

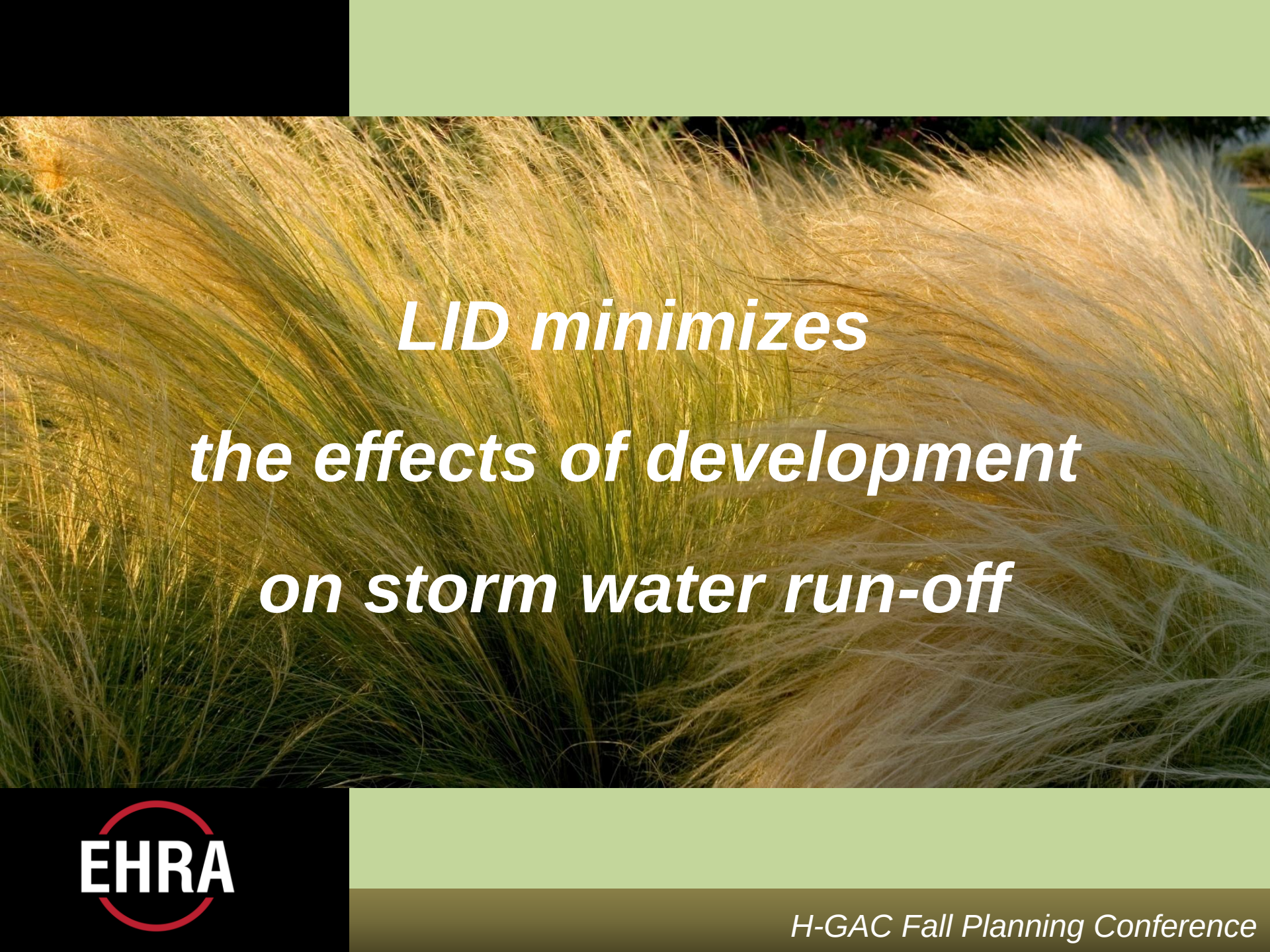


Introduction to Low Impact Development

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***LID minimizes
the effects of development
on storm water run-off***

***First, the basics:
The LID Toolbox***



The LID Toolbox

Raingardens

Vegetated Swales

Planter Boxes

Native Plants

Permeable Pavement

Other Tools



Raingarden (Bioretention Cells)



The LID Toolbox

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Other Tools



Vegetated swales are shallow landscaped areas designed to capture, convey, and potentially infiltrate stormwater runoff as it moves downstream.



