Date: February 18, 2019 (Finalized April 30, 2019)

To: Laura Patiño, City of Houston, Chief Recovery Office

From: Michael Bloom, P.E., Alisa Valderrama, Janet Clements, Abigail Phillips

RE: Legal and Policy Issues, Financial Performance, Barriers, and Challenges
Houston Green Stormwater Infrastructure Incentives Study

PART 1: INTRODUCTION AND KEY FINDINGS

1.1 Introduction

Through funding from the Houston Endowment, the City of Houston’s Chief Resilience Officer (CRO) commissioned this 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.

In May 2018 the CRO retained R. G. Miller Engineers, Inc., in association with Asakura Robinson, Corona Environmental Consulting, and Neptune Street Advisors to perform the work. This memorandum summarizes activities associated with Task 003 of the study, as follows:

- Screen draft incentive program models
- Research legal, policy, and procedural issues
- Review redacted financial statements for various types of development or redevelopment projects inside the City of Houston (COH)
- Identify potential threshold points that might trigger GSI use by private developers in the various types of real estate projects
- Identify legal, policy, or procedural barriers or challenges to implementing the considered incentives or regulatory approaches
- Identify possible strategies or approaches to overcome barriers and challenges

---

1 This study was commissioned prior to the naming of Houston as one of the Rockefeller Foundation’s 100 Resilient Cities (100 RC) and prior to the naming of the city’s 100 RC CRO.
1.2 Key Findings

The memorandum finds, after detailed screening of initial incentive programs, researching potential legal or policy limitations, assessing the ability for incentive programs to exceed associated threshold points to motivate developers to utilize GSI approaches, that the City of Houston should move forward with the development and implementation of the following incentive programs:

- Permitting Timeline Certainty
- Property Tax Abatements
- Award and Recognition Program
- Integrated GSI Development Rules

The balance of this memorandum describes the incentive program screening process and the evaluation of selected incentive programs.
PART 2.0 INITIAL SCREENING OF DRAFT INCENTIVES

Based on the results of Task 001 – Research and Benchmarking Regarding Incentives and Regulatory Approaches and the results of Task 002 – Work with Private Developers, the consulting team developed an initial list of draft incentive programs for consideration. The draft incentives list included the following:

- **Timing Incentives**
  - Expedited platting or re-platting. Developer implements GSI in exchange for faster plat or re-plat approval.
  - Expedited permitting. Developer implements GSI in exchange for faster plan review and approval.
  - Enhanced permitting certainty and speed. Developer implements GSI in exchange for a more consistent reviews and faster permit issuance.

- **Financial Incentives**
  - Reduced permitting fees. Developer implements GSI in exchange for reduced permitting fees.
  - Reduced platting fees. Developer implements GSI in exchange for reduced platting fees.
  - Reduced utility connection fees. Developer implements GSI in exchange for reduced water or wastewater connection fees.
  - Reduced drainage utility parcel fees. Developer implements GSI in exchange for a reduced monthly parcel fee for the life of the completed project.
  - Reduced impact fees. Developer implements GSI in exchange for reduced stormwater impact fee charges.
  - Property tax abatements. Developer implements GSI in exchange for a city property tax abatement for a certain set period of time.
  - Grants to private developers. Developer implements GSI in exchange for direct city funding of the construction of the project. Here, the additional city funding would be obtained from a revenue-neutral funding source in the form of principal forgiveness granted by the Texas Water Development Board on a large-value wastewater project loan from the Clean Water State Revolving Fund that includes a bundled set of small-scale GSI project subsidies in the same project area.

- **Award/Recognition Program**
  - City issued award and public recognition. Developer implements GSI in exchange for public recognition by the city. This could be through a formal awards program and/or through public acknowledgment/branding efforts.

- **Municipal Ordinance Incentives**
  - More flexible parking requirements. Developer implements GSI in exchange for the city imposing a more flexible set of parking requirements (either more or less area) on that project.
  - More flexible landscaping requirements. Developer implements GSI in exchange for the city imposing more flexible requirements on the project.
  - More flexible park dedication, park dedication fund, and compensating open space regulations. Developer implements GSI in exchange for the city imposing a more flexible
set of park dedication, fund payment options, and compensating open space provisions on that project.

- **Infrastructure Design Incentives**
  - **Modified drainage design requirements.** Developer implements GSI in exchange for modified drainage design requirements. For example, the city might allow the use of beehive inlet grates or other specialty inlets in exchange for the use of GSI on a particular project.
  - **Modified detention requirements.** Developer implements GSI in exchange for the city agreeing to impose a modified detention volume requirement. For example, the city might calculate the required detention volume as the difference between the total runoff volume after development, less the total runoff volume before development, rather than based merely on the post-project impervious area.
  - **Modified stormwater quality requirements.** Developer implements GSI in exchange for the city agreeing to impose modified stormwater quality requirements. For example, the city might allow a broader range of appropriately sized GSI techniques to meet stormwater quality requirements, than is currently allowed.

- **Building Code Incentives**
  - **More flexible grading requirements.** Developer implements GSI in exchange for the city imposing a more flexible set of grading requirements.

- **Developer Contracts**
  - **Special provisions to city-developer contracts.** Developer implements GSI in exchange for special concessions granted by the city and documented in project-specific developer agreement.

- **Detention Volume Trading or In-Lieu Fee Programs**
  - **Detention volume trading program.** Developer implements GSI above and beyond existing stormwater requirements in exchange for participation in a city-administered detention volume-trading program. The city-administered program would track the construction of excess GSI-based detention volume in subwatersheds across the city. The city would approve the purchase and sale of excess detention within each subwatershed among participating development sites. The city would grant participating new development or redevelopment sites the option of building the required detention volume or purchasing it from developers who implement GSI in excess of existing standards. Developers who implement GSI could also bank excess capacity for later use.
  - **Fee in-lieu program.** Rather than meeting detention standards onsite, city allows developer to participate in a city-administered fee in-lieu program for detention. The city-administered program would track and collect fees from city-authorized development projects that elected not to construct onsite detention. Fees would be tracked on a subwatershed basis. The city would then construct subregional GSI-based detention facilities using the collected fees. This results in more GSI than otherwise would be implemented because developers implementing detention onsite would likely be using gray infrastructure solutions.

After the City of Houston’s CRO and staff vetted the list, the consulting team conducted an initial screening process to narrow down the list of potential incentive program models. The consulting team developed a
set of evaluation criteria to determine which incentives would be subject to further, more detailed evaluation. The evaluation criteria were established with two parts. The first part qualitatively assesses the incentive using various criteria on a scale of 1 to 10 with 10 being the best outcome for each criterion. The second part indicates how much that particular outcome would motivate developers to use GSI. This can be considered a priority weight or in this case a motivation factor on a scale of 1 to 10, with a 10 weight assigned the factor that would provide the most motivation. The criteria and their respective motivation factors are described below.

- **Developer Benefits**: Qualitatively expresses the anticipated magnitude of benefits to the developer and the developer’s proposed project. This might include a direct subsidy, tax savings, reduced regulatory burden, or reduced construction/development costs. Higher is better. Developer benefits are a very high important consideration when evaluating how GSI incentives might motivate developers to utilize GSI, therefore, a motivation factor of 10 out of 10 was assigned to this criterion.

- **Ease of Implementation**: Qualitatively expresses how easy it will be for the city to create the incentive. Additional work reduces the ease of implementation. For example, the need for drafting and passing a revised or new ordinance, revising the building code, revising the Infrastructure Design Manual, staff training, or the creation of a new tool, all would tend to drive the ease of implementation down, therefore higher is better. Ease of implementation is a moderate consideration when evaluating the feasibility of GSI incentive programs, therefore, a motivation factor of 4 out of 10 was assigned to this criterion.

