

LOW IMPACT DEVELOPMENT

benefits, strategies and implementation

PREPARED FOR HOUSTON - GALVESTON
REGIONAL COUNCIL (H-GAC)
06.04.2015

PREPARED BY

DESIGNWORKSHOP

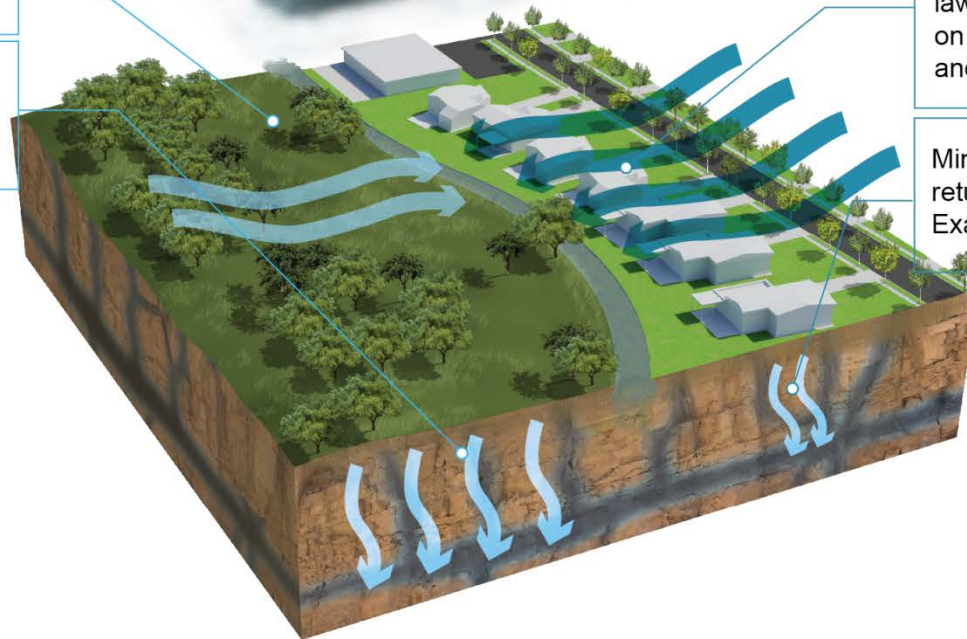
Aspen ▫ Asheville ▫ Austin ▫ Chicago ▫ Denver ▫ Dubai ▫ Houston ▫ Lake Tahoe ▫ Los Angeles ▫

WHY LOW IMPACT DEVELOPMENT?

Low Impact Natural Conditions

Minor increase in river levels, due to natural pooling and draining in area

Natural, pervious cover of soils and plants cleans and returns water to water table for future use.



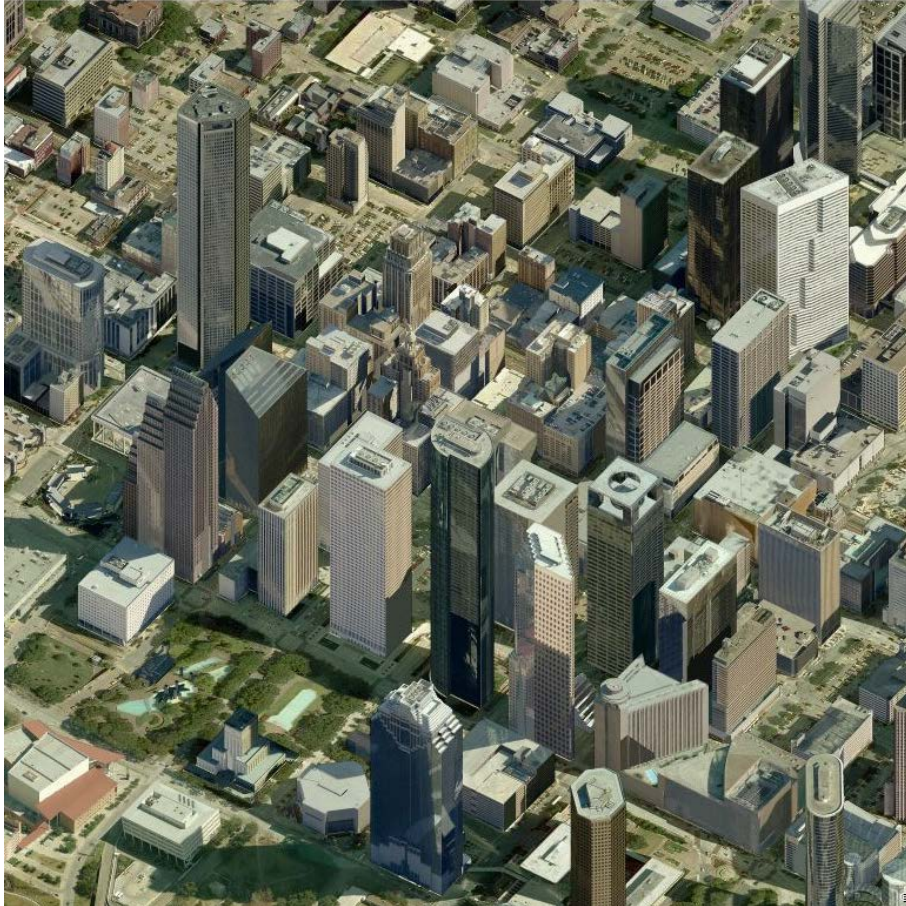
High Impact Developed Conditions

Significant increase in river levels, pollutants added to water from lawn fertilizer, metals and oils on rooftops, streets, driveways and parking lots