Vegetated Swales

The LID Toolbox

Raingardens

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Planter Boxes



The LID Toolbox

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Permeable Pavement

Other Tools

- Native plants **minimize maintenance**
- They thrive with **less fertilizer** and provide disease control
- Require **less irrigation**
- They **reduce sediments, nutrients, and toxic particles** in water bodies
- Roots allow **greater infiltration**



Native Plants

Bald Cypress

Louisiana Iris

American Beautyberry

Butterfly Weed

Giant Turkscap

Swamp Sunflower

Dwarf Palmetto

Mexican Petunia

Flame Acanthus



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Green Roof



Cisterns



**Underground
Detention**

Turning detention into LID

- **LID** treats water at the source instead of using expensive infrastructure to convey stormwater to a distant detention basin
- **LID** techniques take **advantage** of available detention storage; slows water velocities; lengthens time of concentration
- These are not new techniques, just standard engineering practices applied using a different approach

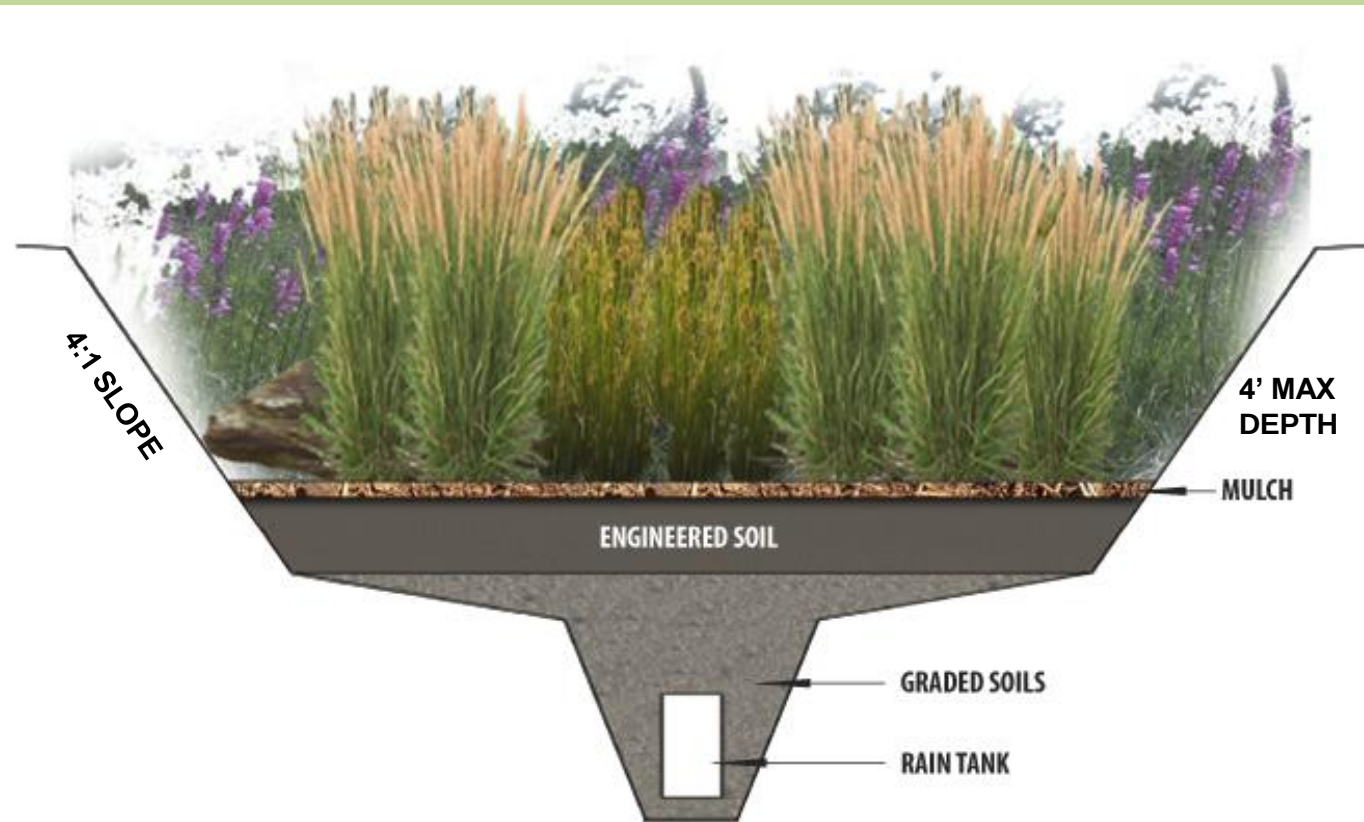




Ever seen a LID?
What does it look like?



