivate the use of GSI more than one alone.

The consulting team recommends proceeding with the implementation steps outlined in Table 4-1.

TABLE 4-1: SUGGESTED INTEGRATED GSI RULES IMPLEMENTATION STEPS

NO.	ACTION	RESPONSIBLE PARTY	DUE DATE
1	Assemble Stakeholder Group	Planning Department and Chief Resilience Officer	4Q 2019
2	Develop Revised Ordinance Language	Planning Department and Chief Resilience Officer	1Q 2020
3	Adopt Ordinance	City Council and Chief Resilience Officer	2Q 2020
4	Develop Revised Infrastructure Design Manual Provisions	Houston Public Works and Chief Resilience Officer	1Q 2020
5	Adopt Revised Design Manual	Houston Public Works and Chief Resilience Officer	2Q 2020
6	Conduct Internal Staff Training	Houston Public Works and Chief Resilience Officer	3Q 2020
7	Conduct Stakeholder and Industry Training	Houston Public Works and Chief Resilience Officer	3Q 2020
8	Implement New Rules	Planning Department, Houston Public Works, and Chief Resilience Officer	4Q 2020

The schedule for this incentive program is shown in combination with the other three incentives in the timeline on page 37.



GSI can connect to existing public green space. iStock/RoschetzkylstockPhoto.

5.0 Property Tax Abatement

Tax abatements have been used to help stimulate land development projects in many real estate markets around the world. They reduce the owner's property tax bill by a certain amount for a certain duration in exchange for some public benefit. Accordingly, developers can be incentivized to implement green stormwater infrastructure (GSI) in their projects if the City delays or reduces the developers' property tax bill. Current city ordinances, policies, and procedures do not appear to limit the ability to offer this incentive. This program could be implemented through the enactment of an explicit GSI tax abatement or through the City's existing authority to issue abatements for general economic development reasons. This incentive should be implemented in parallel with the others outlined in this report.

Throughout the study, the team estimated the value of property tax abatements and compared that to the cost of implementing green stormwater infrastructure (GSI) (Appendix C). This cost comparison illustrated that this incentive program would create a meaningful trigger point across most project scales. The magnitude of the incentive driver will depend upon the scale of the project, the pre- and post- appraised value of the land, and the size of proposed GSI facilities.

Tax abatements should be marketed to developers who are planning to build projects with anticipated appraised values sufficient to cover some or all of the anticipated GSI costs. Like the residential apartment tax abatement that was implemented in 2010, a clear business case should be developed to illustrate that the investment in private GSI will catalyze nearby property value increases and, hence, increase city tax revenue and public good. This incentive program can be bundled with others outlined in this report because a combined set of incentives might motivate the use of GSI more than one alone.

The value, duration, and terms of the abatements offered to future projects should be established using a detailed business case evaluation for each future project. This is because each project, project site, and project area will have their own unique conditions, constraints, and opportunities. The abatement can be granted on the tax bill increase arising from the redevelopment project and should be offered for a period of 5 years.

This incentive should be marketed in discussions with the Urban Land Institute – Houston District Council, the Houston Real Estate Council, and other stakeholders.

Additional policy implications of establishing different abatement durations and amounts for new development and redevelopment during the creation of the program should be addressed.

Wetland plants can be incorporated into GSI landscaping. iStock/earleliason

The consulting team recommends proceeding with the implementation steps outlined in Table 5-1.

TABLE 5-1: SUGGESTED PROPERTY TAX ABATEMENTS IMPLEMENTATION STEPS

NO.	ACTION	RESPONSIBLE PARTY	DUE DATE
1	Assemble Stakeholder Group	Chief Development Officer and Chief Resilience Officer	2Q 2020
2	Develop Program Details and Name	Chief Development Officer and Chief Resilience Officer	3Q 2020
3	Conduct Publicity and Outreach and Recruit Participants	Chief Development Officer and Chief Resilience Officer	3Q 2021
4	Negotiate Initial Agreements	Chief Development Officer and Chief Resilience Officer	3Q 2021
5	Evaluate Program	Chief Development Officer and Chief Resilience Officer	4Q 2021

The schedule for this incentive program is shown in combination with the other three incentives in the timeline on page 37.

Green roof on Carnegie Vanguard High School. Asakura Robinson.

