

12th Annual New Partners for Smart Growth

Green Infrastructure as Convergence of Political Leadership, Architecture and Engineering

2503-B

Kansas City, MO | 8 February 2013

Voters

I.E. Interactive Session

Where Do You Work

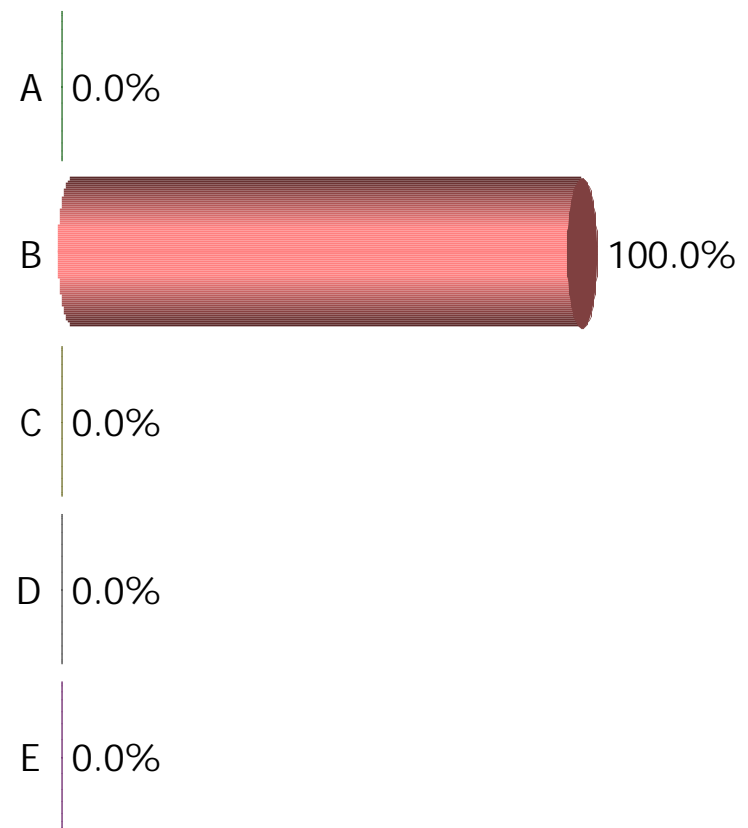
A. Government

B. Planning/Design Firm

C. Developer/Real Estate

D. Non-Profit Organization

E. Other



Voters

I.E. Interactive Session

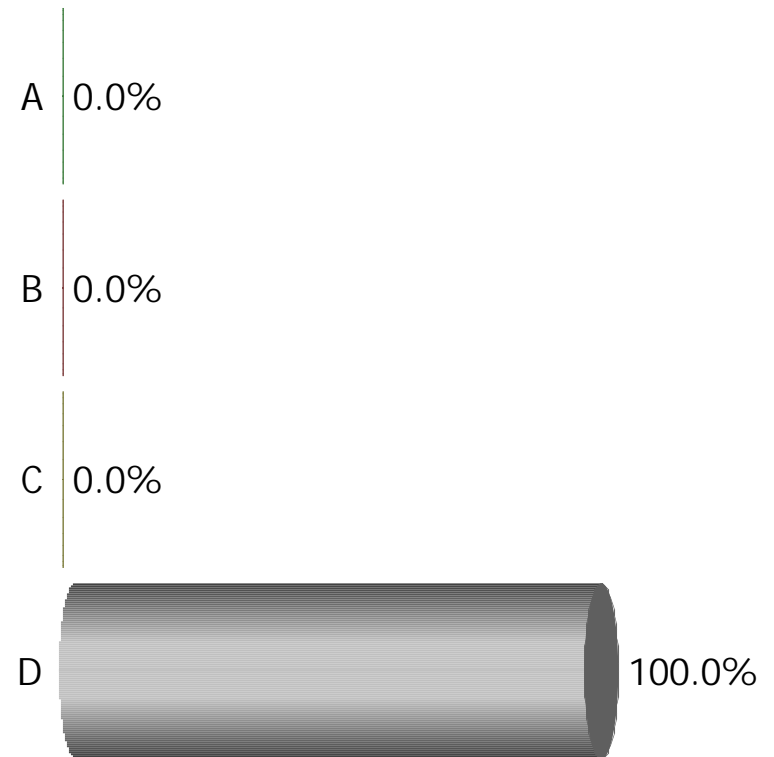
Understanding of Green Infrastructure (GI)