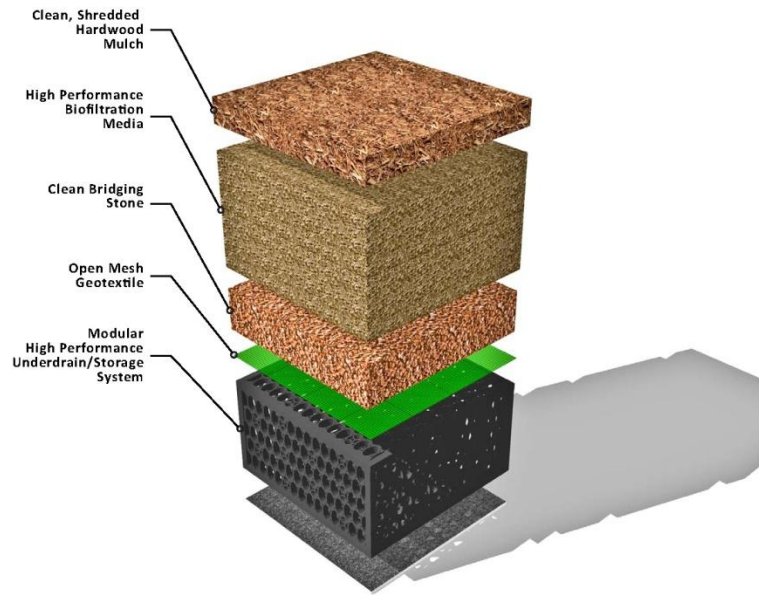
***Putting the
Parts
Together:
LID Drainage***



Engineered Raingarden Section



Putting the Parts Together: LID Drainage

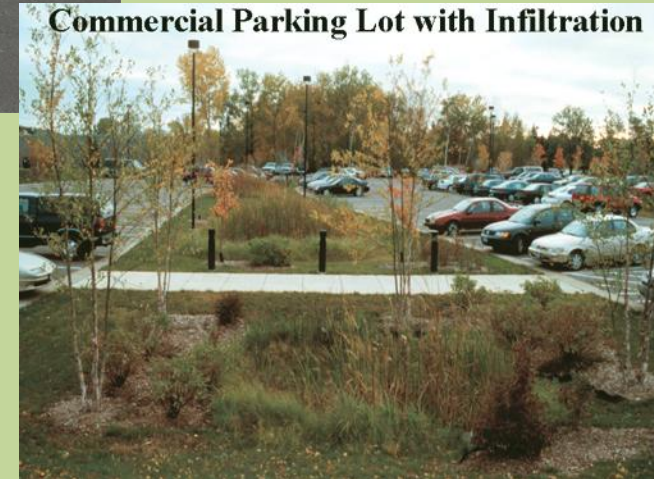


Typical Raingarden Section

H-GAC Fall Planning Conference

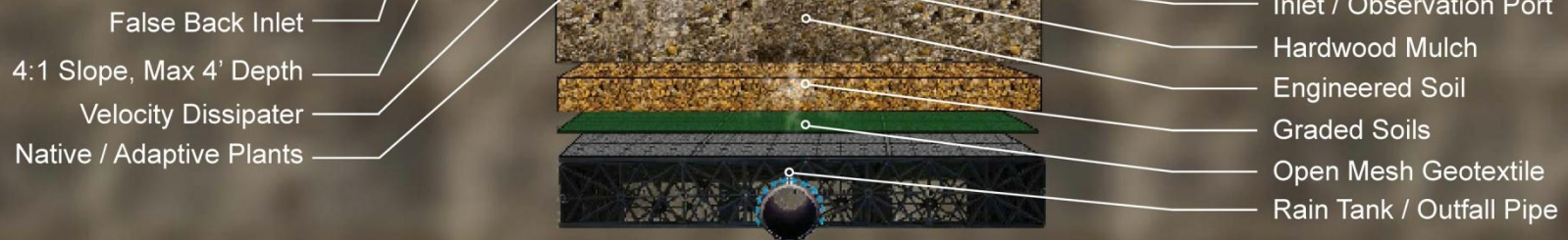
Comparing Solutions:

Parking Lot Drainage



Putting the Parts Together:

LID Drainage



Typical Roadway Section

H-GAC Fall Planning Conference

Maintenance



- **Maintenance** for rain gardens is a function of keeping the plants alive
- **Native plants** are a **MUST** for easier maintenance
- Mowing can be done yearly, depending on grasses selected
- Use of mulch is **highly encouraged** and needs to be replaced annually

Maintenance comparison: Typical drainage

- Ponding and sedimentation
- Mowing costs
- Slope failures



Maintenance comparison: LID

- Trash and debris removal
- Mulch replacement





***Betcha can't do LID
in Houston!***

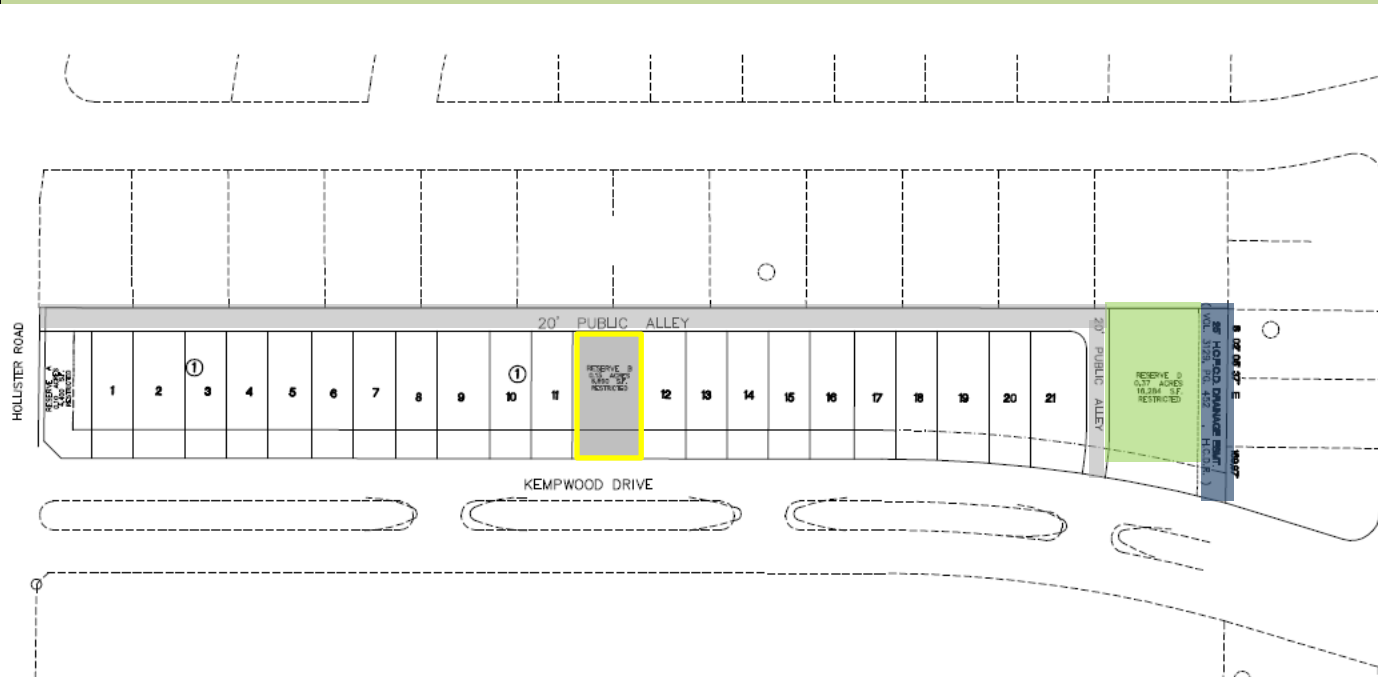


Challenge ACCEPTED:
LID Townhomes



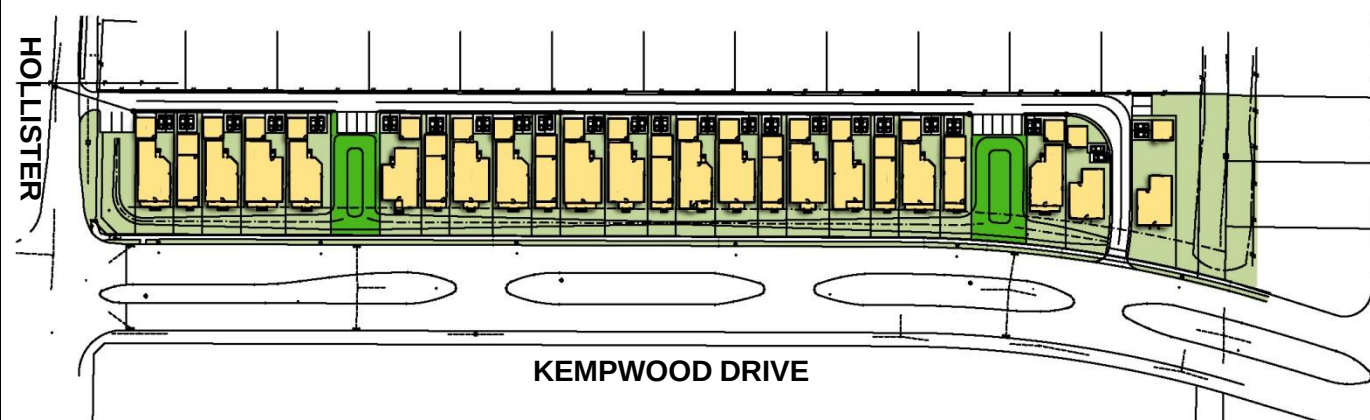
Kolbe Farms

- Began as standard detention pond layout with 21 lots
- Concrete public alley
- Parking lot in middle of project



Kolbe Farms

- 24 lots using LID
- 15% more lots with LID techniques



Standard detention became 2 raingardens, and a bioswale platted as reserves and used as compensating open space