- **Ease of Administration**: Qualitatively expresses how easy it will be for the city to run the incentive program. Additional work reduces the ease of administration. For example, hiring additional staff, performing data management activities, conducting additional reviews, generating additional paperwork, or performing additional interdepartmental coordination all would tend to drive the ease of administration down, therefore higher is better. Ease of administration is moderate consideration when evaluating the effectiveness or feasibility of GSI incentive programs, therefore, a motivation factor of 4 out of 10 was assigned to this criterion.

- **Degree of Cost or Revenue Neutrality**: Qualitatively expresses to what extent the city can execute the program without incurring additional costs or without revenue shortfalls. For example, incurring increased salary costs, additional software costs, or a reduction in tax proceeds, all would drive the program neutrality down, therefore higher is better. Degree of cost or revenue is moderate to high consideration when evaluating the feasibility of GSI incentive programs, therefore, a motivation factor of 6 out of 10 was assigned to this criterion.

- **Net Public Benefits**: Qualitatively expresses the anticipated magnitude of the difference between any increase in public benefits from the implementation of GSI; less any reduction in level of services arising from any flexibility granted from existing ordinance or design requirements. Higher is better. Net public benefits is a low to moderate consideration when evaluating how GSI incentives might motivate developers to utilize GSI, therefore, a motivation factor of 2 out of 10 was assigned to this criterion.

The consulting team scored all incentives based on professional judgement and feedback from private land development companies who participated in an earlier phase of this project and provided information and ideas to the process. Table 2-1 illustrates the results of the screening process.
Table 2-1. Qualitative Incentive Screening

<table>
<thead>
<tr>
<th>Incentive</th>
<th>Developer Benefits</th>
<th>Ease of Implementation</th>
<th>Ease of Administration</th>
<th>Degree of Cost/Revenue Neutrality</th>
<th>Net Public Benefits</th>
<th>Weighted Score</th>
<th>Further Evaluation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>10</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>100</td>
<td>NO</td>
</tr>
<tr>
<td>Timing Incentives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expedited platting or re-platting.</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>100</td>
<td>NO</td>
</tr>
<tr>
<td>Expedited permitting.</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>92</td>
<td>NO</td>
</tr>
<tr>
<td>Plating and permitting timing certainty</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>138</td>
<td>YES</td>
</tr>
<tr>
<td>Financial Incentives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced permitting fees.</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>124</td>
<td>NO</td>
</tr>
<tr>
<td>Reduced platting fees.</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>124</td>
<td>NO</td>
</tr>
<tr>
<td>Reduced utility connection fees.</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>124</td>
<td>NO</td>
</tr>
<tr>
<td>Reduced drainage utility parcel fees.</td>
<td>2</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>124</td>
<td>NO</td>
</tr>
<tr>
<td>Reduced impact fees.</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>180</td>
<td>YES</td>
</tr>
<tr>
<td>Property tax abatements.</td>
<td>9</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>166</td>
<td>YES</td>
</tr>
<tr>
<td>Grants to private developers.</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>180</td>
<td>YES</td>
</tr>
<tr>
<td>Award program</td>
<td></td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>138</td>
<td>YES</td>
</tr>
<tr>
<td>Municipal Ordinance Incentives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More flexible parking requirements.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>150</td>
<td>YES</td>
</tr>
<tr>
<td>More flexible landscaping requirements.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>150</td>
<td>YES</td>
</tr>
<tr>
<td>More flexible park dedication, park fund, and compensating open space regulations.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>150</td>
<td>YES</td>
</tr>
<tr>
<td>Infrastructure Design Incentives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified drainage design requirements.</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>176</td>
<td>YES</td>
</tr>
<tr>
<td>Modified detention requirements.</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>176</td>
<td>YES</td>
</tr>
<tr>
<td>Modified stormwater quality requirements.</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>180</td>
<td>YES</td>
</tr>
<tr>
<td>Building Code Incentives</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More flexible grading requirements.</td>
<td>2</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td>124</td>
<td>NO</td>
</tr>
<tr>
<td>Developer Contracts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special provisions to city-developer contracts.</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>8</td>
<td>2</td>
<td>128</td>
<td>NO</td>
</tr>
<tr>
<td>Detention Volume Trading or In-Lieu Fee Programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detention volume trading program.</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>106</td>
<td>NO</td>
</tr>
<tr>
<td>Fee in-lieu program.</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>126</td>
<td>NO</td>
</tr>
</tbody>
</table>

| Best | 10 | 10 | 10 | 10 | 10 | 260 |
| 75th Percentile | 7.5 | 7.5 | 7.5 | 7.5 | 7.5 | 195 |
| Median | 5 | 5 | 5 | 5 | 5 | 130 |
| 25th Percentile | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 65 |
| Worst | 1 | 1 | 1 | 1 | 1 | 26 |
The initial screening process eliminated all draft incentives except for the following:

- **Timing Incentives**
  - Enhanced permitting certainty and speed.

- **Financial Incentives**
  - Reduced impact fees.
  - Property tax abatements.
  - Grants to private developers.

- **Award/Recognition Program**
  - City issued award and public recognition.

- **Municipal Ordinance Incentives**
  - More flexible parking requirements.
  - More flexible tree and shrub list.
  - More flexible park dedication, park dedication fund, and compensating open space regulations.

- **Infrastructure Design Incentives**
  - Modified drainage design requirements.
  - Modified detention requirements.
  - Modified stormwater quality requirements.
PART 3.0 EVALUATION OF INCENTIVES

The following sections present the results of the consulting team’s work to address the following items for each of the incentive concepts remaining from the initial screening process:

- **Legal, policy, and procedural issues.** This includes a discussion of how the incentive might be implemented using current or modified legal authorities, using current or modified policies, or under current or modified city procedures.

- **Benefits and costs.** This includes a discussion of the costs and benefits of the proposed incentive, from the perspective of both developer and the city.

- **Threshold points.** This considers how the proposed incentives can grant a certain amount of subsidy, a certain amount of regulatory flexibility, or a certain amount of reduction in required detention volume, to change developer behavior. This section defines the “threshold point” as the value or quantity of the granted concession or subsidy that would feasibly result in a behavior change because it creates a cost savings, an increase in revenue, or some other benefit that is material to the developer’s project pro-forma. To assess possible threshold points for each incentive program the consultant team designed a hypothetical new commercial site using current City of Houston planning and design provisions related to landscaping, parking, and stormwater management. The team designed and estimated construction costs for the hypothetical site using GSI techniques and alternative planning and design provisions. These two designs and cost estimates then allowed the consulting team to compare the anticipated costs to the value of the offered incentive to see if the developer benefits outweighed the developer costs. (See Enclosure A for details.)

- **Barriers or challenges.** This includes an assessment of the factors that would increase the required level of effort to implement the incentive program, the factors that would thwart implementation, and the factors that might lead to program failure.

- **Implementation strategies.** This includes a discussion of how the city might proceed with implementation, despite the identified barriers.

The consulting team’s deeper dive into each of the incentives generated additional information about potential program models. The consulting team used this additional information to help guide the selection of incentive recommendations, which are presented at the end of this memorandum.

The consulting team created a detailed design comparison to help evaluate each incentive program. The design comparison and example scenario that helps us determine the effectiveness of each incentive can be found in appendix A.
PART 4.0 ENHANCED PERMITTING CERTAINTY AND SPEED

During interviews for this project, representatives from in-city development companies expressed a strong desire for more certainty in the plan review process and a faster process. Many developers indicated that uncertainty regarding when city comments would be received, the completeness and consistency of comments, and how many times plans would need to be submitted for review to obtain a permit, and how long the overall process might take, had a negative impact on their cash flow and project performance. The city might incentivize developers to use GSI in projects if the city provided a more consistent plan review process and a faster process.