A. Activist for GI

B. GI Design Team Member

C. Supporter of the Concept

D. Limited Understanding



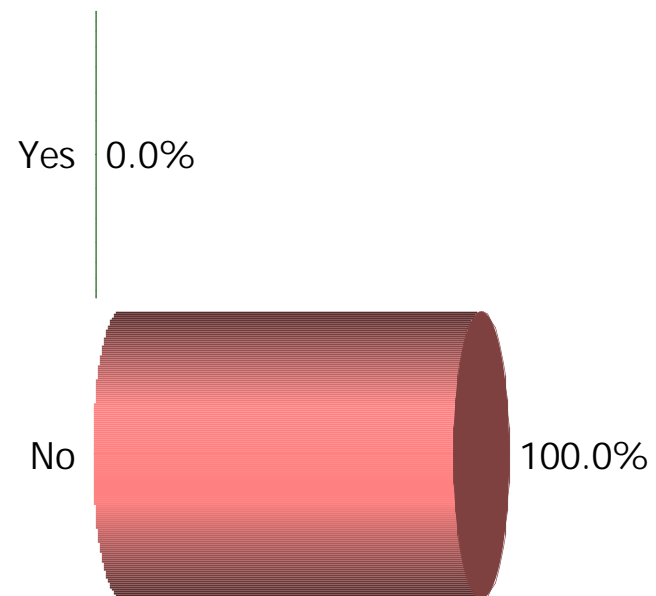
Voters

I.E. Interactive Session

The Marlborough Tour yesterday or the morning session titled “The cost of Green Infrastructure”

A.Yes

B.No



Introductions

Bob Berkebile, **BNIM**

Cindy Circo, **City of Kansas City**

David Dods, **URS Corporation**

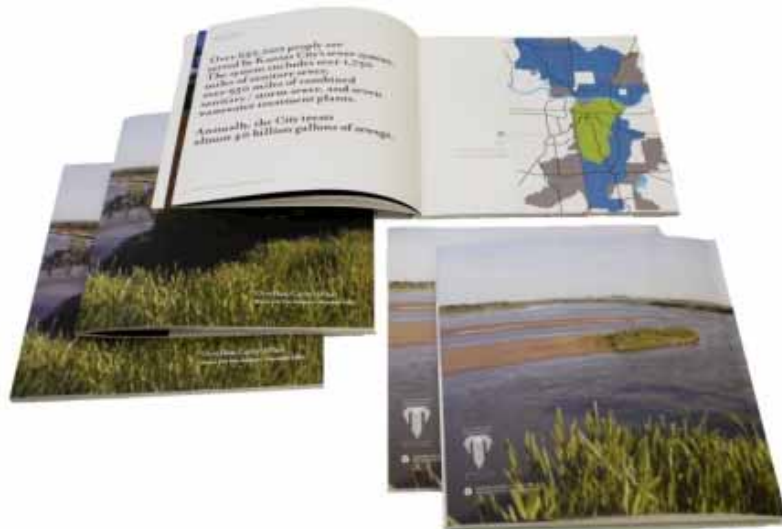
Jim Schuessler, **BNIM**

Brenda Thomas, **Marlborough Community Coalition**

Kansas City Facts

Over 652,000 people are served by Kansas City's sewer system. The system includes over 1,750 miles of sanitary sewer, over 950 miles of combined sanitary / storm sewer, and seven wastewater treatment plants.

Annually, the City treats almost 40 billion gallons of sewage.



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Marlborough Neighborhood - Before



Construction



Construction



Public Meetings





Before



After





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Kansas City's **Green Solutions** Pilot Project