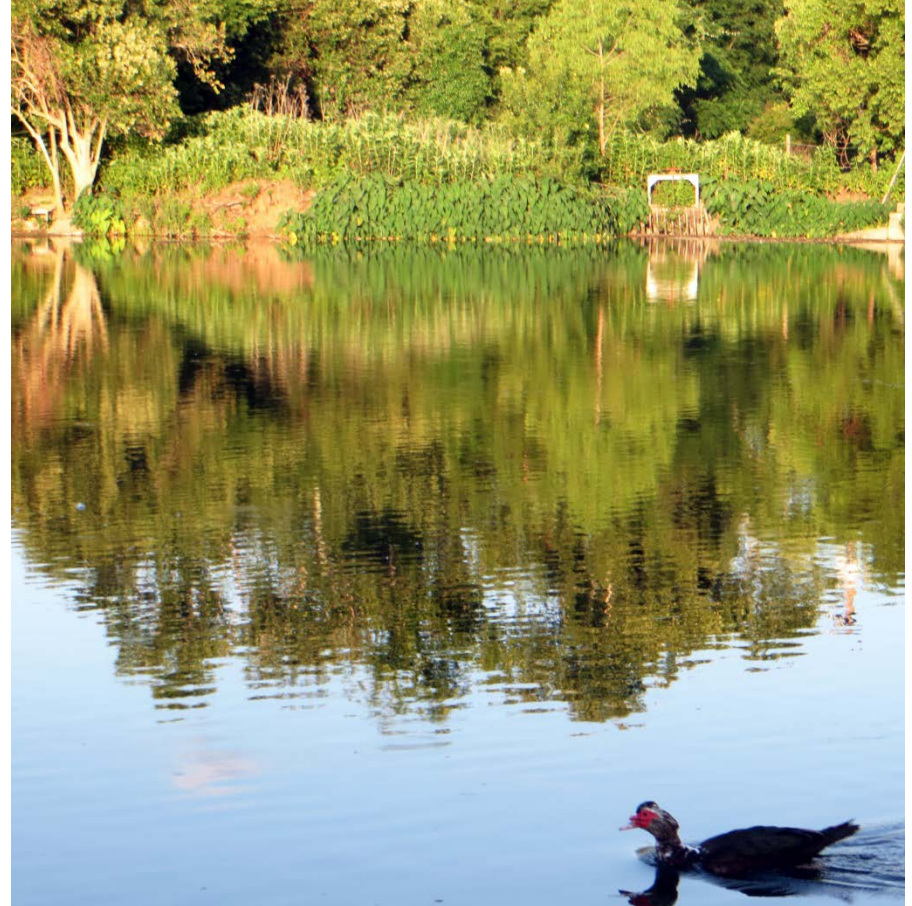
Minor amount of water returned to water table. Exacerbates drought conditions.

LOW IMPACT DEVELOPMENT BENEFITS

ECONOMY



ENVIRONMENT



LOW IMPACT DEVELOPMENT AND THE ENVIRONMENT



LOW IMPACT DEVELOPMENT AND THE ENVIRONMENT

BENEFITS:

- 1) Protection of water quality throughout region for culinary, recreational, and economic use
- 2) Cleaner, more plentiful water promotes health of local ecosystem flora and fauna
- 3) Widespread use of LID practices promotes conservation of water quality and supply for future generations

LOW IMPACT DEVELOPMENT AND THE ECONOMY



LOW IMPACT DEVELOPMENT AND THE ECONOMY

PRIVATE BENEFITS:

- 1) LID elements provide alternatives to standard detention basin requirements, potentially increasing land available for development
- 2) LID site design provides amenities and value where typical development only provides streets and detention basins – creating hedonic value for developers
- 3) The use of LID elements can significantly reduce the cost of development by reducing requirements for subterranean stormwater pipes, drains, curb and gutter

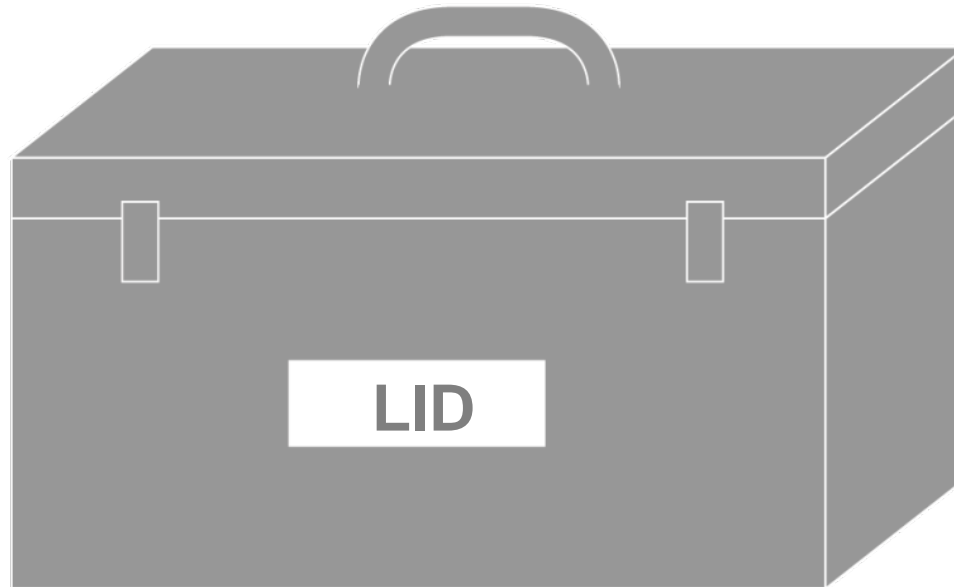
LOW IMPACT DEVELOPMENT AND THE ECONOMY

PUBLIC BENEFITS:

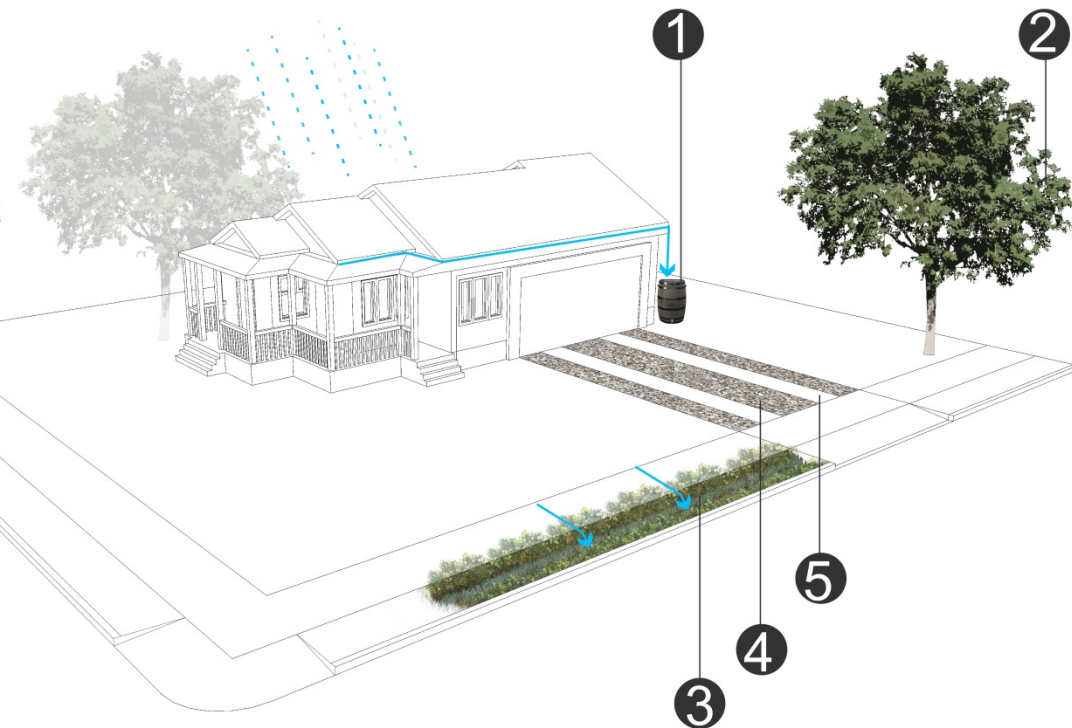
- 1) Widespread use of LID slows and detains stormwater; resulting in fewer and less extensive flood damage events at a community wide scale
- 2) LID strategies incorporated throughout an area reduce stormwater loads to existing infrastructure, reducing the need for taxpayer funded repairs and upgrades
- 3) LID techniques can improve regional water quality, resulting in reduced need for taxpayer funded water treatment facilities