6.0 Award and Recognition Program

An award and recognition program for developers who implement green stormwater infrastructure (GSI) in their projects can also be an effective incentive. This incentive should be implemented in parallel with the others outlined in this report in order to maximize developer and public benefits.

City ordinances and state law do not appear to create any limitations on the City's ability to offer and grant recognition or awards to private developers for the use of green stormwater infrastructure (GSI).

Initial program elements should include:

- Widespread publicity about the award program and why it was created.
- Recognition or branding of projects that participate in the incentive program.
- A tiered implementation process that will publicly recognize the first five marquee GSI projects, followed by an evolution into a more formal program with a consistent and open nomination and application process that allows for self-nominations and nominations from any citizen, organization, or entity.
- The number of awards to be issued each year or other appropriate time interval.
- A process for issuing and announcing the award or recognition in concert with the recipient to maximize exposure and benefits realized by the recipient.
- Ongoing educational programming featuring the award recipients to foster additional GSI use.

Site tours, public events, and media events that include project sponsors and city elected officials should be conducted. Social media should be used to promote the projects and the developers receiving recognition.

The initial program should be expanded later by adding:

- Clear eligibility requirements, including project status, extent of GSI use, location, size, and similar considerations.
- A clear application process that is not overly burdensome.
- A procedure for independent, non-biased, judging of applications.

It may be challenging to convince the first potential award recipient to invest in GSI solely in hopes of receiving an award. The likelihood that a developer will move forward with GSI will marginally increase as the scale and cost of the award publicity increases; more publicity might lead to more potential applicants. In addition, the City's revenue cap and general budget constraints will limit its ability to implement this program using the larger, more elaborate options.

The program can be administered with internal resources and staff time, however, if these are found to be limited, a non-profit organization could be identified as a partner to facilitate the recognition and awards for specific projects. As noted previously, all incentives, including the one described in this section, could be bundled with the others described because a combined set of incentives might motivate the use of GSI more than one alone.

Due to the limited use of GSI in Houston thus far and the time required to create and implement the other incentives outlined in this report, it is recommended that the launch of the awards program is delayed until other incentives have been formulated and developers have had a chance to plan, design, and build projects. The first five marquee projects, which can be considered as pilots of these incentives, could be publicized throughout the implementation timelines proposed below. All awards and recognition will need to consider a variety of project types and scales as this will help motivate developers that work at all scales to use GSI.

The consulting team recommends proceeding with the implementation steps outlined in Table 6-1.

TABLE 6-1: SUGGESTED AWARD / RECOGNITION PROGRAM IMPLEMENTATION STEPS

NO.	ACTION	RESPONSIBLE PARTY	DUE DATE
1	Develop Program Details and Name	Office of Sustainability, Mayor's Office of Communications, Chief Resilience Officer, and Green Building Resource Center	3Q 2020
2	Conduct Publicity and Outreach and Recruit Applicants	Office of Sustainability, Mayor's Office of Communications, Chief Resilience Officer, and Green Building Resource Center	3Q 2021
3	Grant Awards and Publicize Winning Projects	Office of Sustainability, Mayor's Office of Communications, Chief Resilience Officer, and Green Building Resource Center	4Q 2021

The schedule for this incentive program is shown in combination with the other three incentives in the timeline on page 37.

Urban forestry in Houston. iStock/Sean Pavone.

7.0 Increased Permitting Process Certainty and Speed

During stakeholder engagement, developers indicated that they could also be incentivized to use green stormwater infrastructure (GSI) in projects if they could obtain a more consistent and faster plan review process.

This could help achieve better economic performance on private development projects while delivering higher public benefits more quickly.

Wildflowers can be incorporated into GSI landscaping. iStock/Richard McMillin

The alternative permitting program would charge a higher fee than the current program, but it would assemble all project design professional and all reviewers for a team review session lasting from two to four hours (depending upon the scale of the project). The City of Dallas has created a very similar program that could be adapted for use in Houston.