Controlling Sewer Overflows and Helping Renew a Neighborhood



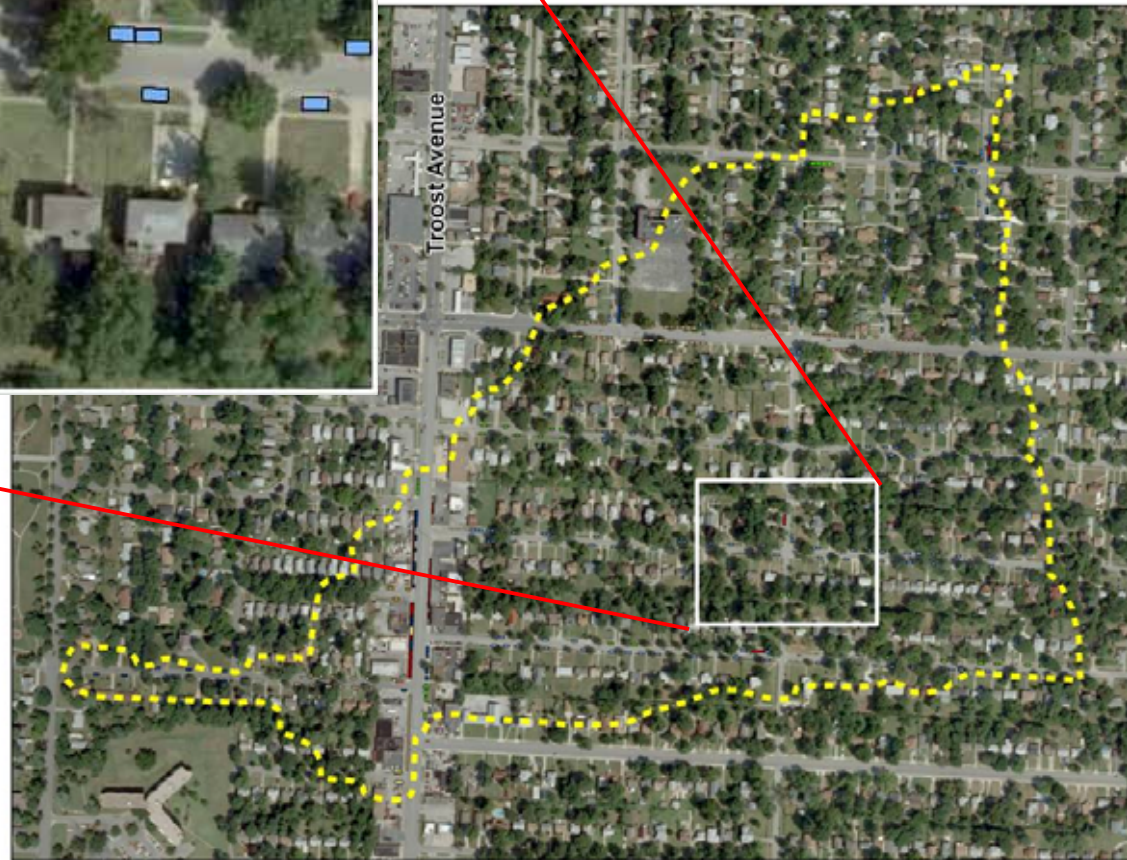
David Dods, URS Corporation, Overland Park, Kansas

URS Green Solutions, Kansas City

Retrofitting Green Infrastructure onto Every Street



100 acres
150+ locations
370,000 gallons storage



And Transforming a Neighborhood in the Process



Before



After

Question:

What is Green Infrastructure?

1. Trees
2. Any Landscaping
3. Stormwater
Treatment Systems
4. Natural Systems in
the Built
Environment
5. Astro Turf

Green Infrastructure Types in this Project



Rain Garden

Retrofitting between existing curb & sidewalk



Rain Garden

New curbs and porous sidewalk



Porous Concrete Sidewalks



Porous Concrete Sidewalks



Bioswale with Below Grade Storage



Cascade: Stair-Stepped Gardens on Steep Streets



Curb Extensions with Below-Grade Storage



- Stormwater Collection Focal Points
- Traffic Calming
- Porous Sidewalks



Troost Avenue: Little greenspace

Pervious Sidewalks + Below Grade Storage



Neighborhood Meetings

We came to talk about stormwater;
The residents came to talk about . . .



QUESTION

What did residents want to talk about?

1. Sewer backups
2. Garden plants
3. Curbs & sidewalks
4. Traffic Speed
5. Grocery Stores

Community Input Influenced Design



Neighborhood Improvements



Question

Biggest Concerns about Rain Gardens?



QUESTION

What were the major concerns about rain gardens?

1. Flowers attracting bees
2. Weeds
3. Depth - Safety
4. Visibility to Street
5. Snakes

QUESTION

What are the technical challenges to keeping rain gardens working well?

1. Trash
2. People walking in them
3. Drought
4. Snow and Ice
5. Leaves and Sediment

QUESTION

What are the technical challenges to keeping gardens working well?

Leaves & Sediment

Routine maintenance is needed, just like any garden



Green Infrastructure as a Focal Point for Stormwater Management and Neighborhood Renewal



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QUESTION

How many of you have a RAINGARDEN in your downtown?

1. Yes
2. No

QUESTION

How many of you have a GREEN STREET in your downtown?