4.1 Legal, Policy, or Procedural Issues

Current city ordinances, policies, and procedures do not appear to limit the city’s ability to offer this incentive.

4.2 Cost Information

A more consistent plan review process and a faster permit issuance process would allow the project sponsor to more accurately estimate the cost of loans, to establish the timeline of equity partner payouts, plan the timing of funding actions, reduce the cost of planning and design services associated with multiple design revisions and plan submittals, and generally enhance the economic performance of their project. The current permitting process is illustrated in Figure 4-1 on the following page.
Figure 4-1: Permitting Process Flow Diagram
Developers currently claim that while the city may provide comments in a reasonable amount of time, the city provides inconsistent and incomplete comments during each plan review cycle. This causes developers to address comments on plans, resubmit, and then receive new comments on elements of the plans that were acceptable during the prior review cycle. Assuming site civil and landscaping construction costs of $1.5 million (as shown in Enclosure A for the hypothetical project) and engineering and landscape architecture services might cost about 10% of that amount, say $150,000, the consulting team estimated that revisions to address comments received during each plan review cycle might cost $15,000 (1% of professional service fees). Assuming the city reviews each set of plans three times, the developer might incur $45,000 in additional professional service fees, plus the debt service on the full amount of outstanding debt times the duration of the review process.

The consulting team made the following assumptions to estimate the time value of money to the developer:

- Borrowed Amount: $2 million
- Annual Interest Rate: 10%
- Permit Review Time: 30 days
- Time to Address Review Comments: 15 days
- Number of Review Cycles: 3

Based on the assumptions above, the consulting team estimated that the overall permitting process would take 135 days or 37% of a year and the total cost to borrow $2 million dollars at a 10% annual interest for 135 days would be $74,000. The consulting team estimated the total cost of the process by adding the professional service costs to the time costs, yielding $119,000.

If the city implemented an alternative, higher fee-based permitting process, similar to that provided by the City of Dallas, the City of Houston could offer developers who enter into a contract to utilize GSI a discounted fee structure for this enhanced permitting service.

Reportedly, the City of Dallas offers an expedited plan review performed by the “Q-Team” in a single review session. Reviewers specializing in building code, zoning, mechanical, electrical, plumbing, landscaping, sanitary, and fire safety participate and meet with the applicant and the applicant’s design professional and conduct a full review of all plans. Site civil engineering review is currently conducted separately, but the developer can choose to bundle that into the main meeting. If the review requires changes in the drawings, the changes may be made during the review and signed off on as required. If revisions cannot be completed at the meeting, a follow up review with the same team can be scheduled. If the plans meet the relevant requirements of city codes and ordinances, and necessary changes are made on the spot, permits can be issued immediately following the meeting.

A prequalification Q TEAM Review is required as part of the process of accepting an application for Q TEAM Review. This provides a review for “completeness” of documents submitted with the permit application. This process typically takes 5 to 12 days.

Developers must pay for the expedited review process. Fees include the standards application plan review
fees plus an additional pre-qualification fee (that is non-refundable). Maximum prequalification fees vary based on the size of the development, as follows:

- 0 – 10,000 sq. ft.: $500
- 10,001 – 50,000 sq. ft.: $750
- 50,001 – 100,000 sq. ft.: $1,000
- 100,001 + sq. ft.: $1,250

There is an additional charge of $1,000 per hour for the actual Q-Team Review meeting. This is due right after the meeting. Maximum review fees also vary by development size:

- 0 – 10,000 sq. ft.: $2,000
- 10,001 – 50,000 sq. ft.: $12,500
- 50,001 – 100,000 sq. ft.: $27,500
- 100,001 + sq. ft.: $50,000

The Dallas program is staffed by ten technical staff, three coordination staff, and two administrative assistants. Dallas reports that they typically conduct between 55 and 65 reviews per month. Meetings typically take between 1.5 to 2.5 hours with some taking 8 hours. Meetings typically include 20 people at a time.

If the City of Houston implemented such a permitting approach, it could be implemented with a higher set of fees for traditional development and a lower set of fees for GSI developments.

4.3 Threshold Points

As outlined in Section 4.2, the current costs associated with multiple reviews and schedule impacts outlined on appears to be high enough to motivate developers to utilize the proposed alternative, higher fee-based permitting process discussed above. If the city charged a high enough fee for this process and offered a high enough discount for the use of GSI, this might also motivate developers to utilize GSI.

4.4 Barriers or Challenges

Developers may want to use the expedited permitting process, however, they may submit incomplete or low quality plans for consideration. This will consume staff time and may lead to team review meetings that must be terminated because of the quality of the plans. Implementing the proposed alternative, higher fee-based permitting process discussed above would pose several challenges. Five full time employees currently conduct all stormwater reviews; two for public projects and three for private projects. Current staffing levels might not be sufficient to accommodate requests for the team, expedited review described above. The city will face many comments from all stakeholders regarding the fee structure and the discount offered for GSI use. The city will face a challenge in getting developers to execute a contract to implement GSI in exchange for the discounted permitting fees, however, that may be the only way to help ensure that the promised GSI actually gets built after the developer secures their permit.
4.5 Implementation Strategies

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 will require additional staffing with specialized training as only five full time employees currently conduct all stormwater reviews; two for public projects and three for private projects. Additional stakeholder engagement as well as thought on how to create the program must take place. Once program is created, prior to scheduling and conducting the expedited team review meeting the city should require plans to be evaluated for completeness. Once plans are deemed sufficiently complete, the city should proceed to schedule the expedited team review meeting. The city should bundle this incentive program with others outlined in the memorandum because a combined set of incentives will motivate the use of GSI more than one alone.
PART 5.0     FINANCIAL INCENTIVES

The city might incentivize developers to implement GSI on their projects if the city provided direct financial support for such projects, including reduced drainage impact fees, property tax abatements, or grants to developers. These options are discussed in more detail below. The following subsections present the results of the evaluation of the following incentives:

- Reduced drainage impact fees.
- Property tax abatements.
- Grants to private developers.

5.1     Reduced Drainage Impact Fees.

The city might incentivize developers to implement GSI on their projects if the city reduced their drainage impact fees. State law allows cities to impose drainage impact fees to new development projects to help offset the cost of providing new drainage capacity to serve those projects. Under this approach the city would agree to trade a reduced public good arising from improved public drainage facilities funded from impact fee collection in exchange for an increase in public good arising from the use of GSI. The discussion below explores this potential incentive in more detail.

5.1.1     Legal, Policy, or Procedural Issues

City ordinances allow the city to require developments to pay a portion of the costs to build public drainage facilities required to serve the new development project. It allows property owners in defined watershed areas to enter into development agreements with the city to connect to the drainage system. Agreements can direct the developer to construct public drainage facilities or pay charges equivalent to drainage impact fees, as defined in a city prepared drainage impact fee improvement plan.

5.1.2     Cost Information

Impact fees established in current city ordinances range from $0.00 per 1,000 square feet of increased impervious area in Addicks, Barker, or the Ship Channel watersheds to as high as $18.50 per 1,000 square feet of increased impervious area in the Sims / Vince Bayou watersheds. Expressed on a per acre basis, these fees range from $0.00 to $805.86 per acre of new impervious area.

5.1.3     Threshold Points

The range of charged fees does not appear to be high enough to create a meaningful trigger point. Take, for example, a relatively large, green-field, development site of 4 acres. The city would charge a developer proposing to convert 4 acres of grass to pavement, at most, $3,223.44 in drainage impact fees. That cost is less than 2% of the cost of installing the bioswale included in the hypothetical GSI design of the

---

2 Chapter 47. Water and Sewer, Article XV. Drainage Impact Fees, Division 2.
3 Chapter 47. Water and Sewer, Article XV. Drainage Impact Fees, Division 2.
commercial site outlined in Enclosure A. This means that any reduction in impact fee would not likely be sufficient to trigger a behavior change and the private use of GSI.