LOW IMPACT DEVELOPMENT TOOLBOX

ELEMENTS OF LOW IMPACT DEVELOPMENT



SUSTAINABLE SITE DESIGN



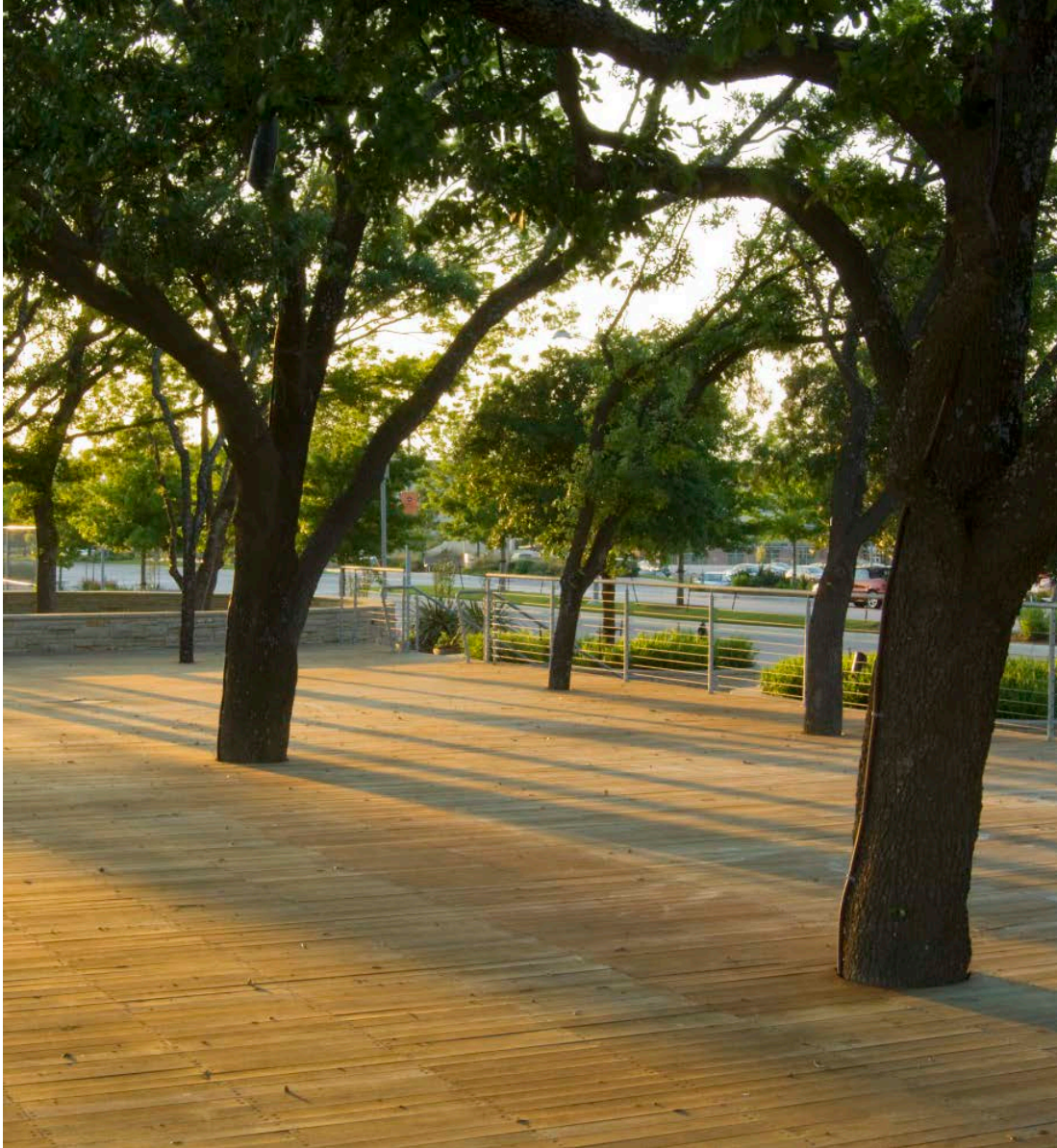
BENEFITS

Working with, rather than independent of local site hydrology can greatly reduce a site's impact on natural hydrology systems, such as ensuring roadway runoff moves to bioswales and other LID elements rather than directly into an adjacent drainageway or stream.

Requires LID design input from the very first stages of design.