Prior to scheduling and conducting the expedited team review meeting, plans will need to be evaluated for completeness. Once plans are deemed sufficiently complete, the expedited team review meeting can be scheduled. The review team should include plan reviewers from all departments and disciplines who will meet with the applicant and the applicant's design professionals to conduct a full review of all plans. If the review requires relatively minor changes in the plans, then these changes can be made during the review and city staff would sign them prior to the end of the meeting. If revisions cannot be completed at the meeting, a follow up review with the same team should be scheduled. If the plans meet the relevant requirements of city codes and ordinances, and necessary changes are made on the spot, permits should be issued immediately following the meeting. Reportedly this is similar to the review process used by Houston Permitting for telecommunications infrastructure projects.

In order to incentivize green infrastructure within an expedited team review program developers would need to be charged a higher set of fees for traditional development and a lower set of fees for green stormwater infrastructure (GSI) developments as outlined in Appendix C.

This incentive program will require additional staffing with specialized training. Five full time employees currently conduct all stormwater reviews; two for public projects and three for private projects. Because the Office of the City Engineer reportedly utilizes a team review approach for telecommunications infrastructure projects, this approach should work for all other development projects, both with and without GSI. This incentive program would be bundled with others outlined in the report to maximize both developer and public benefits.

The consulting team recommends proceeding with the implementation steps outlined in Table 7-1.

TABLE 7-1: SUGGESTED PERMITTING TIMELINE IMPLEMENTATION STEPS

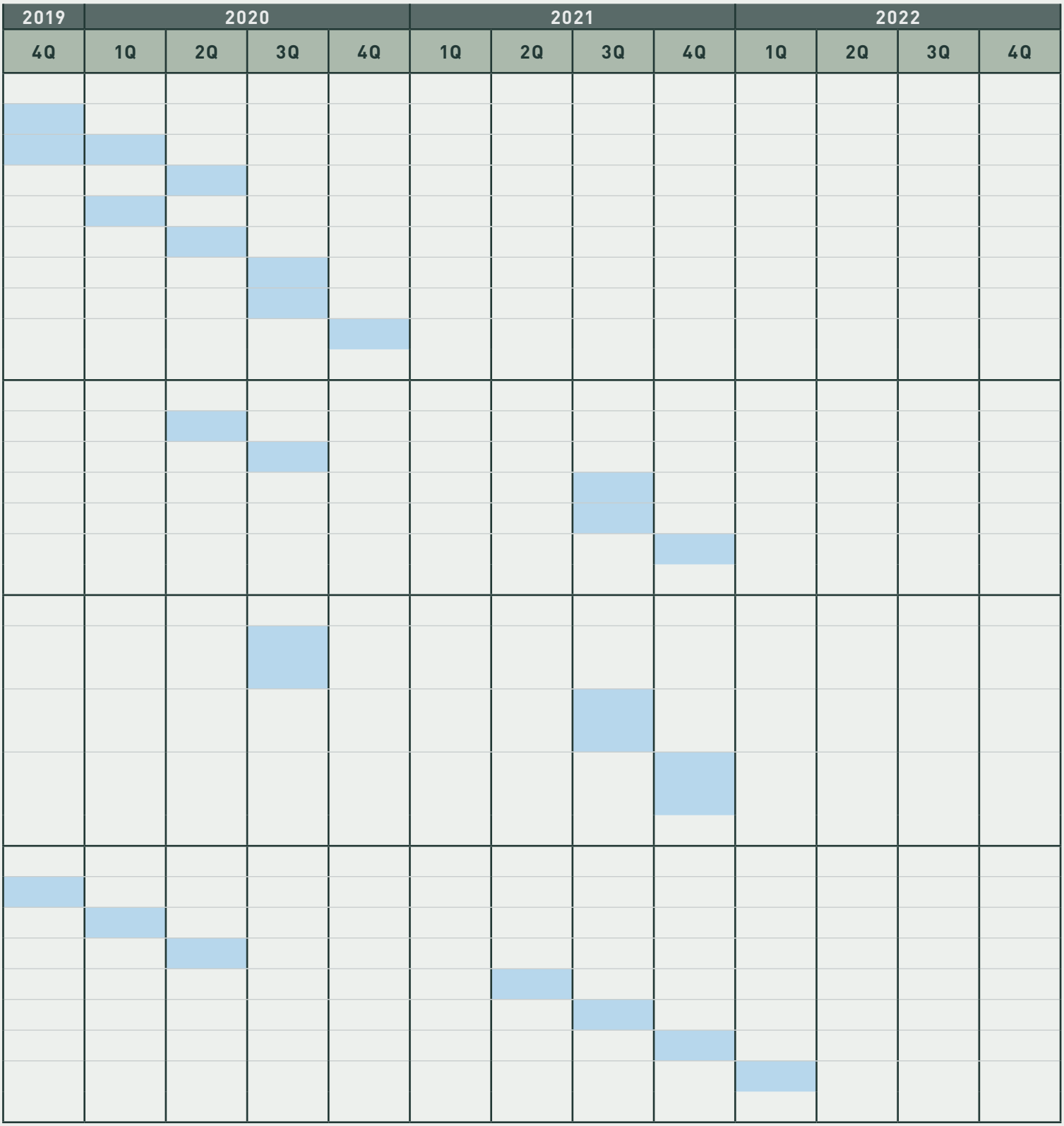
NO.	ACTION	RESPONSIBLE PARTY	DUE DATE
1	Assemble Stakeholder Group	Houston Permitting and Chief Resilience Officer	4Q 2019
2	Develop Program Details and Name	Houston Permitting and Chief Resilience Officer	1Q 2020
3	Hire and Train Staff	Houston Permitting and Chief Resilience Officer	2Q 2020
4	Initiate Pilot Program and Fee Schedule	Houston Permitting and Chief Resilience Officer	2Q 2021
5	Evaluate Pilot Results	Houston Permitting and Chief Resilience Officer	3Q 2021
6	Revise Program and Fee Schedule	Houston Permitting and Chief Resilience Officer	4Q 2021
7	Implement Revised Program	Houston Permitting and Chief Resilience Officer	1Q 2022