5.1.4 Barriers or Challenges

The city imposes small drainage impact fees for increases in impervious area. The charged fees are so small that reductions in them would not result in any changes to site design decision or the use of GSI.

5.1.5 Implementation Strategies

State law currently allows the city to charge a drainage impact fee that is based on the full cost of drainage facilities required to support new development. If the city completed a new drainage impact fee study that included an estimate of the full cost of existing and planned drainage facilities in each watershed, the city might be able to justify a sizable increase in the fee, if the total cost of service included consideration of flood damage reduction facilities. The city could consider bundling this incentive program with others outlined in the memorandum because a combined set of incentives might motivate the use of GSI more than one alone.

5.2 Property Tax Abatements.

The city might incentivize developers to implement GSI on their projects if the city deferred or reduced their property tax bill. Under this approach the city would agree to trade a reduced or delayed public good arising from deferred tax revenue in exchange for an increase in public good arising from the use of GSI and future increases in tax revenue resulting from enhanced property value. The discussion below explores this potential incentive in more detail.

5.2.1 Legal, Policy, or Procedural Issues

City ordinances allow the city to provide tax abatements to owners of certain projects in order to achieve economic development objectives; to owners of projects that create new or increased property value; and to owners of new or expanded sites or improvements if proven to be essential to the entity's or the facility's economic survival. Abatements are granted to owners of buildings, structures; fixed machinery and equipment, site improvements; office space and related fixed improvements necessary to the operation and administration of the facility; and tangible personal property. The city may not grant abatements on bare land, supplies, tools, vehicles, vessels, or aircraft.

To establish the term and value of granted abatements the city must evaluate the costs and benefits realized by the project sponsor and the net public benefits realized from the project. Depending on an analysis of such factors and data, the city may grant an appropriate amount and duration of abatement up to a period of ten years. The city may grant abatements for the following project types:
Projects that provide an economic benefit to the city (considering value of the abatement, sales tax income, franchise fee income, and the cost of public services to the project);
Projects that will increase the value of the real or tangible personal property;
Projects that increase (or prevent the decrease in) the number of permanent jobs;
Projects in Texas Enterprise Zones in accordance with the provisions of their enabling legislation;
Brownfield redevelopment projects; and,
New or refurbished projects that obtain Leadership in Energy and Environmental Design (LEED) certification.

These ordinance provisions suggest that the city would have the legal authority to create an explicit GSI tax abatement to incentivize GSI if desired, or simply rely upon the general economic development provision outlined above.

5.2.2 Cost Information

The city currently collects a property tax of $0.588310 for every $100.00 of property valuation. This means that a property with an appraised value of $1 million pays $5,883.10 per year in taxes to the city (not including taxes owed to other taxing entities). To illustrate the costs associated with this incentive concept, Table 3-1 presents publicly available information from the Harris County Appraisal District website for a few randomly selected properties.

<table>
<thead>
<tr>
<th>No.</th>
<th>Property Type</th>
<th>Address</th>
<th>Land Area (sf)</th>
<th>Building Area (sf)</th>
<th>Appraised Value</th>
<th>Annual Tax Due to City</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential, Multi-Family</td>
<td>150 W. Sam Houston Pkwy. North, Houston, TX 77024</td>
<td>183,823</td>
<td>284,221</td>
<td>$44,775,027</td>
<td>$263,416</td>
</tr>
<tr>
<td>2</td>
<td>Hotel, Convention Center Marriott</td>
<td>1777 Walker St. Houston, TX 77010</td>
<td>113,186</td>
<td>1,091,726</td>
<td>$215,482,937</td>
<td>$1,267,708</td>
</tr>
<tr>
<td>3</td>
<td>Vacant Land</td>
<td>3028 Washington Ave. Houston, TX 77007</td>
<td>56,541</td>
<td>0</td>
<td>$2,827,050</td>
<td>$16,632</td>
</tr>
<tr>
<td>4</td>
<td>Single Family Residence</td>
<td>Shenandoah Subdivision Houston, TX 77081</td>
<td>8,640</td>
<td>1,397</td>
<td>$138,572</td>
<td>$815</td>
</tr>
<tr>
<td>5</td>
<td>Retail Shopping Center with Surface Parking</td>
<td>3249 SW Freeway Houston, TX 77027</td>
<td>173,112</td>
<td>60,691</td>
<td>$17,311,200</td>
<td>$101,844</td>
</tr>
</tbody>
</table>

Table 5-1. Example Property Tax Information
5.2.3 Threshold Points

The owner of a project or property will incur property tax in proportion to the appraised value of the completed development or redevelopment. The developer’s annual tax bill must be equal to some reasonable fraction of the cost of any proposed GSI facilities for a tax abatement to provide a meaningful economic benefit.

If, for example, the developer installed the bioswale described in Enclosure A, the upfront capital cost would be approximately $256,000.\(^5\) (Assuming implementation of the new GSI development rules.) The developer would compare this cost (less the cost of a conventional stormwater system, approximately $713,000\(^6\) in the conventional design presented in Enclosure A) with the value of the abated taxes to decide if she should use GSI. The site design comparison presented in Enclosure A illustrates a cost savings of $457,000 on a project estimated to cost a total of $25 million, without the tax abatement. This illustrates that a city-granted tax abatement provides an additional cost savings, above and beyond that realized by designing the project under the proposed integrated GSI development rules.

If the city enacted a policy to provide the incentive over a three-year period, the tax abatement would pay for 100% of the Enclosure A hypothetical bioswale if the appraised value of the project was $14.3 million. The consulting team anticipates that the applicable threshold point for this incentive program would be achieved if 100% of the installation cost of the GSI project elements could be funded via tax abatement over a period of less than three years. Since the cost and scale of installed GSI typically varies with the scale of the overall project, the consulting team believes that the value of the tax abatement would exceed the threshold point and motivate developers to implement GSI.

5.2.4 Barriers or Challenges

Developers that plan to own the finished project, to earn lease income and to realize value appreciation over time, would benefit directly from a tax abatement, most likely in situations where the taxable value of the completed project is sufficient to receive an abatement over three years that covers a reasonable fraction or all of the cost of GSI. The consulting team estimated that if the city granted abatements equal to the value of the property tax increase from the associated development project for a period of 5 years to one property per year for 10 years, revenue would decline by about $4.6 million over that time period. This would be offset by the increase in property tax revenue and public good from the use of GSI on the subject properties and nearby tracts. Smaller projects need less costly GSI, so the abatement concept would likely work at most scales. The consultant team understands that tax abatements are granted to owners of property, rather than the property itself and that an owner with an active tax abatement can transfer that abatement agreement to a new owner, if performance conditions associated with the agreement continue to be achieved.

\(^5\) The prorated sum of Items 2, 3, 4, 5, 8, 12 and 17 for the green site listed in Table 7-2.
\(^6\) The sum of Items 13, 14, 15, and 17 for the conventional site listed in Table 7-2.
5.2.5 Implementation Strategies

The city should market the tax abatement incentive to developers who plan to build projects with anticipated appraised values sufficient enough to cover some or all of the anticipated GSI costs. Similar to the residential apartment tax abatement that was implemented in 2010, the city should develop a clear business case illustrating that investment in private GSI (through deferred or reduced revenue) will catalyze nearby property value increases and, hence, increased city tax revenue and public good. The city could consider bundling this incentive program with others outlined in the memorandum because a combined set of incentives might motivate the use of GSI more than one alone.

The city should consider the policy implications of restricting the tax abatement incentive to projects that redevelop properties and excluding properties that develop previously undeveloped land. The consulting team suggests the public benefits of restricting this incentive to redevelopment projects would be greater than if the incentive was offered to both redevelopment and new development.