1. Yes
2. No

Project Context

CONVENTION DISTRICT

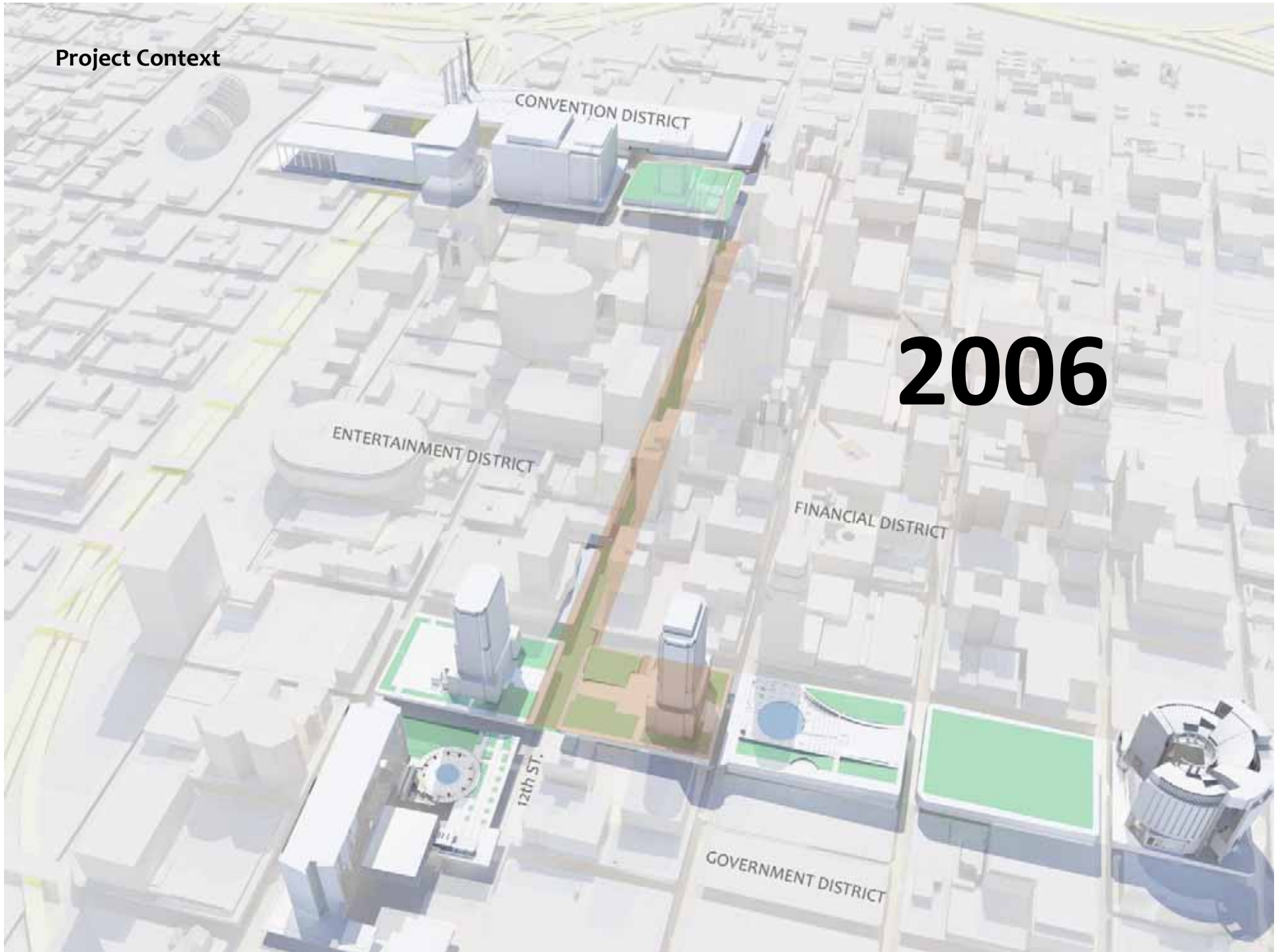
ENTERTAINMENT DISTRICT

FINANCIAL DISTRICT

12th ST.

GOVERNMENT DISTRICT

2006





Existing Conditions



Infiltration Basin Concept

Native plant materials slow runoff, allowing it time to infiltrate. They also filter street effluents and sediment.