CHALLENGES

SUSTAINABLE SITE DESIGN – tree canopy preservation



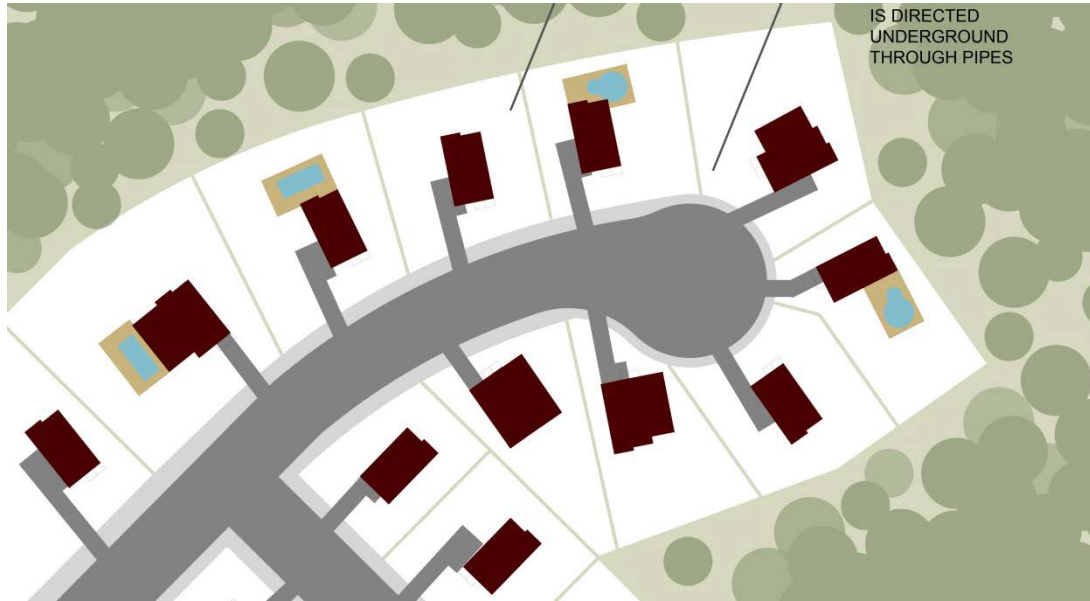
BENEFITS

Additional tree canopy captures rainwater, contributing to lower storm surges and reduced need for other detention measures. Also provides increased land values and lower surface temperatures to development.

CHALLENGES

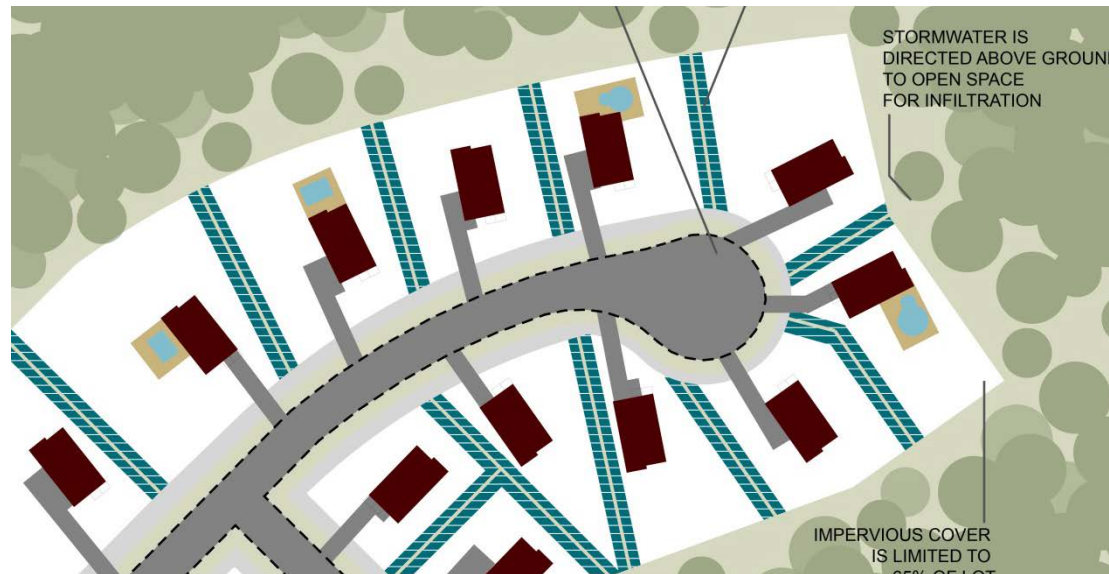
May require thoughtful planning to avoid damaging trees on site. May reduce (horizontal) development footprint.

SUSTAINABLE SITE DESIGN – reduction in impervious areas



BENEFITS

Minimizing impervious area (parking lots, paved walks, roofing) can reduce costs of detention and traditional stormwater pipe and drain.



CHALLENGES

A constant balancing act to supply enough parking and development area while minimizing impervious surfaces.

SUSTAINABLE SITE DESIGN – native plantings



BENEFITS

Native plants require reduced water budgets and tend to be more hardy long term – reducing developer and homeowner maintenance budgets.

CHALLENGES

Relatively minor LID benefits, unless paired with other elements (reduction of impervious surfaces / bioswale / raingarden).

BIOSWALES & VEGETATED SWALES



BENEFITS

Low cost stormwater management facilities that can be planted and maintained as public amenity.

Designed to retain, infiltrate, and slow stormwater along linear areas – ideal along roadways.

CHALLENGES

Require relatively large areas to be effectively utilized. Planted versions require maintenance to allow plantings to establish when new.

RAIN GARDENS



BENEFITS

Effective method of capturing and storing stormwater in urban or rural settings. Used in series, can significantly reduce overall load on municipal stormwater systems. May add value to streetscapes and home developments as landscape amenities.

CHALLENGES

Require moderate maintenance to clean filters and maintain plantings.

VEGETATED FILTER STRIPS



BENEFITS

Designed to buffer slopes from erosion while providing infiltration and detention function. Low cost, simple techniques also clean stormwater before it enters major waterways and drainages.

CHALLENGES

Require large amount of space to be effective in retaining and slowing stormwater.

PERMEABLE PAVEMENTS



BENEFITS

Low cost stormwater management facilities that can be planted and maintained as public amenity.

Designed to retain, infiltrate, and slow stormwater along linear areas – ideal along roadways.

CHALLENGES

Require soil which allows for rapid infiltration of stormwater – a soil type not commonly found in coastal or heavily urbanized Houston/Galveston Region.

TREE BOX FILTERS



BENEFITS

Effectively treat small areas of runoff, such as parking lots. Do not require large installation areas. Clean, infiltrate, and detain stormwater runoff before returning it to the ground or the stormwater sewer

CHALLENGES

Expensive compared to some other LID elements.

GREEN ROOFS



BENEFITS

Capture and store stormwater at its source, before it reaches sewer. Provide additional benefits to building occupants of lowered interior temperatures. Can be incorporated as amenity for residents or employees.