5.3 Grants to Developers

The city might incentivize developers to implement GSI on their projects if the city funded a portion of the project’s GSI construction using a revenue neutral source of cash that is revenue-neutral for the City, here, in the form of a loan from the Clean Water State Revolving Fund that is eligible for forgiveness and is effectively a grant from the State. Under this approach the city would agree to trade city staff time associated with the administration of a loan and grant program in exchange for an increase in public good arising from the use of GSI on private land. The discussion below explores this potential incentive in more detail.

The revenue cap included in the current City Charter will limit the use of these types of incentives. As of 2005, the City Charter imposes a limit to revenue increases. Revenue increases cannot exceed the lower of either (a) the inflation rate plus the population growth or, (b) a 4.5% increase. This provision imposes a revenue cap on the city. This cap on potential revenue means the city will be unlikely to have additional funding to spend on financial incentives for GSI. Even with the revenue cap limitation, there may be other revenue sources that could be used to provide financial incentives, therefore, the discussions below explore this type of approach in more detail.

5.3.1 Legal, Policy, or Procedural Issues

Under the authority of the Federal Water Pollution Control Act (Clean Water Act) the U.S. Environmental Protection Agency (EPA) receives an annual appropriation from Congress and the President to fund the Clean Water State Revolving Fund (CWSRF). EPA shares the money in the CWSRF with states, including Texas, subject to budget considerations. The Texas Water Development Board (TWDB) administers the CWSRF in Texas and uses it as a source of funding to make low interest loans to wastewater and stormwater utilities across the state for eligible projects. The Texas SRF program typically lends about $525 million statewide and the City of Houston has borrowed about $53 million each cycle, on average.

The federal and Texas SRF programs include a provision known as the Green Project Reserve (GPR), which
sets aside funds to support green infrastructure projects, as defined in technical guidance. The GSI techniques considered in this incentives study report generally would be eligible. Under the GPR program some eligible projects may receive loan forgiveness or principal forgiveness. This effectively provides a source of grant funding – funding to the borrower that does not have to be repaid to the lender.

Figure 5-1 below, illustrates this concept using a hypothetical project.

A hypothetical project might proceed as follows:

- The City of Houston wastewater utility applies for a $50 million loan from the CWSRF to make sanitary sewer collection system upgrades. The application describes the full extent of collection system work [blue gray box in the diagram] and also includes a $0.5 million suite of potential GSI projects on private property in the same sewer sheds [green circles]. The application for a total of $51 million outlines the area where potential future GSI projects will be located and how they would help improve the level of service in the same sewersheds.
- The TWDB reviews the loan application and then approves the loan for $50.5 million with $0.5 million of the loan “forgiven,” i.e.: not required to be paid back.
- The City of Houston wastewater utility builds the sanitary sewer system work.
- The City enters into agreements with private developers and issues $0.5 million in GSI grants to private developers to build projects.

TWDB officials provided feedback on the concept described above at a meeting in October 2018 and indicated that it appeared very feasible to implement, however, later discussions with City of Houston officials familiar with the CWSRF identified a serious obstacle to implementation, as described below.

5.3.2 Cost Information

The city’s wastewater utility typically borrows $50 million each year under the Texas SRF for conventional wastewater system improvements that are not eligible for the GPR. Initially, the consulting team believed that this might generate about $0.5 million in loan forgiveness funding, however upon further evaluation and consultation with City of Houston staff resources familiar with the Texas SRF, the team determined
that any loan forgiveness could only be for a small fraction of the estimated costs of the green project elements included in the base loan amount. This would require the city pay almost the full cost of any GSI grants issued plus the interest on those dollars. After this determination the team abandoned this incentive idea.
PART 6.0 AWARD OR RECOGNITION PROGRAM

The city might incentivize developers to implement GSI on their projects if the city recognized the developer and the developer’s project in a very public manner. Under this approach the city would agree to trade a reduced public good arising from the staff time and expenditures to run the award program in exchange for an increase in public good arising from the use of GSI. An awards or recognition program would likely be most successful if implemented in coordination with other incentive programs. The discussion below explores this potential incentive in more detail.

6.1 Legal, Policy, or Procedural Issues

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 GSI. Constrained revenue will limit the monetary value of any award and, therefore, the ability of the city to implement this approach with a financial award; however, this program could be accomplished using a public relations or marketing approach with modest added direct costs.

6.2 Cost Information

Cost for city implementation of an awards program will depend on the value of any awards issued, the frequency of award issuance, the size and complexity of any public events or media recognition conducted in association with the award, and the number of awards issued each year. Costs might range from a low estimate of $24,000 per year to $500,000 per year or more. The low estimate might cover staff time, local news coverage of a short press event with the mayor, some social media content posting by existing staff, and a modest award plaque to one recipient a year. The high estimate might include a professional public relations effort, a larger press event with city officials, professionally produced and managed social media content, and a more elaborate plaque to multiple recipients per year.

The Houston Green Office Challenge (which is no longer underway), recognized office buildings and tenants who retrofitted their facilities to reduce energy and water consumption and promoted sustainable behavior change within the workplace. A former manager of the program reported that the program was a very successful, ongoing operation while it was supported by private, external funding which ranged from over $200,000 in the first year to about $10,000 in the final year. A former manager of the program reported that the successful program required the following resources:

- City staff time of about to 20-30 hours per week as well as a part-time intern;
- Website design, hosting, and updating; $10,000 to $15,000;
- Annual awards luncheon for about 50-250 people;
- Annual prizes valued at about $50/each;
- Promotional items and printing valued at about $5,000 to $30,000.

A former manager of the program reported that as the program evolved over time, it was challenging to maintain the same level of interest as the first year but having a network of green businesses and companies share their best practices and expertise was still a huge value to participants. The Houston
Green Office Challenge was winding down because the City was considering an energy efficiency policy that would mandate energy benchmarking and transparency, which ultimately was not pursued.

6.3 Threshold Points

Only certain developers, marketing to certain tenants or buyers, would be interested in this incentive program. Some developers would not change their site design approach at all, even if such an award program was available to them at the start of their project. A specific subset of developers, perhaps those who are positioning to serve younger, more active customers, might be moved to implement GSI because of the award program. They might see the award as a way to differentiate their offerings and to leverage the free media and advertising benefits of being an award winner. The threshold point for this program is difficult to determine. The city might initiate a modest program, with a focus on recognizing the first five “marquee” projects that participate in a GSI incentive program. Based on the level of interest, the city could adjust the program from there.

6.4 Barriers or Challenges

The city will have a hard time convincing the first potential award recipient to invest in GSI solely for that reason. 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 recipients. The city’s revenue cap and general budget constraints will limit the city’s ability to implement this program using the larger, more elaborate option. The city will need to show how recognition by the local GSI award program will be more valuable to developers that recognition obtained from LEED®, Envision®, or other third party recognition programs.

The city will encounter the same challenges by the Green Office Challenge. The city will encounter challenges in promoting and advertising the program, recruiting participants, judging entries, recognizing winners, and maintaining the program.

6.5 Implementation Strategies

The city might consider appropriating funds to hire a communications or marketing firm to promote, advertise the program, recruit participants, assist with event planning, and create and deliver award items (trophy or statute). The city might consider hiring interns to assist the implementing department with the required staff work. The city could use Houston Permitting or Houston Public Works staff as subject matter experts for judging entries. The Mayor’s Office of Communications could assist with recognizing winners.

The city might consider combining the award program with other incentives described in this report. This might exceed the necessary threshold point and trigger developer GSI use. The city might also consider starting with a smaller award and a less elaborate publicity program and adjust the program scale after obtaining initial feedback. The city could consider bundling this incentive program with others outlined in the memorandum because a combined set of incentives might motivate the use of GSI more than one alone.
The city might consider creating and granting awards for a variety of project types and scales. This will help motivate developers that work at all scales to use GSI.