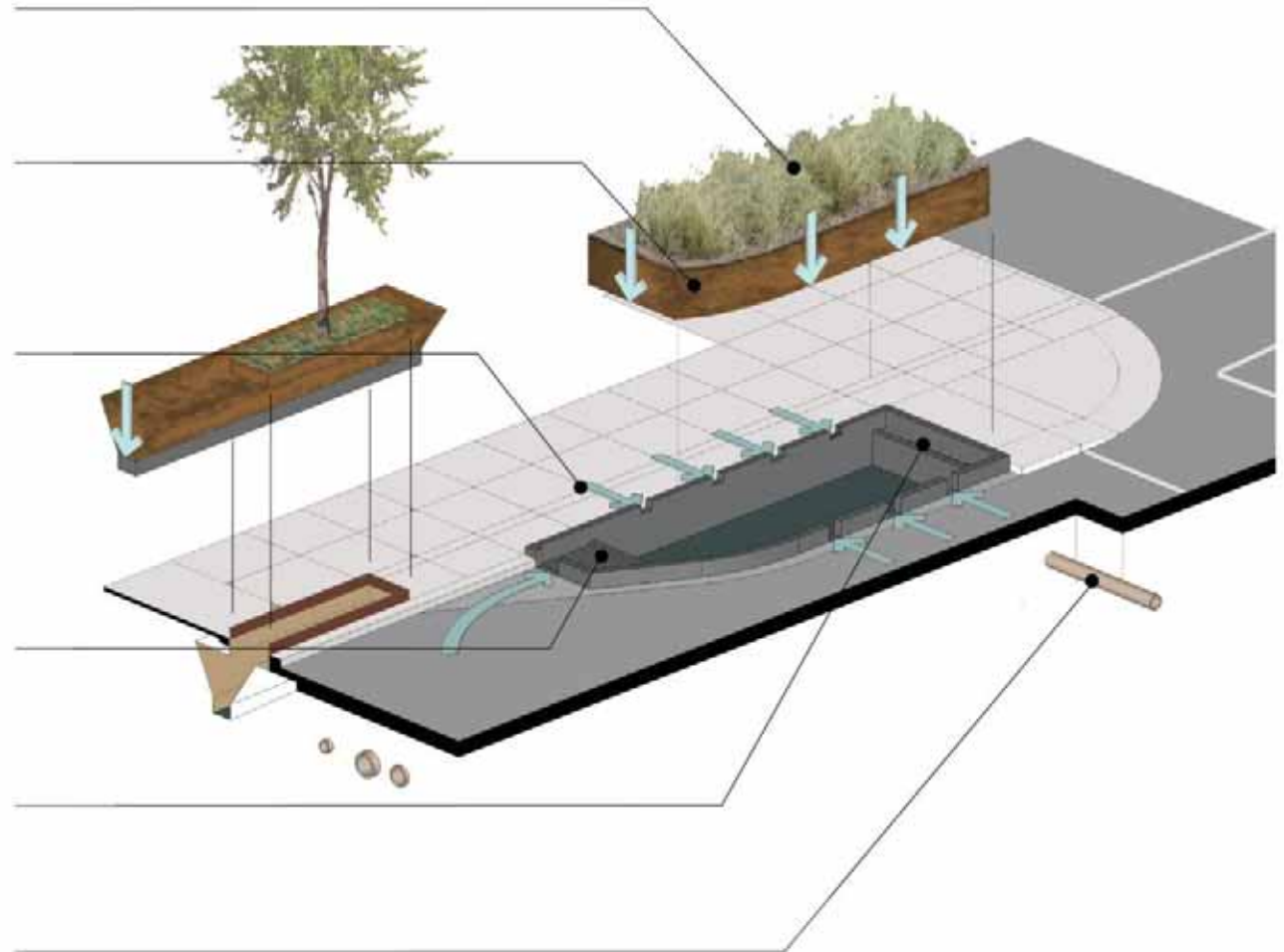
Designed soil mixtures encourage fast infiltration of stormwater, reducing the overall runoff volumes entering the sewer system.

Rainwater is collected from the sidewalk and street, removing pollutants, promoting infiltration and reducing peak flows during a storm event.

The main inlet of the raingarden includes a sediment trap forebay. This two inch deep retention area collects sediment and allows maintenance to easily shovel it from the system.