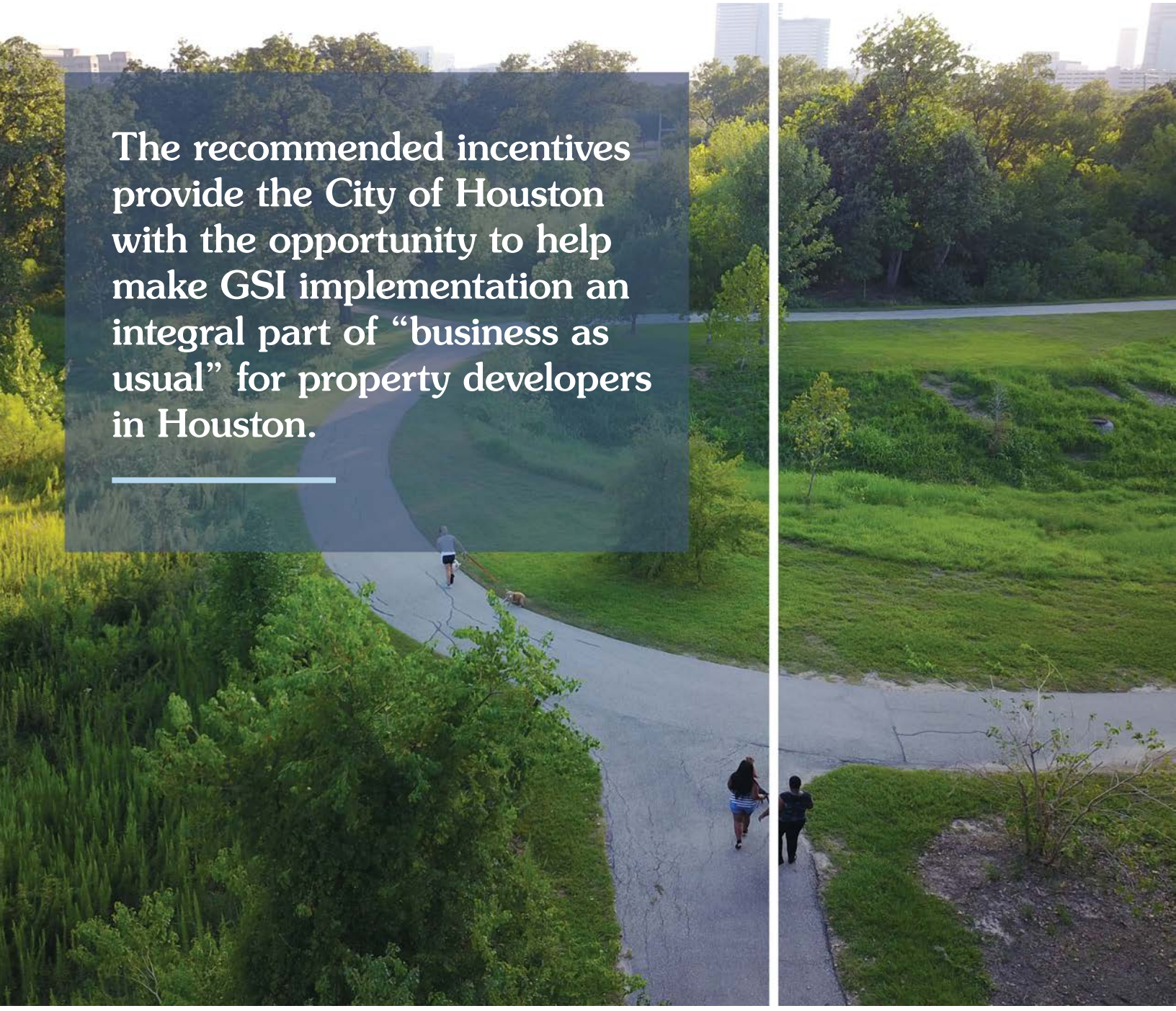
The schedule for this incentive program is shown in combination with the other three incentives in the timeline on page 37.