The city could also combine GSI recognition with promotion of the use of the United States Green Building Council’s Leadership in Energy and Environmental Design (LEED) credit program for buildings and the Institute for Sustainable Infrastructure’s Envision credit program for horizontal infrastructure. This could include the city sponsoring or conducting both practitioner credentialing in both systems, use of both systems in city projects, and encouragement of private sector use of both programs.

Lastly, the city might evaluate all existing award programs that relate to sustainability, energy, resilience, water conservation, green stormwater, parks, and related items to see if the programs could be harmonized and the communications and marketing costs could be shared. The city might realize cost savings and efficiencies by combining or otherwise harmonizing multiple award programs.
PART 7.0 MODIFIED ORDINANCE PROVISIONS AND DESIGN REQUIREMENTS

After the screening step described in PART 2.0 the consulting team identified the following incentives as worthy of additional consideration:

- **Municipal Ordinance Incentives**
  - More flexible parking requirements.
  - More flexible landscaping requirements.
  - More flexible park dedication, park dedication fund, and compensating open space regulations.

- **Infrastructure Design Incentives**
  - Modified drainage design requirements.
  - Modified detention requirements.
  - Modified stormwater quality requirements.

Rather than consider each of the above incentives concepts alone and in isolation, the consulting team decided to evaluate the policy issues, costs, threshold points, and implementation challenges associated with an integrated set of ordinance provisions and design requirements using the hypothetical commercial development site described in Enclosure A.

The following subsections describe the current situation, the proposed, integrated approach, and presents an evaluation of the main considerations associated with this incentive concept.

### 7.1 Summary of Current Requirements

#### 7.1.1 Landscaping

City ordinances currently give the city the power to impose a variety of landscaping rules, in particular, the city requires a landscape plan for certain new or expanded non-residential buildings, or multi-family residential buildings, and for certain **new parking lots**. The city also imposes tree and shrub planting requirements for private parking lots. The developer must plant one tree for every ten parking spaces and ensure that at least one tree is within 120 feet of every parking space. The developer must plant shrubs along the perimeter of all parking surfaces to screen the parking lot from all adjacent public streets. Shrubs must be between 18 and 36 inches tall. The number of shrubs must be ten times the number of street trees (public right of way trees) required by city rules. At least 75% of the shrubs required by the city must be planted in along the parking lot perimeter adjacent to the public street. The city provides a list of acceptable trees and shrubs for landscaping work and imposes a requirement for irrigation. There may be opportunities to update the list of acceptable trees and shrubs to allow for greater biodiversity and increased resilience of Houston’s green spaces. to be more suitable for the Houston area.

---

7.1.2 Open Space Requirements

City ordinances require multi-family residential developments in the extra-territorial jurisdiction (ETJ) to provide from 200 to 500 square feet of open space per dwelling unit. Open space (as applied to multi-family residential projects in the ETJ) means land within the multi-family residential development that is not covered by buildings, covered walkways, parking spaces, private streets or driveways. Under certain conditions, the city allows a reduction in the area of open space for multi-family residential projects.

The city allows multi-family residential developments to pay a fee equal to $700 per dwelling unit, in lieu of open space dedication. The city must use the collected fees for any type of park site or improvement within a particular geographic area and in accordance with park department prioritization.

7.1.3 Parking

City ordinances impose private, off-street, parking requirements for various building use classifications as outlined in the document. For example, a Class 8, Retail Service, Neighborhood Shopping Center between 25,000 and 100,000 square feet of gross floor area, must provide at least 4 spaces for every 1,000 square feet of gross floor area, plus any increase in space count if more than 20% of the gross area is a tavern, pub, or bar. Requirements range from 2 to 14 parking spaces per 1,000 square feet of gross floor area, depending upon the use classification. Some requirements are alternatively expressed as spaces per dwelling unit or spaces per seat or similar requirements. City rules allow for variances and also allow for adjustments if bicycle spaces are provided, the building is historical, parking is shared or located offsite, or is a transit-oriented development.

7.1.4 Stormwater Conveyance Design

The city’s Infrastructure Design Manual (IDM) requires private storm sewers and other stormwater conveyances to meet or exceed certain design requirements. Drainage systems for curb and gutter pavement must consist of underground closed conduits. The IDM requires that private development drainage systems not alter existing or natural overland flow patterns and not increase or redirect sheet flow to adjacent property. The IDM requires inlets and storm sewer system elements be sized to accommodate the two-year recurrence interval storm event (50% annual chance rain depth) with a duration of no less than 3 hours for drainage areas of less than 200 acres (about 3.14 inches, depending upon location). The city requires that the drainage system convey the two-year design storm without inundating any portion of the paved areas served by the inlets. The city requires that all private drainage

---

systems conform to the City Uniform Building Code. The city requires the use of storm sewer pipe “leads” (the connection from the private sewer to the public sewer) of at least 24-inch nominal diameter, except for single-family residential lots. The IDM prohibits the use of beehive grate inlets and “other specialty inlets.”

The city’s IDM requires an analysis of how the new development will perform during the 100-year recurrence interval rain event (the 1% annual chance storm event, about 8.58 inches in 3 hours, depending upon location). This so-called, extreme event analysis, must show the flow path of the extreme event overland flow, the capacity of the roadways through which the flow is routed, and define the maximum depth of inundation (peak water surface elevation) in the areas under study. The finished floor elevation of all structures in the area must be located above the peak water surface elevation.

### 7.1.5 Stormwater Detention Design

The city’s IDM requires that developers provide onsite detention for all development that alters the existing ground surface in some manner and results in impervious surfaces within the area of ground surface alteration (known as “disturbed area”). The IDM requires the developer of a project smaller than 1-acre to provide onsite detention at a rate of 0.2 acre-feet per acre of disturbed area with a final impervious condition. The IDM requires the developer of a project larger than 1-acre to provide onsite detention at a rate of 0.5 acre-feet per acre of disturbed area with a final impervious condition.

Unlike many other jurisdictions, the city’s IDM does not currently allow project sponsors to assess the volume, rate, and timing of stormwater runoff before and after the proposed project in order to size detention to mitigate any increases in runoff conditions to the public drainage system. This creates a disincentive to use some GSI techniques, such as bioswales or vegetative filter strips, which alter the timing of stormwater runoff and can reduce detention requirements without diminishing the overall level of service and public benefits.

The city’s IDM allows private projects to provide detention in parking areas, private streets, and private driveways as long as the ponding depth does not exceed 9-inches in areas used by passenger vehicles or 15-inches in areas used only by private trucking fleets.

The city does not currently provide any means to build excess detention and sell or trade the excess volume to another party, which could form the basis for a “stormwater credit trading” market.

### 7.1.6 Stormwater Quality Design

City ordinances\(^\text{12}\) require developers and property owners to obtain a stormwater quality permit to address the discharge of pollutants from completed new development or significant redevelopment projects larger than 1 acre. Developments must provide a stormwater treatment device or implement stormwater pollutant removal practices on the property in perpetuity. City regulations require the

---

\(^\text{12}\) Chapter 47. Water and Sewers. Article XII. Storm Water Discharges. Section 47-651. Storm water quality permit application generally.
property owner to annually hire a professional engineer to certify that any stormwater quality devices on the property are being maintained and are still functioning. The property owner must also pay an annual renewal fee of $150.00.

7.2 Proposed Integrated GSI Rules

The city might incentivize developers to implement GSI on their projects if the city modified both the code of ordinances and the IDM to harmonize parking, landscaping, open space, drainage design, detention design, and stormwater quality design requirements. The city could offer developers the option of applying for a development permit using the existing set of rules or, in exchange for the use of GSI, the city could allow the developer to proceed using an alternative set of rules.