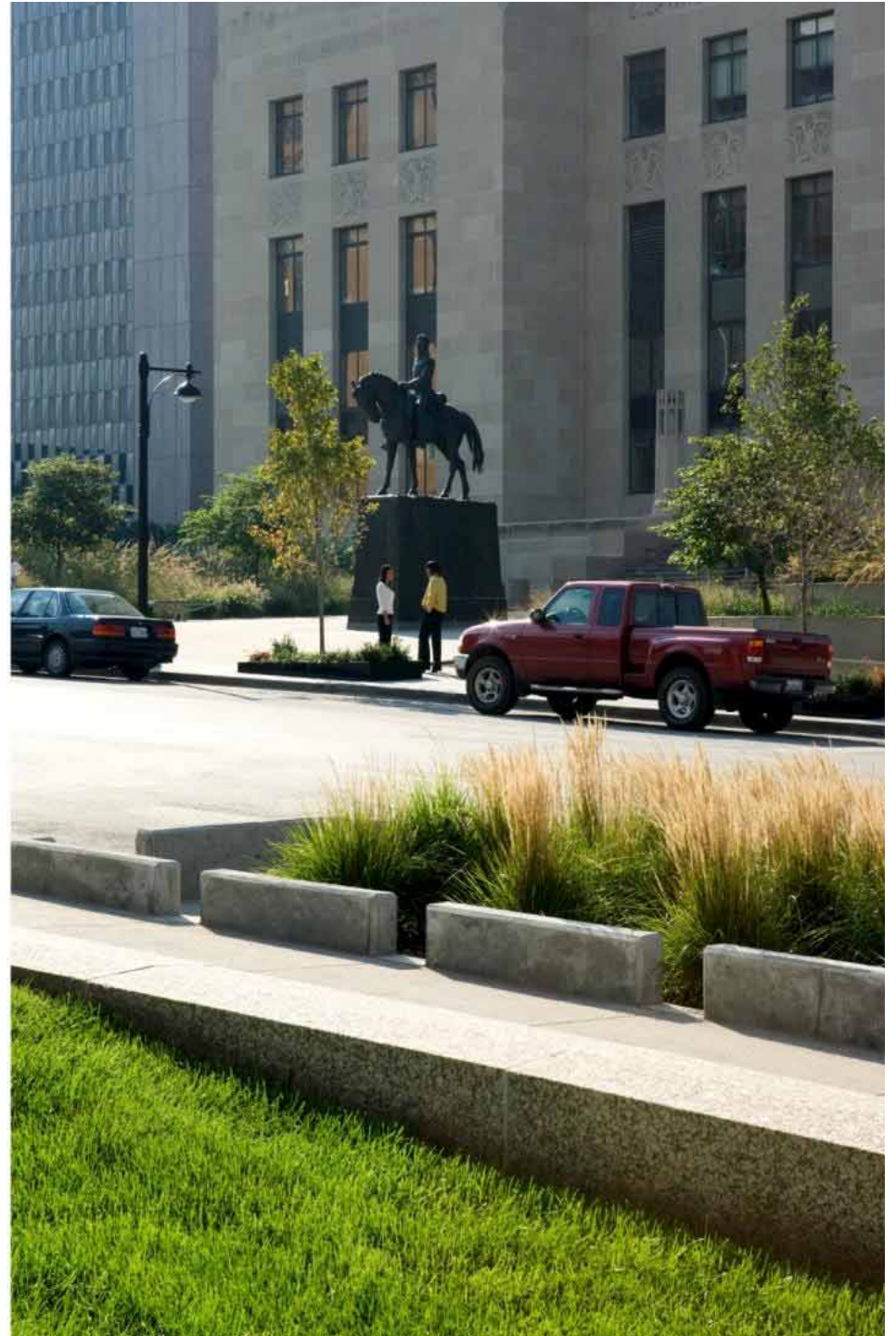
At the end of the raingarden water can escape through the overflow. This occurs when rainfall intensities are so large that the raingarden can not infiltrate quick enough.

The overflow connects to the combined stormwater sewer system.





City Hall South Entry





12th Street Infiltration Basin

QUESTION

How many of you are familiar with the Greensburg, Kansas Sustainable Community story?

1. Yes
2. No



GREENSBURG DOWNTOWN STREETScape

VISION | GREENSBURG DOWNTOWN STREETScape



Greensburg Post War



Greensburg 2007





Main street symbolizes a spine that connects key elements downtown. Greensburg came together to have charrettes and give ideas and feedback to design a town core that relates to the goals of rain, community, environment, family, wind, growth, and prosperity.



IMPLEMENTATION



01 Deteriorated Systems



02 Renewed Hope

IMPLEMENTATION



Stormwater as Amenity

The raingardens and infiltration basins filter and collect stormwater which can be stored in underground cisterns. This greywater is used to irrigate streetscape plantings which serve as a significant pedestrian amenity.