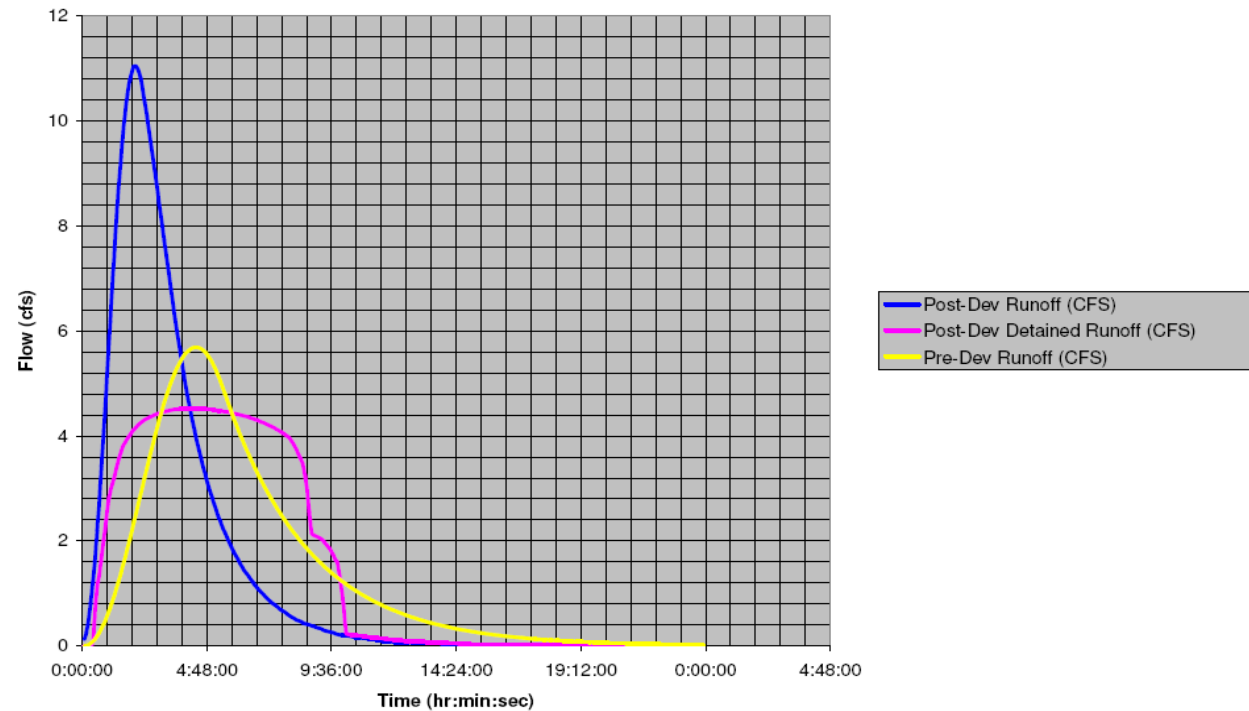


Raingardens include pervious pavement, vegetated swales, and native plants

Gratuitous Hydrologic Data

KEMPWOOD MANOR SECTION ONE

System Hydrographs - 100-Year Storm



Edminster, Hinshaw, Russ and Associates, Inc.
Kempwood Manor Section One
EHRA Project No 101-024-01
September 2010



Kolbe Farms

- First City of Houston LID Permit
- Required a variance for smaller outfall pipes