The alternative set of “GSI rules” would seek to encourage the planning and design of development features that provide more than one function and would require the use of GSI. The integrated GSI rules would provide both inherent cost savings and benefits to the project because design elements that perform more than one function can reduce costs. 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 permeable13 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 all of the proposed integrated rules should be considered by all relevant city departments and interested stakeholders, the following general provisions should be included in the GSI rules:

- **Landscaping and Open Space**
  - Impose a higher open space fee for sites that do not utilize GSI and a lower fee for sites that do utilize GSI;
  - Grant credit for GSI techniques towards open space requirements;
  - Increase the requirement for parking lots trees;
  - 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; and,
  - 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;

---

13 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.
o Allow smaller diameter private storm sewer leads to accommodate shallower and more visible GSI flowlines;
o Include consideration of Atlas 14, Volume 11, Version 2.0 rainfall depths, frequencies, and intensities;
o 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;
o Explicitly allow drainage design calculations to consider GSI features designed to retain, detain, convey, or infiltrate stormwater to be permeable;
o Harmonize drainage and stormwater quality design provisions with Harris County;
o Allow bioretention to be sized and designed in a manner similar to that required by Harris County;
o Require an underdrain connected to a storm sewer below all permeable paving;
o Require an operations and maintenance plan for all private GSI facilities, as currently required for stormwater quality devices;
o Require annual certification of private GSI facilities by a professional engineer, as currently required for stormwater quality devices;

• Design Criteria for GSI Techniques
  o Develop detailed design criteria for GSI techniques allowed in private development;
o Define specific criteria that must be met for any site design feature to be considered GSI for the purposes of receiving any incentive; and,
o 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.

7.3. Evaluation Criteria

The consulting team evaluated the proposed set of integrated GSI rules using the same criteria as the prior incentives. These criteria included:

• Legal, policy, and procedural issues.
• Benefits and costs.
• Threshold points.
• Barriers or challenges.
• Implementation strategies.

The consulting team generated comparative cost and threshold information using the conventional and green hypothetical projects presented in Enclosure A.

7.3.1 Legal, Policy, or Procedural Issues

Section 7.1 outlined the current rules and identified the relevant sections of current city ordinances and the IDM. The consulting team was not able to identify any legal, policy, or procedural issues that would
preclude the implementation of the proposed integrated GSI rules. To move forward with implementation the city would need to revise some city ordinances using established city council committees, public input processes, and procedures. The city would also need to revise some chapters of the IDM using the established revision process implemented by the Office of the City Engineer.

7.3.2 Cost Information

During a prior phase of project work the consulting team interviewed developers and obtained a limited amount of project information and costs. None of the projects included GSI facilities. To provide additional cost information the consulting team devised a hypothetical project site and designed it using both a conventional approach and using a GSI approach. Enclosure A includes the details of this hypothetical project site. The main features of the hypothetical project site are summarized in Table 7-1.

The table also presents maintenance costs, which are almost always a big concern of developers and local governments. The presented cost comparison illustrates a higher cost for landscape and drainage system maintenance, however, the consulting team believes that the enhanced aesthetics and quality of the tenant and customer experience would lead to higher retail sales, higher lease income, faster lease up, and better financial performance.

<table>
<thead>
<tr>
<th><strong>Table 7-1 Hypothetical Site Features</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development Type:</strong></td>
</tr>
<tr>
<td><strong>Building Uses:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Building Size:</strong></td>
</tr>
<tr>
<td><strong>Building Format:</strong></td>
</tr>
<tr>
<td><strong>Lot Size:</strong></td>
</tr>
<tr>
<td><strong>Location:</strong></td>
</tr>
<tr>
<td><strong>Pre-Development Condition:</strong></td>
</tr>
<tr>
<td><strong>Assumed Total Project Cost:</strong></td>
</tr>
</tbody>
</table>

The consulting team prepared detailed cost estimate of both designs to allow direct comparisons of development features. Elements common to both designs, such as lighting, dry utilities, water service, wastewater service, benches, building construction, signage, annual color plantings, and similar items were omitted from the analysis. Table 7-2 presents the cost differences for the main site development items.
Table 7-1 Hypothetical Commercial Site Cost Comparison for Selected Elements

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Conventional Site</th>
<th>Green Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>INSTALLATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Trees</td>
<td>$22,800</td>
<td>$22,800</td>
</tr>
<tr>
<td>2</td>
<td>Shrubs</td>
<td>$88,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>3</td>
<td>Mulch</td>
<td>$24,420</td>
<td>$33,300</td>
</tr>
<tr>
<td>4</td>
<td>Soil</td>
<td>$48,840</td>
<td>$66,600</td>
</tr>
<tr>
<td>5</td>
<td>Decorative Stone/Cobbles</td>
<td>-</td>
<td>$5,000</td>
</tr>
<tr>
<td>6</td>
<td>Irrigation</td>
<td>$16,300</td>
<td>$22,500</td>
</tr>
<tr>
<td>7</td>
<td>Pedestrian Walkways and Patios (Concrete)</td>
<td>$115,493</td>
<td>$99,582</td>
</tr>
<tr>
<td>8</td>
<td>Pedestrian Bridges</td>
<td>-</td>
<td>$10,000</td>
</tr>
<tr>
<td>9</td>
<td>Construction Stormwater Management</td>
<td>$9,800</td>
<td>$10,879</td>
</tr>
<tr>
<td>10</td>
<td>Parking Lot Grading and Paving</td>
<td>$445,318</td>
<td>$282,993</td>
</tr>
<tr>
<td>11</td>
<td>Permeable Paving and Underdrain</td>
<td>NA</td>
<td>$244,530</td>
</tr>
<tr>
<td>12</td>
<td>Bioswale Grading</td>
<td>NA</td>
<td>$14,880</td>
</tr>
<tr>
<td>13</td>
<td>Drainage System Inlets</td>
<td>$78,000</td>
<td>$3,500</td>
</tr>
<tr>
<td>14</td>
<td>Storm Sewer Pipes and Manholes</td>
<td>$4,500</td>
<td>$12,120</td>
</tr>
<tr>
<td>15</td>
<td>Below Grade Detention</td>
<td>$618,255</td>
<td>NA</td>
</tr>
<tr>
<td>16</td>
<td>Stormwater Quality Treatment Device</td>
<td>$12,000</td>
<td>NA</td>
</tr>
<tr>
<td>17</td>
<td>Bioretention System</td>
<td>NA</td>
<td>$29,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total Initial Installed Cost</strong></td>
<td><strong>$1.49 million</strong></td>
<td><strong>$978 thousand</strong></td>
</tr>
<tr>
<td></td>
<td><strong>ANNUAL MAINTENANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mulching</td>
<td>$1,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>2</td>
<td>Weeding</td>
<td>$1,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>3</td>
<td>Permeable Paving Vacuuming</td>
<td>NA</td>
<td>$3,762</td>
</tr>
<tr>
<td>4</td>
<td>Bioretention System Rehab</td>
<td>NA</td>
<td>$660</td>
</tr>
<tr>
<td>5</td>
<td>Stormwater Quality Treatment Device</td>
<td>$2,500</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td><strong>Total Maintenance</strong></td>
<td><strong>$5,500</strong></td>
<td><strong>$9,422</strong></td>
</tr>
</tbody>
</table>

**Note:** Costs estimated by R. G. Miller Engineers, Inc. and Asakura Robinson based on site development and landscaping unit costs and vendor cost estimates from the period from June 2018 to February 2019.
Table 7-1 illustrates a construction cost savings of $504,000 on an assumed overall project cost of $25 million. This represents a 2% cost reduction for the overall project.

7.3.3 Threshold Points

Almost all developers interviewed during an earlier phase of this project reported that detention requirements created one of the biggest challenges in site design. The proposed integrated GSI rules should incentivize developer use of GSI if the new rules provide a clear cost savings and developers recognize the benefits provided by the approach to tenants, residents, and other users of the finished development.