Bioswale in single-family residential development. R. G. Miller Engineers, Inc.

Houston Incentives for Green Development:
Implementation Schedule

ACTIVITY	RESPONSIBLE PARTY
INTEGRATED GSI DEVELOPMENT RULES	
Assemble Stakeholder Group	Planning Department and Chief Resilience Officer
Develop Revised Ordinance Language	Planning Department and Chief Resilience Officer
Adopt Ordinance	City Council and Chief Resilience Officer
Develop Revised Infrastructure Design Manual Provisions	Houston Public Works and Chief Resilience Officer
Adopt Revised Design Manual	Houston Public Works and Chief Resilience Officer
Conduct Internal Staff Training	Houston Public Works and Chief Resilience Officer
Conduct Stakeholder and Industry Training	Houston Public Works and Chief Resilience Officer
Implement New Rules	Planning Department, Houston Public Works, and Chief Resilience Officer
PROPERTY TAX ABATEMENTS	
Assemble Stakeholder Group	Chief Development Officer and Chief Resilience Officer
Develop Program Details and Name	Chief Development Officer and Chief Resilience Officer
Conduct Publicity and Outreach and Recruit Participants	Chief Development Officer and Chief Resilience Officer
Negotiate Initial Agreements	Chief Development Officer and Chief Resilience Officer
Evaluate Program	Chief Development Officer and Chief Resilience Officer
AWARD AND RECOGNITION PROGRAM	
Develop Program Details and Name	Office of Sustainability, Mayor's Office of Communications, Chief Resilience Officer, and Green Building Resource Center
Conduct Publicity and Outreach and Recruit Participants	Office of Sustainability, Mayor's Office of Communications, Chief Resilience Officer, and Green Building Resource Center
Grant Awards and Publicize Winning Projects	Office of Sustainability, Mayor's Office of Communications, Chief Resilience Officer, and Green Building Resource Center
INCREASED PERMITTING PROCESS CERTAINTY AND SPEED	
Assemble Stakeholder Group	Houston Permitting and Chief Resilience Officer
Develop Program Details and Name	Houston Permitting and Chief Resilience Officer
Hire and Train Staff	Houston Permitting and Chief Resilience Officer
Initiate Pilot Program and Fee Schedule	Houston Permitting and Chief Resilience Officer
Evaluate Pilot Results	Houston Permitting and Chief Resilience Officer
Revise Program and Fee Schedule	Houston Permitting and Chief Resilience Officer
Implement Revised Program	Houston Permitting and Chief Resilience Officer


2019
2020
2021
2022
4Q
1Q
2Q
3Q
4Q
1Q
2Q
3Q
4Q
1Q
2Q
3Q
4Q



The recommended incentives provide the City of Houston with the opportunity to help make GSI implementation an integral part of "business as usual" for property developers in Houston.