IMPLEMENTATION

QUESTION

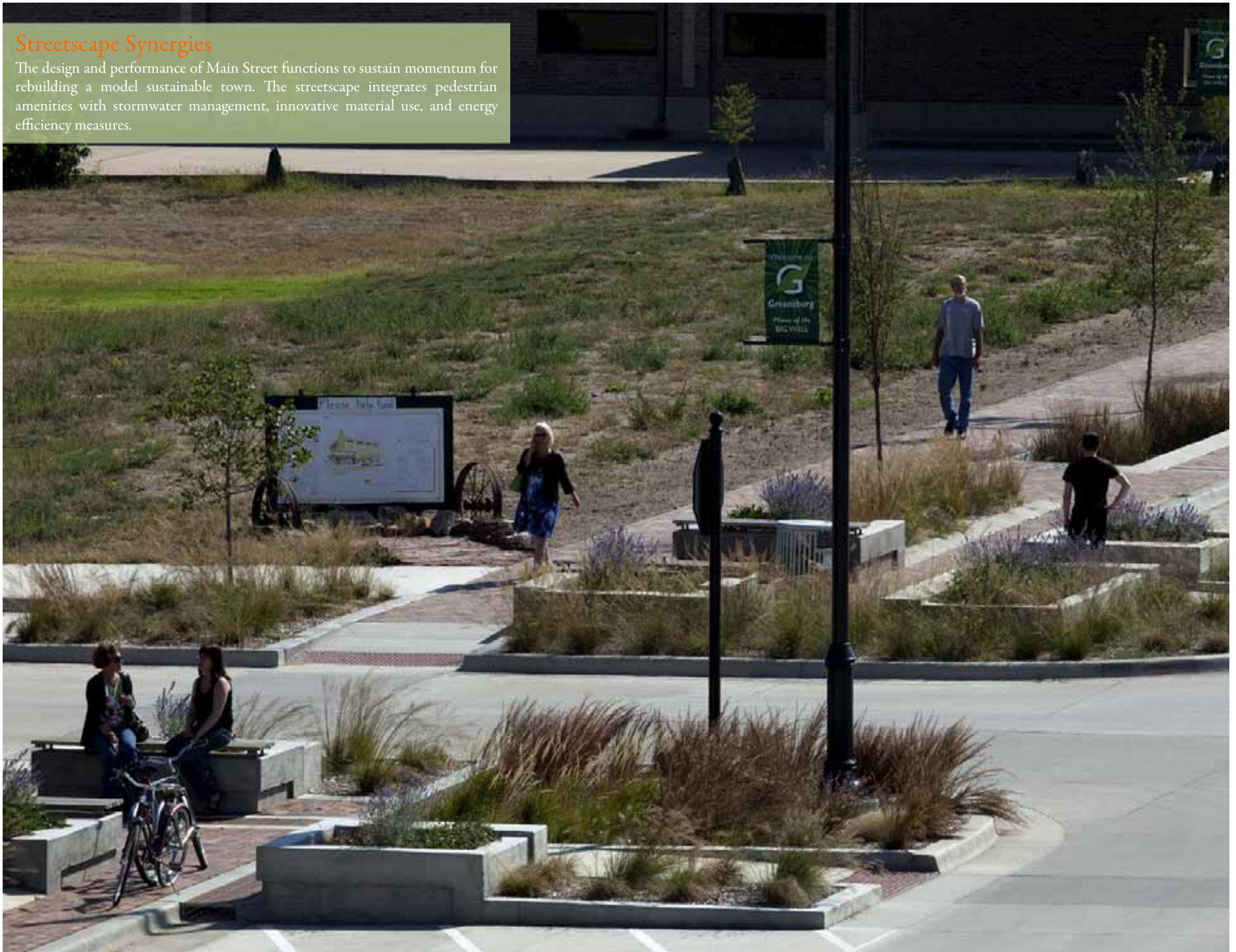
How many Green Features do you see?

1. Two
2. Four
3. Six
4. Eight



Streetscape Synergies

The design and performance of Main Street functions to sustain momentum for rebuilding a model sustainable town. The streetscape integrates pedestrian amenities with stormwater management, innovative material use, and energy efficiency measures.





IMPLEMENTATION

04 Pedestrian Experience

Pedestrian Experience
Benches, street trees, bike racks, brick walkways, vegetated planters, mid-block crossings, and end-block crossings contribute to a comfortable and welcoming pedestrian experience.

Sustainable Materials

The elevated planters and native vegetation demonstrate just one of many sustainable materials used on site. The bench wood, reclaimed from an inactive Army Ammunitions Plant, in combination with simple concrete forms yield and aesthetic elevated planter design.



IMPLEMENTATION

Walkable Destinations

City Hall, in addition to the Post Office and the new Sun Chip incubator building, is located along the four block spine of Main Street. Strong pedestrian and bicycle connection encourages the development of additional destinations in close proximity.

06 Walkable Destinations







Framework for Future Development

As one of the first major infrastructure projects in Greensburg, the Main Street Streetscape is a signature project that helps sustain momentum for rebuilding a model sustainable town. Many of the strategies integrated into the streetscape design serve as a model for additional city projects.





HISTORIC BRICK PAVERS beneath the street will be salvaged and re-used in key locations like the intersections

RAIN GARDENS along the street will detain and treat stormwater runoff and will provide colorful plantings with year-round interest

STREET TREES will be added to frame pedestrian spaces and shade buildings and sidewalks

PERMEABLE UNIT PAVING in the street and sidewalk will filter stormwater and reduce runoff rates and volumes



QUESTION

Can a geothermal system be integrated within the public right of way for private business use?

1. Yes
2. No













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ROAD
CLOSED





Raingarden







WELCOME!
NEW PARTNERS FOR SMART GROWTH
CONFERENCE ATTENDEES

You are cordially invited to a reception hosted by BNIM
on Friday, February 7th, 2013 from 5pm to 7:30pm
at 106 W. 14th Street, Kansas City, Missouri 64105

No RSVP required. Light refreshments will be served.



bnim.com



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10 Lessons Learned

Preserve the Existing Landscape

- It is easier to preserve the landscape than to rebuild it

2) Development Significantly Disturbs Site Soils

- Construction causes loss of plants, topsoil, and soil structure
- Stabilize sites before finishing BMPs. Erosion is the enemy of BMPs.
- Restore site soils to promote healthy plants