CHALLENGES

High installation and maintenance costs exist – best for newly built buildings, as roof must be specifically designed to withstand planting media's additional weight.

STORMWATER WETLANDS



BENEFITS

Can create additional habitat for flora and fauna, and be designed as a park like setting, increasing land values of surrounding developments.

CHALLENGES

Require significant space to accommodate necessary ecology.

RAINWATER HARVESTING



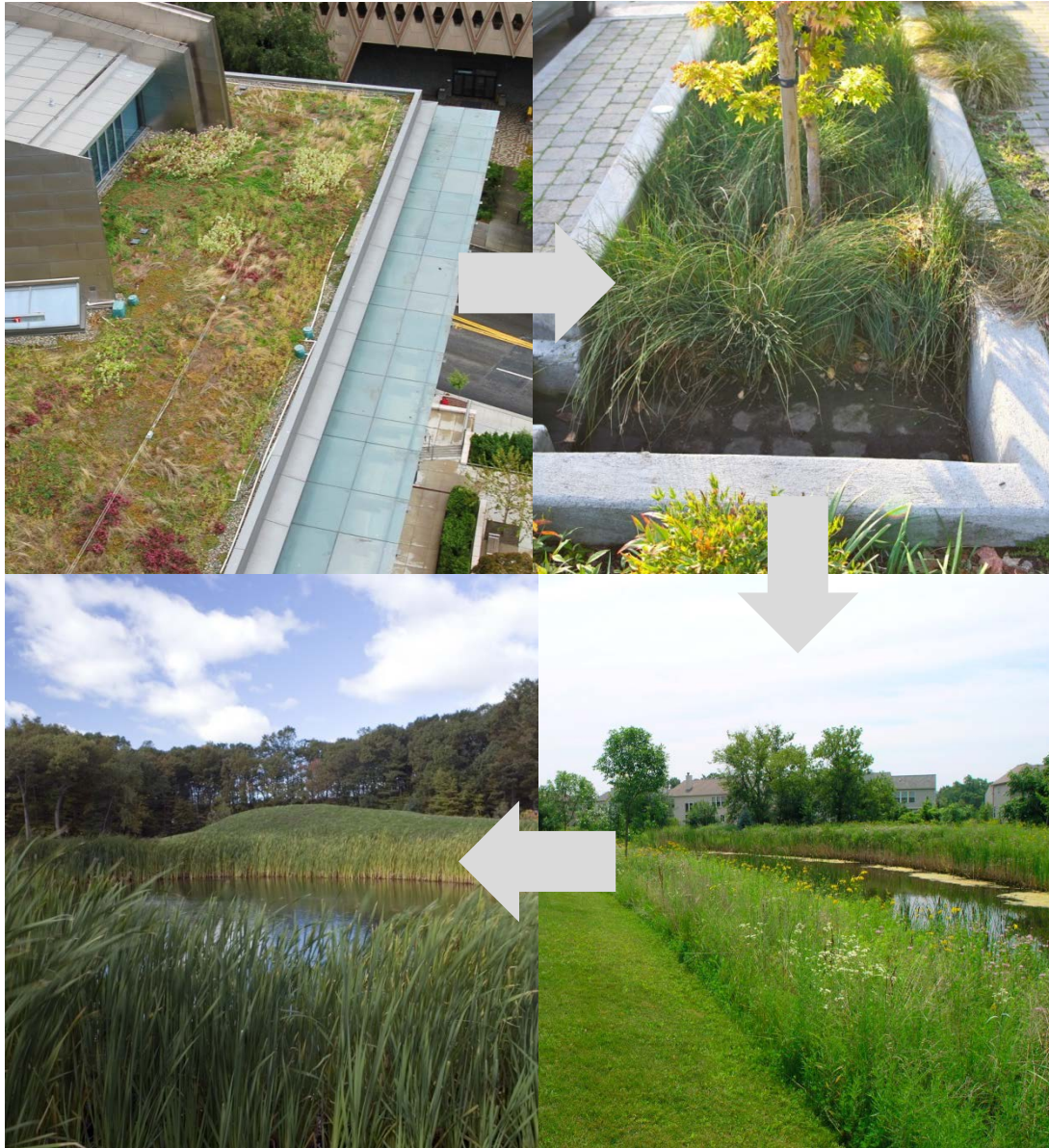
BENEFITS

Retain runoff from building rooftops to be utilized as water for landscape plantings or other industrial uses.

CHALLENGES

May require secondary treatment if water is to be utilized for potable purposes

TREATMENT TRAINS



BENEFITS

Treatment trains combine benefits of multiple LID elements, funneling water into one or more of these treatment systems in series.

CHALLENGES

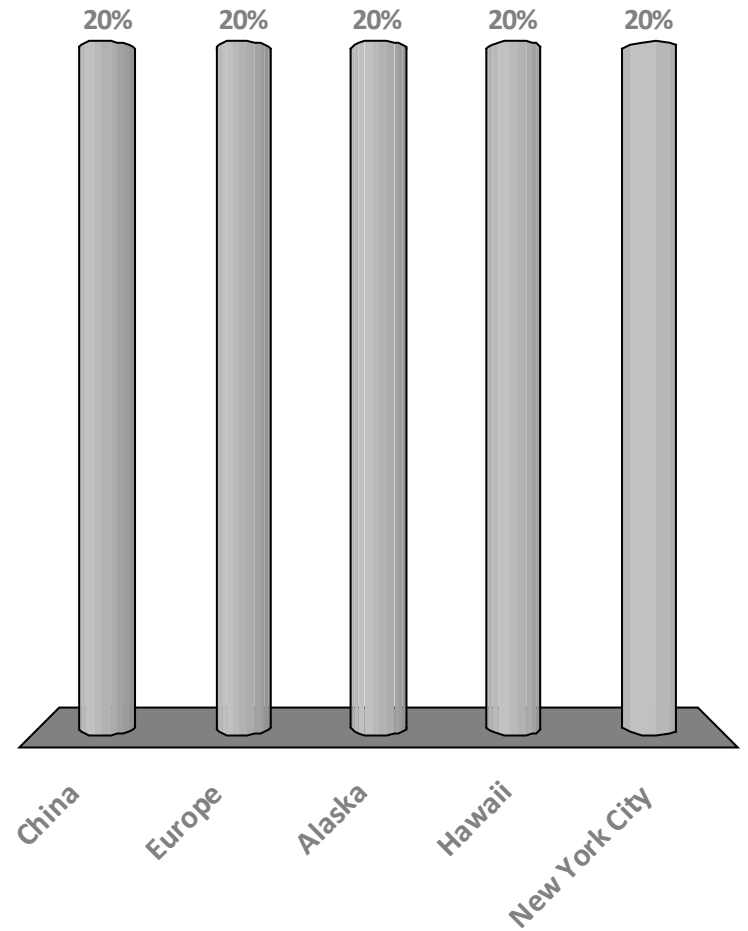
Larger spaces and detailed design considerations are required in order to properly design treatment trains.