Trails connecting private development to large scale green infrastructure. Asakura Robinson

8.0 Summary

Support from the Houston Endowment has allowed the City of Houston to establish a more robust green stormwater infrastructure (GSI) program. The Houston Incentives for Green Development study has prioritized four practical, cost-effective and regionally appropriate incentives for private development that will lay a greener foundation for future development within the city. These incentives include:

1. Integrated Green Stormwater Infrastructure (GSI) Development Rules
2. Property Tax Abatements
3. Award and Recognition Program
4. Increased Permitting Process Certainty and Speed

Green space along Buffalo Bayou. iStock/Sean Pavone

Integration of green stormwater infrastructure into the planning and development of public and private assets needs to become "business as usual" for all property developers in Houston. The incentives would increase the chance of for GSI to become an integral part of how Houston "builds forward" to address our flooding challenges, while addressing water and air quality, urban heat island effect, and neighborhood beautification.

Houston has taken strides towards a more holistic storm water management approach thanks to engagement with peer cities and key industries. Every property owner in developed environments now has an opportunity to blend green infrastructure components into retrofitted or future projects.

While improving storm water management, GSI would also boost economic performance, provide Houstonians with a better sense of safety and resilience, and make the city more attractive.

This report culminates the first steps towards building a robust green infrastructure program for Houston. The City now will take the lead by implementing the four incentives across departments, foster relationships with the private sector, and incorporate green techniques into public projects. This includes taking the opportunity to highlight green building actions in the upcoming ***Resilience Strategy*** and ***Climate Action Plan*** and ensuring implementation through Harvey recovery programs.

About the Authors

Michael F. Bloom, PE

Mr. Bloom directs the Sustainability Practice for R. G. Miller Engineers, Inc., where he plans and designs natural drainage systems that increase operating income, reduce detention requirements, increase developable land, and provide an anchor for natural amenities that improve health outcomes and social connectedness. He recently served on Urban Land Institute (ULI) National Technical Assistance Panel for the municipality of Toa Baja, Puerto Rico, which was subject to catastrophic flooding during Hurricane Maria. He was an expert contributor to and reviewer of the ULI report Harvesting the Value of Water: Stormwater, Green Infrastructure, and Real Estate (May 2017). He assisted with the preparation of Addressing Flood Risk: A Path Forward for Texas After Hurricane Harvey, published by the Texas Section of American Society of Civil Engineers. Michael is the current chair of the Houston Chapter of the Environment & Water Resources Institute of the American Society of Civil Engineers. Michael currently serves on the Public Policy Committee of the ULI Houston District Council and is a member of ULI's National Community Development Council (Black Flight).

Janet Clements

Ms. Clements has more than 18 years of experience in water resources planning and economics. She conducts benefit-cost, triple-bottom line, and economic impact analyses to evaluate the economic, social, environmental implications of water-related policies and programs. Her focus areas include integrated water resource management, green infrastructure and stormwater financing, and affordability of water and wastewater services. Ms. Clements has conducted several studies to quantify and monetize the benefits of green infrastructure and to develop market-based incentive programs for green infrastructure implementation. Her clients include local, state, and federal governments, research foundations, and non-profit organizations. Ms. Clements received her B.S. in sustainable resource management from The Ohio State University and her M.S. in agriculture and resource economics from Colorado State University.

Alisa Valderrama

Ms. Valderrama is Founder and Principal of environmental advisory firm Neptune Street Advisors. Prior to launching Neptune Street, Alisa was the Director of Water Infrastructure Finance at the Natural Resources Defense Council (NRDC). At the NRDC from 2010 to 2018, Alisa initiated and led the organization's work with cities focused on innovative urban water infrastructure finance. Alisa is best known for helping the Philadelphia Water Department structure its Greened Acre Retrofit Program, a reverse-auction inspired approach that helps the City locate and fund low-cost and socially-beneficial stormwater management projects. Alisa has worked in partnership with a wide range of cities to design and implement markets in avoided stormwater runoff.

r.g. miller engineers

CORONA ENVIRONMENTAL CONSULTING

NEPTUNE STREET
ENVIRONMENTAL MARKETS ADVISORS

Sakura robinson

Financial Support Provided by:

HOUSTON
ENDOWMENT

Houston Incentives for Green Development