Alley
Underdrain
Construction



Completed Paver Alley



Homes begun in December 2011

Kolbe Farms



***Challenge ACCEPTED:
LID Apartments***



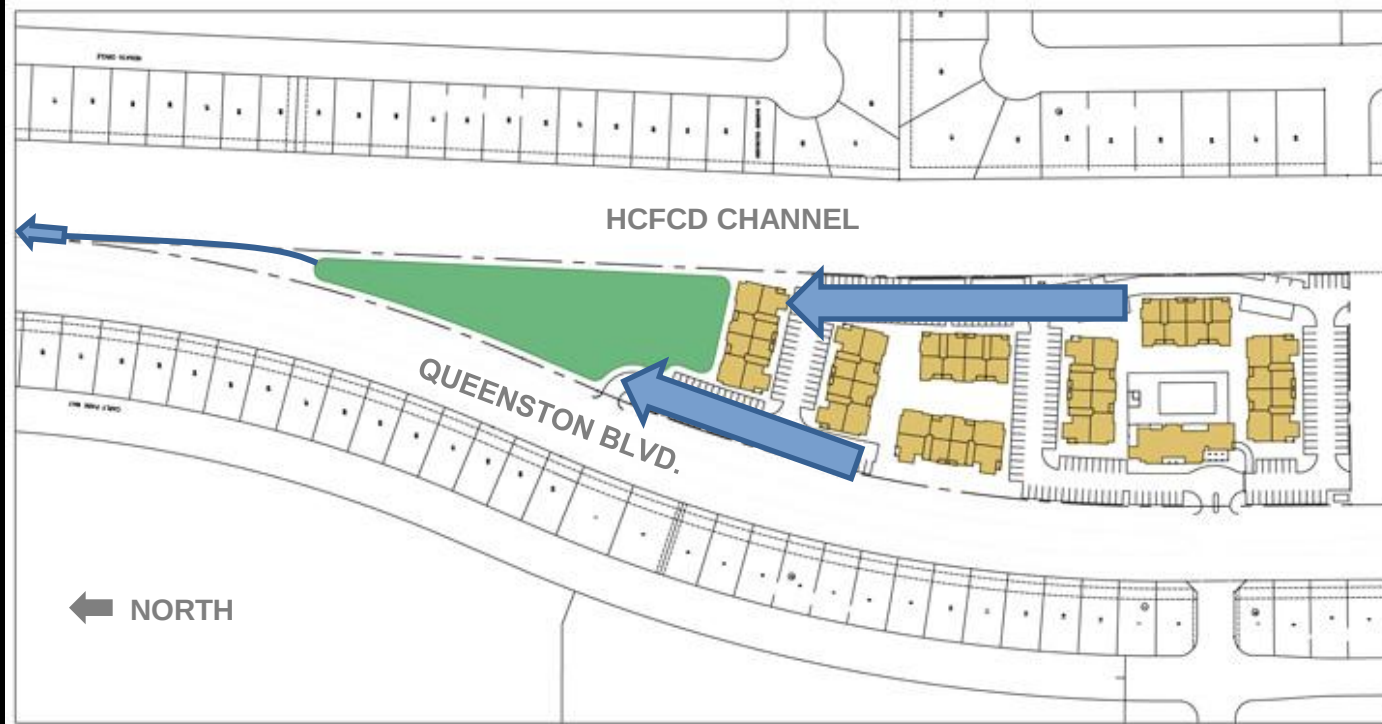
Queenston Manor Apartments

- Odd site shape
- Detention requirement busted the developer's pro-forma



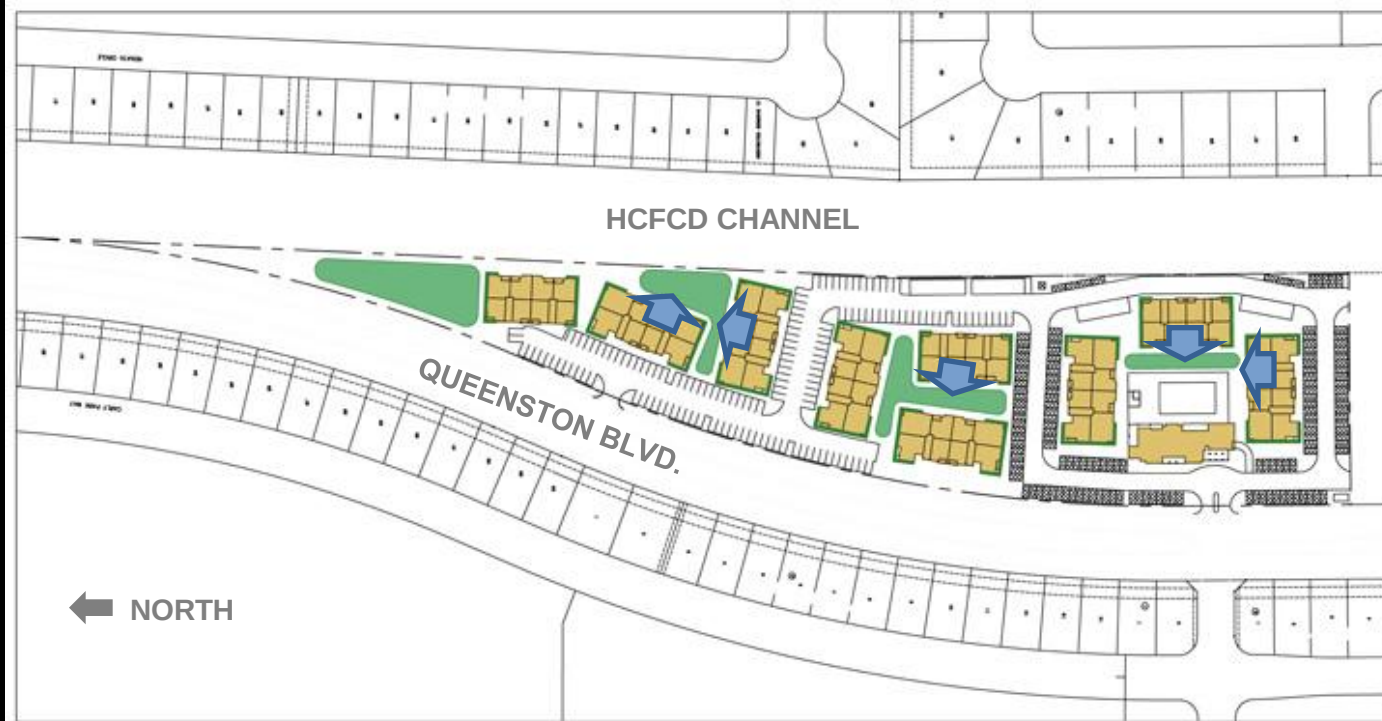
Queenston Manor Apartments

- Typical detention storage
- 7 residential buildings
- 7.4 acres



Queenston Manor Apartments

- Raingardens
- Underground storage
- Pervious pavement (parking)
- Vegetated swales



Queenston Manor Apartments

- LID design spreads drainage throughout site as an amenity
- Redesign yielded 2 additional buildings
- 48 more apartment units



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



Queenston Manor Apartments



H-GAC Fall Planning Conference

Queenston Manor Apartments



***Queenston
Manor
Apartments***

NET RESULT

More Efficient Land Plan

+

Attractive Development

+

MORE Product

=

Happy Client!