PERCEPTIONS OF LOW IMPACT DEVELOPMENT



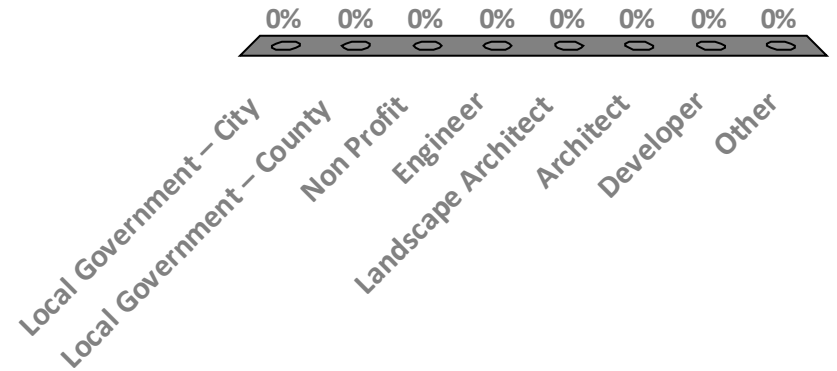
Where would you most like to travel? (pick one)

- A. China
- B. Europe
- C. Alaska
- D. Hawaii
- E. New York City



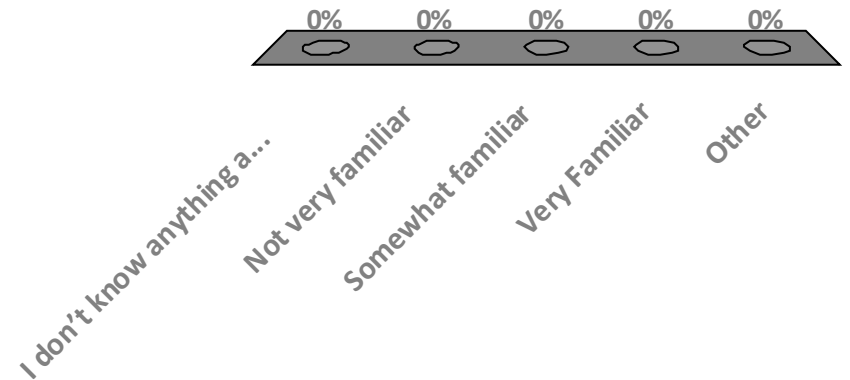
I am here today representing:
(select all that apply)

- A. Local Government – City
- B. Local Government – County
- C. Non Profit
- D. Engineer
- E. Landscape Architect
- F. Architect
- G. Developer
- H. Other



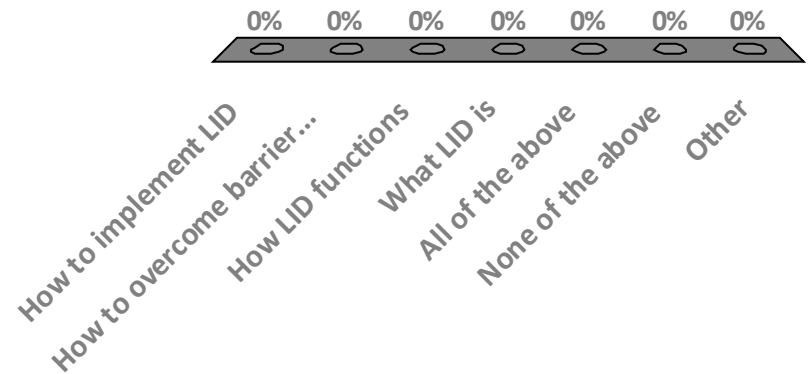
How familiar are you with Low Impact Development? (select one)

- A. I don't know anything about it
- B. Not very familiar
- C. Somewhat familiar
- D. Very Familiar
- E. Other



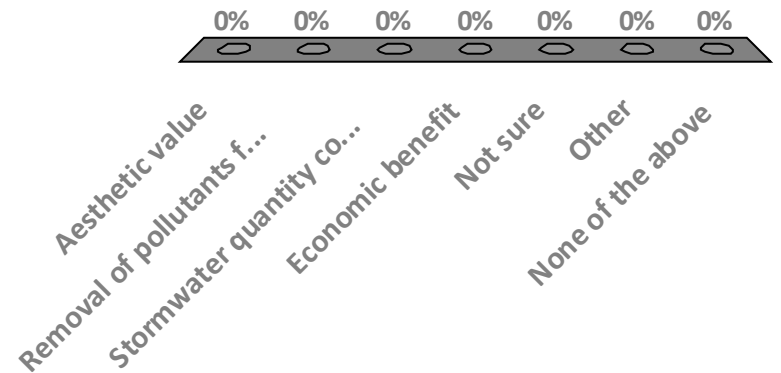
What about LID do you hope to learn more about today? (select all that apply)

- A. How to implement LID
- B. How to overcome barriers to LID
- C. How LID functions
- D. What LID is
- E. All of the above
- F. None of the above
- G. Other



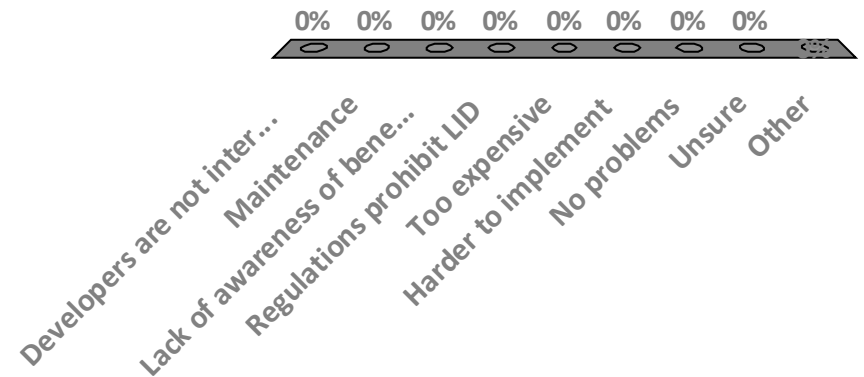
What about LID do you hope to learn more about today? (select all that apply)