The hypothetical project site costs, along with the H-GAC cost estimates, illustrate that GSI can reduce overall development costs from 2% to as high as 38%, depending upon the project type, scale, and other site-specific factors. This range of cost savings would appear to be sufficient to motivate developer use of GSI.

7.3.4 Barriers or Challenges

The city will encounter several challenges in implementing this incentive. First, adoption of ordinance and design criteria requirements will take time and consensus building. Second, stakeholder agreement on technical changes may be difficult to achieve. Third, once adopted, staff training will likely be required. Fourth, developers and various real estate professional service firms will need to learn the new procedures and requirements.

7.3.5 Implementation Strategies

The city should be able to overcome the listed challenges as outlined below. First, adoption of ordinance and design criteria requirements could be accomplished using the Redevelopment and Drainage Task Force established after Hurricane Harvey. That stakeholder group is very well versed in drainage and development issues and represents a broad group of community advocates, engineers, architects, contractors, and developers. Second, stakeholder agreement should be facilitated through the use of the Redevelopment and Drainage Task Force and using the city's existing IDM revision process. 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-Galveston Area Council, and the American Council of Engineering Companies, and the Greater Houston Builders Association. The city could consider bundling this incentive program with others outlined in the memorandum because a combined set of incentives might motivate the use of GSI more than one alone.
PART 8.0 FINDINGS

The memorandum finds, after detailed screening of initial incentive programs, researching potential legal or policy limitations, assessing the ability for incentive programs to exceed associated threshold points to motivate developers to utilize GSI approaches, that the City of Houston should move forward with the development and implementation of the following incentive programs:

- Permitting Timeline Certainty
- Property Tax Abatements
- Award and Recognition Program
- Integrated GSI Development Rules
ENCLOSURE A

DESIGNS AND COST ESTIMATES FOR CONVENTIONAL AND GREEN HYPOTHETICAL COMMERCIAL PROPERTY
ENCLOSURE A: DESIGNS AND COST ESTIMATES FOR CONVENTIONAL AND GREEN HYPOTHETICAL COMMERCIAL PROPERTY

To assist with incentive program evaluations the consulting team created a 2.6-acre hypothetical development project with the main features shown in Table A-1.

Table A-1: Hypothetical Site Features

<table>
<thead>
<tr>
<th>Development Type:</th>
<th>Mixed Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Uses:</td>
<td>Food and Beverage (6,936 sf)</td>
</tr>
<tr>
<td></td>
<td>Retail (16,184 sf)</td>
</tr>
<tr>
<td></td>
<td>Office (23,120 sf, second floor)</td>
</tr>
<tr>
<td>Building Size:</td>
<td>23,120 sf (First Floor Footprint)</td>
</tr>
<tr>
<td>Building Format:</td>
<td>2 story</td>
</tr>
<tr>
<td>Lot Size:</td>
<td>2.606 acres</td>
</tr>
<tr>
<td>Location:</td>
<td>On corner of major thoroughfare and collector street.</td>
</tr>
<tr>
<td>Pre-Development Condition:</td>
<td>Open space, Type D soils with poor condition turf grass.</td>
</tr>
</tbody>
</table>

The consulting team made the following assumptions to prepare our designs:

- Undeveloped site with Type D soils, poor condition turfgrass prior to project construction;
- No utility conflicts or relocations;
- No street tree conflicts;
- Public 30-inch storm sewer located along collector street at an adequate depth;
- Surface parking lot to be utilized;
- Current IDM and ordinance requirements guided design decisions for conventional design;
- Up to 9-inches of inundation on parking areas to help achieve detention in both designs;
- Proposed “GSI rules” guided design decisions for green design;
- For the green site used a detention rate of 0.40 acre-feet per acre that was calculated using the rational method and comparison of the pre-development and post-development hydrographs;
- Parking requirements reduced by 20% for the green design option;
- Specification of commercially available plant materials; and,
- Full irrigation system provided for both designs.

Figure A-1 provides the site plan for the conventional design. Figure A-2 provides the site plan for the green design. Elements common to both designs, such as lighting, dry utilities, water service, wastewater service, benches, building construction, signage, and similar items were omitted from the analysis. Table 7-2 presents the cost differences for the main site development items.
### Table A2: Hypothetical Commercial Site Cost Comparison for Selected Elements

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Conventional Site</th>
<th>Green Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>INSTALLATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Trees</td>
<td>$22,800</td>
<td>$22,800</td>
</tr>
<tr>
<td>2</td>
<td>Shrubs</td>
<td>$88,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>3</td>
<td>Mulch</td>
<td>$24,420</td>
<td>$33,300</td>
</tr>
<tr>
<td>4</td>
<td>Soil</td>
<td>$48,840</td>
<td>$66,600</td>
</tr>
<tr>
<td>5</td>
<td>Decorative Stone/Cobbles</td>
<td>$</td>
<td>$5,000</td>
</tr>
<tr>
<td>6</td>
<td>Irrigation</td>
<td>$16,300</td>
<td>$22,500</td>
</tr>
<tr>
<td>7</td>
<td>Pedestrian Walkways and Patios (Concrete)</td>
<td>$115,493</td>
<td>$99,582</td>
</tr>
<tr>
<td>8</td>
<td>Pedestrian Bridges</td>
<td>$</td>
<td>$10,000</td>
</tr>
<tr>
<td>9</td>
<td>Construction Stormwater Management</td>
<td>$9,800</td>
<td>$10,879</td>
</tr>
<tr>
<td>10</td>
<td>Parking Lot Grading and Paving</td>
<td>$445,318</td>
<td>$282,993</td>
</tr>
<tr>
<td>11</td>
<td>Permeable Paving and Underdrain</td>
<td>NA</td>
<td>$244,530</td>
</tr>
<tr>
<td>12</td>
<td>Bioswale Grading</td>
<td>NA</td>
<td>$14,880</td>
</tr>
<tr>
<td>13</td>
<td>Drainage System Inlets</td>
<td>$78,000</td>
<td>$3,500</td>
</tr>
<tr>
<td>14</td>
<td>Storm Sewer Pipes and Manholes</td>
<td>$4,500</td>
<td>$12,120</td>
</tr>
<tr>
<td>15</td>
<td>Below Grade Detention</td>
<td>$618,255</td>
<td>NA</td>
</tr>
<tr>
<td>16</td>
<td>Stormwater Quality Treatment Device</td>
<td>$12,000</td>
<td>NA</td>
</tr>
<tr>
<td>17</td>
<td>Bioretention System</td>
<td>NA</td>
<td>$29,000</td>
</tr>
<tr>
<td></td>
<td>Total Initial Installed Cost</td>
<td><strong>$1.49 million</strong></td>
<td><strong>$978 thousand</strong></td>
</tr>
<tr>
<td></td>
<td><strong>ANNUAL MAINTENANCE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mulching</td>
<td>$1,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>2</td>
<td>Weeding</td>
<td>$1,500</td>
<td>$2,500</td>
</tr>
<tr>
<td>3</td>
<td>Permeable Paving Vacuuming</td>
<td>NA</td>
<td>$3,762</td>
</tr>
<tr>
<td>4</td>
<td>Bioretention System Rehab</td>
<td>NA</td>
<td>$660</td>
</tr>
<tr>
<td>5</td>
<td>Stormwater Quality Treatment Device Maintenance</td>
<td>$2,500</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Total Maintenance</td>
<td><strong>$5,500</strong></td>
<td><strong>$9,422</strong></td>
</tr>
</tbody>
</table>

**Note:** Costs estimated by R. G. Miller Engineers, Inc. and Asakura Robinson based on site development and landscaping unit costs and vendor cost estimates from the period from June 2018 to February 2019.