Challenge ACCEPTED:
LID Commercial



Low Impact Commercial

***Millis
Construction
Company
offices &
equipment
storage***



Low Impact Commercial

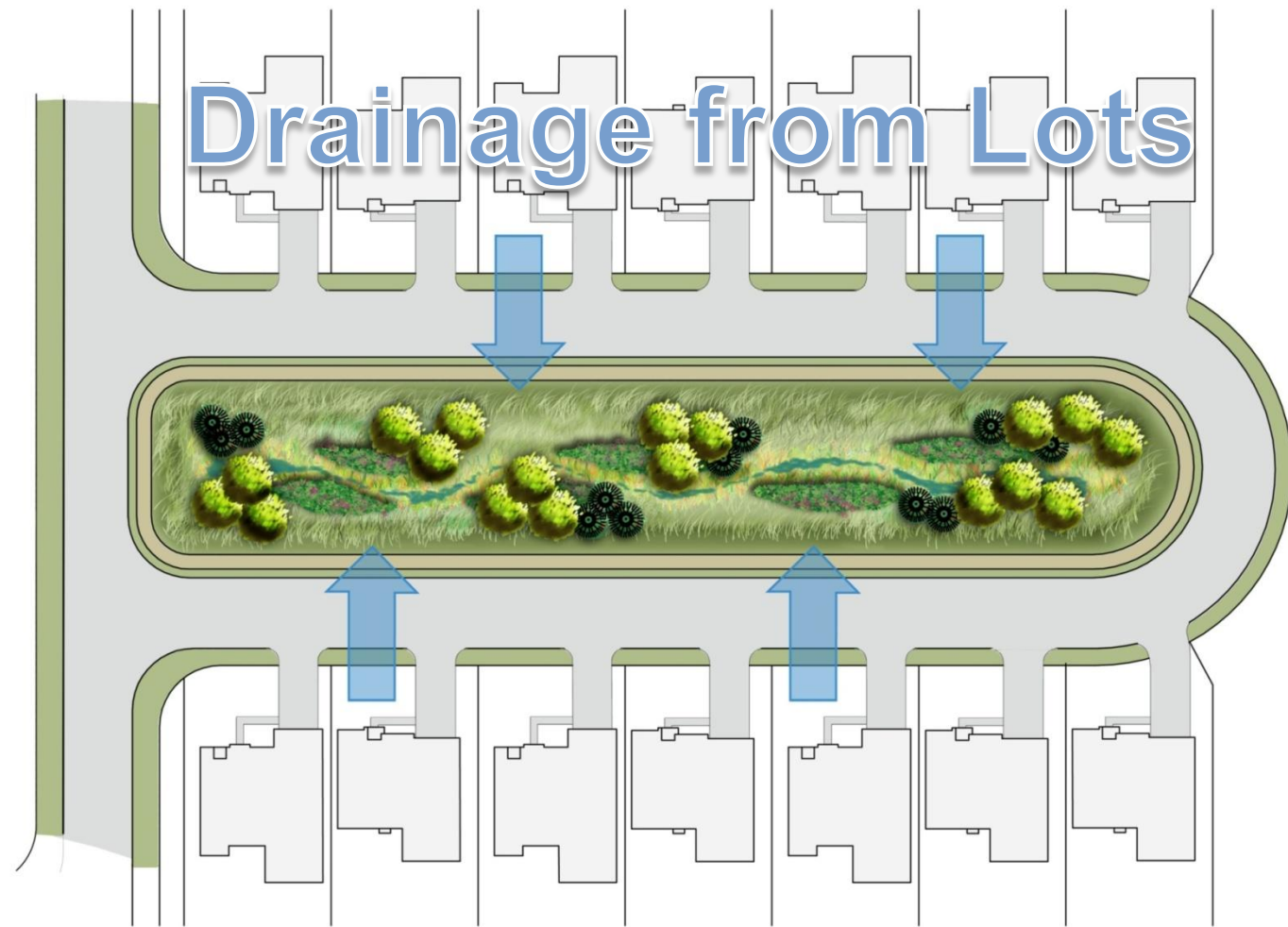
***Millis
Construction
Company
offices &
equipment
storage***



***Challenge ACCEPTED:
LID Master Planned Community***



Low Impact Residential Community Concept



Low Impact Residential Community Concept



Low Impact Residential Community:

Camellia in Ft. Bend County,

*Under
construction*



Challenge ACCEPTED:
LID Roadway