- A. Aesthetic value
- B. Removal of pollutants from stormwater runoff
- C. Stormwater quantity control
- D. Economic benefit
- E. Not sure
- F. Other
- G. None of the above



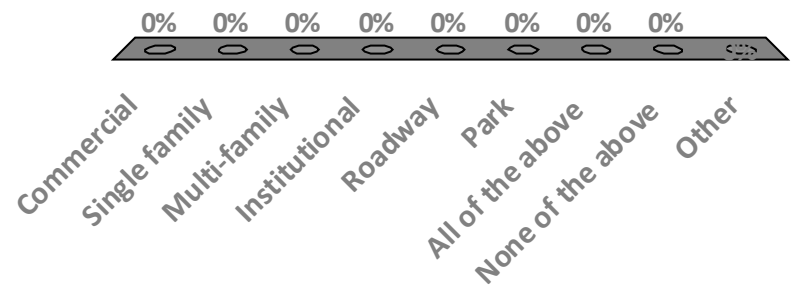
What do you think is the greatest challenge of implementing LID? (select one)

- A. Developers are not interested
- B. Maintenance
- C. Lack of awareness of benefits of LID
- D. Regulations prohibit LID
- E. Too expensive
- F. Harder to implement
- G. No problems
- H. Unsure
- I. Other



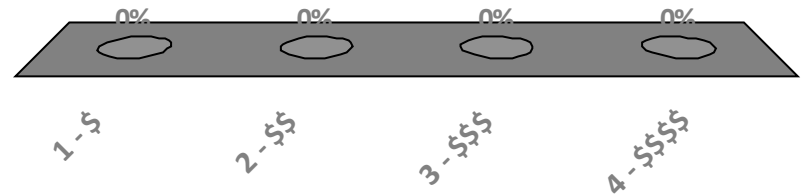
What context do you think LID could be applied in? (select all that apply)

- A. Commercial
- B. Single family
- C. Multi-family
- D. Institutional
- E. Roadway
- F. Park
- G. All of the above
- H. None of the above
- I. Other



On a scale of 1 – 4 (1=\$ / 4=\$\$\$\$)
What is your perception of the cost of LID? (select one)

- A. 1 - \$
- B. 2 - \$\$
- C. 3 - \$\$\$
- D. 4 - \$\$\$\$

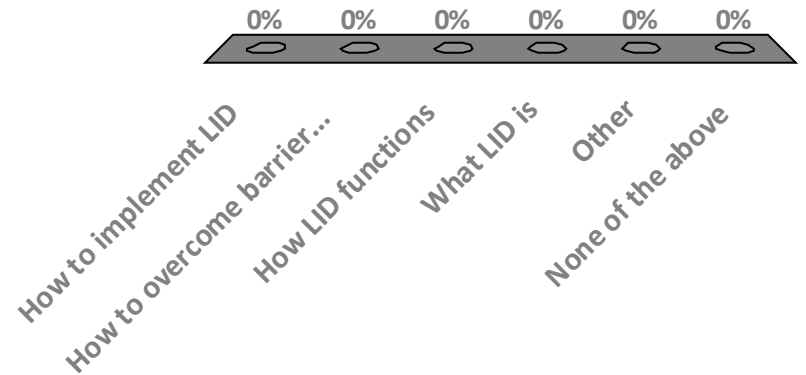


DESIGN WORK SESSION



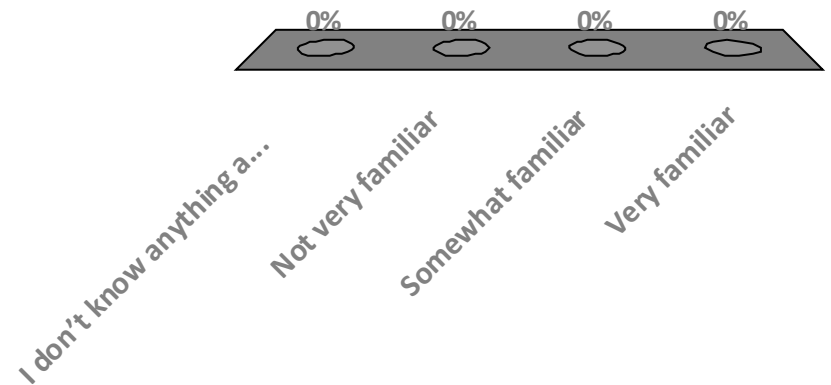
What did you learn the most about LID? (select one)

- A. How to implement LID
- B. How to overcome barriers to LID
- C. How LID functions
- D. What LID is
- E. Other
- F. None of the above



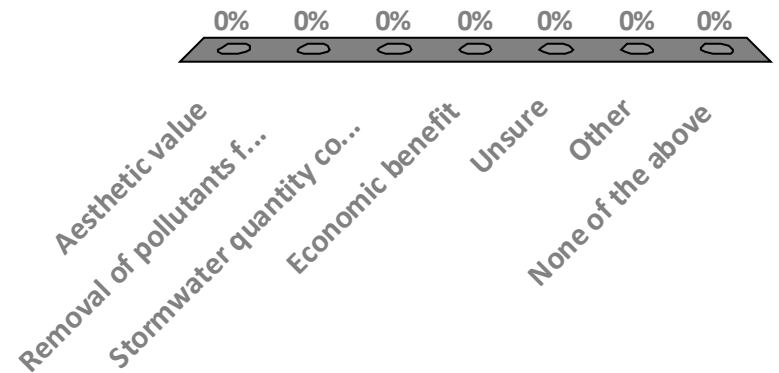
How familiar are you with LID now? (select one)

- A. I don't know anything about LID
- B. Not very familiar
- C. Somewhat familiar
- D. Very familiar



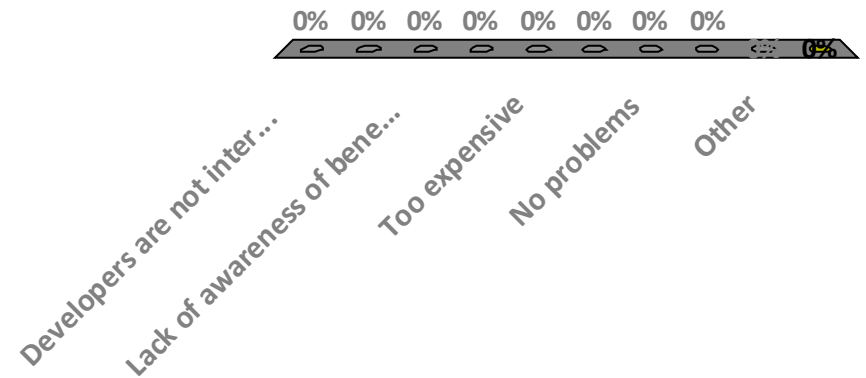
What do you think is the greatest benefit of LID? (select one)

- A. Aesthetic value
- B. Removal of pollutants from stormwater runoff
- C. Stormwater quantity control
- D. Economic benefit
- E. Unsure
- F. Other
- G. None of the above



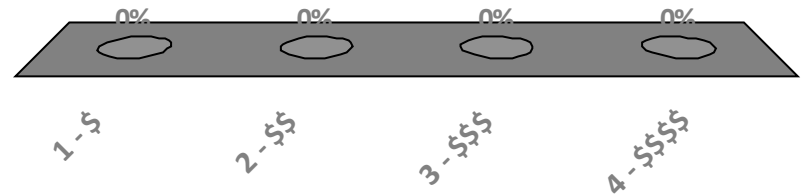
What do you think is the greatest challenge of LID? (select one)

- A. Developers are not interested
- B. Maintenance of LID
- C. Lack of awareness of benefits of LID
- D. Ordinance and regulations prohibit LID
- E. Too expensive
- F. Easier to conduct business as usual
- G. No problems
- H. I don't know
- I. Other
- J. None of the above



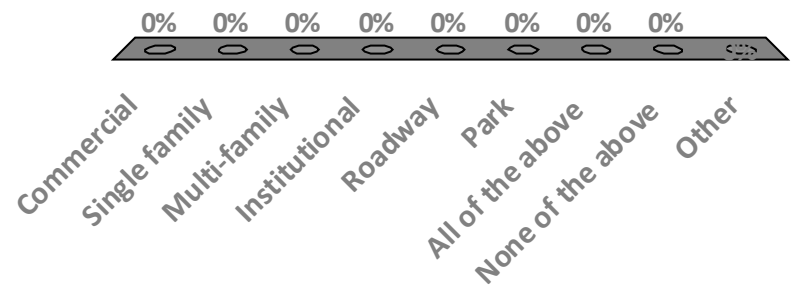
On a scale of 1 – 4 (1=\$ / 4=\$\$\$\$)
What is your perception of the cost of LID? (select one)

- A. 1 - \$
- B. 2 - \$\$
- C. 3 - \$\$\$
- D. 4 - \$\$\$\$



What context do you think LID could be applied in? (select all that apply)

- A. Commercial
- B. Single family
- C. Multi-family
- D. Institutional
- E. Roadway
- F. Park
- G. All of the above
- H. None of the above
- I. Other



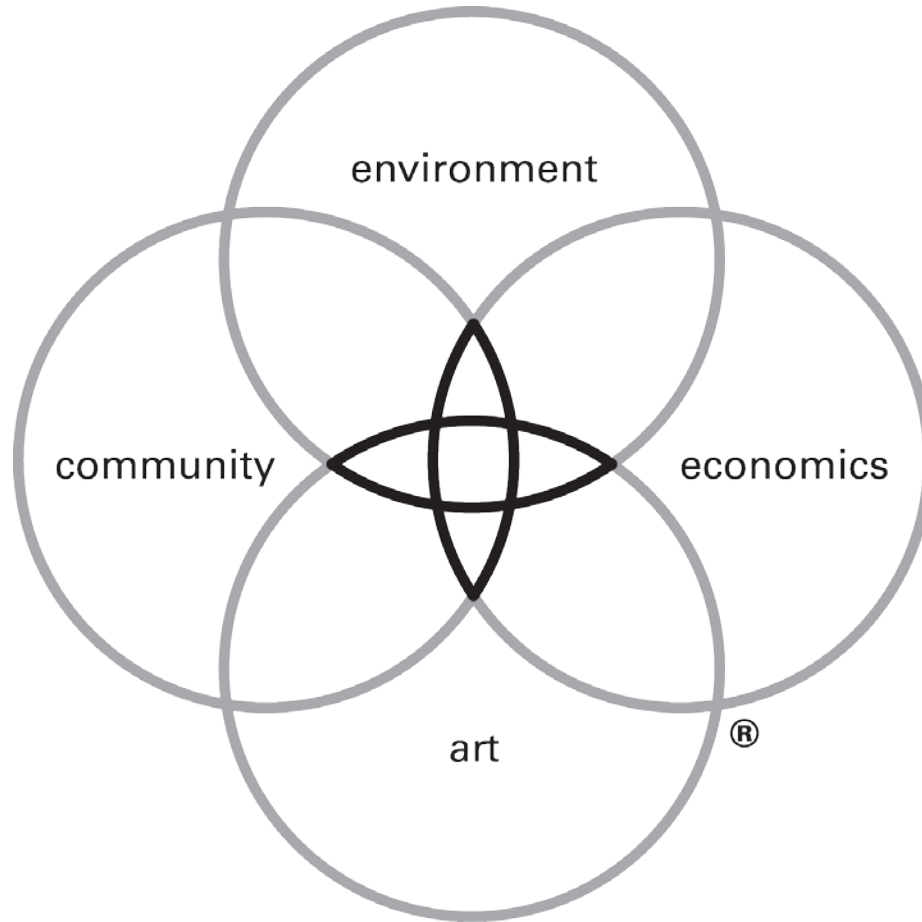
LOW IMPACT DEVELOPMENT
benefits, strategies and
implementation

PREPARED FOR HOUSTON - GALVESTON
REGIONAL COUNCIL (H-GAC)
06.04.2015

PREPARED BY

DESIGNWORKSHOP

Aspen ▫ Asheville ▫ Austin ▫ Chicago ▫ Denver ▫ Dubai ▫ Houston ▫ Lake Tahoe ▫ Los Angeles ▫



PREPARED BY

DESIGNWORKSHOP

Aspen ▫ Asheville ▫ Austin ▫ Beijing ▫ Chicago ▫ Denver ▫ Dubai ▫ Houston ▫ Lake Tahoe ▫ Los Angeles