10 Lessons Learned

3) Site Characterization Informs Design

- Soil type and compaction
- Fill material
- Depth to bedrock and groundwater

4) Size is Important. Properly Sized BMPs:

- More effectively remove pollutants
- Convey large storms without erosion



10 Lessons Learned

5) Learning from Mother Nature (1): Distributed Systems

- Distributed systems are less prone to overall failure if one part has problems



6) Learning from Mother Nature (2): Diversity

- Diverse systems are more resilient than monocultures
- If you lose one plant, the entire system doesn't fail



10 Lessons Learned

7) Plant Material is Important

- Plants promote infiltration, prevent erosion, remove pollutants, and build soil
- Match plants to moisture zones in the garden

8) Keep Designs Simple

- The more complex the system, the more difficult to build and maintain
- This is especially important if BMPs are new to the construction industry



Stormwater Management Can be Beautiful



Photo: David Dods, Assassi

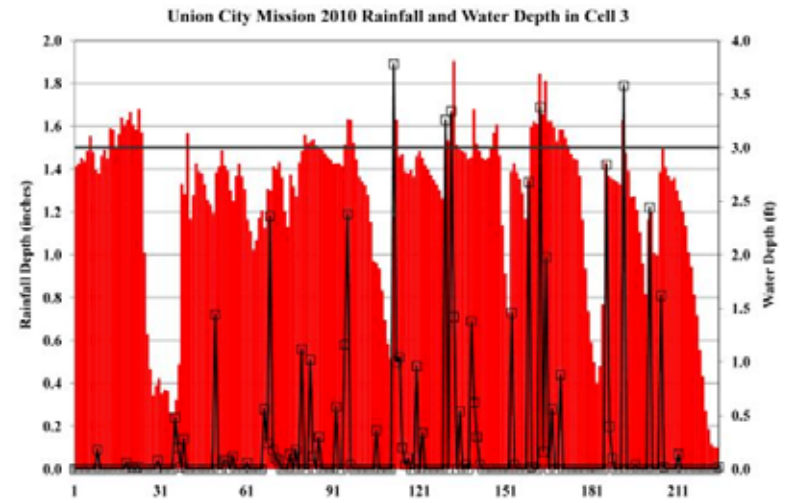


Photo: © Assasi



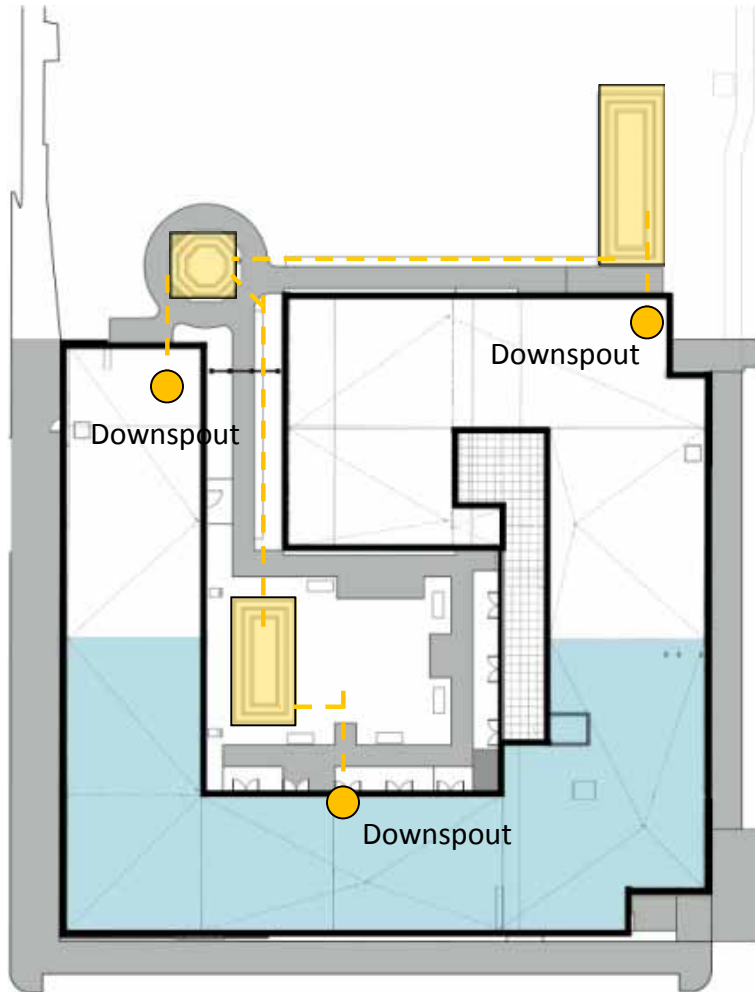
Photo: © Assasi

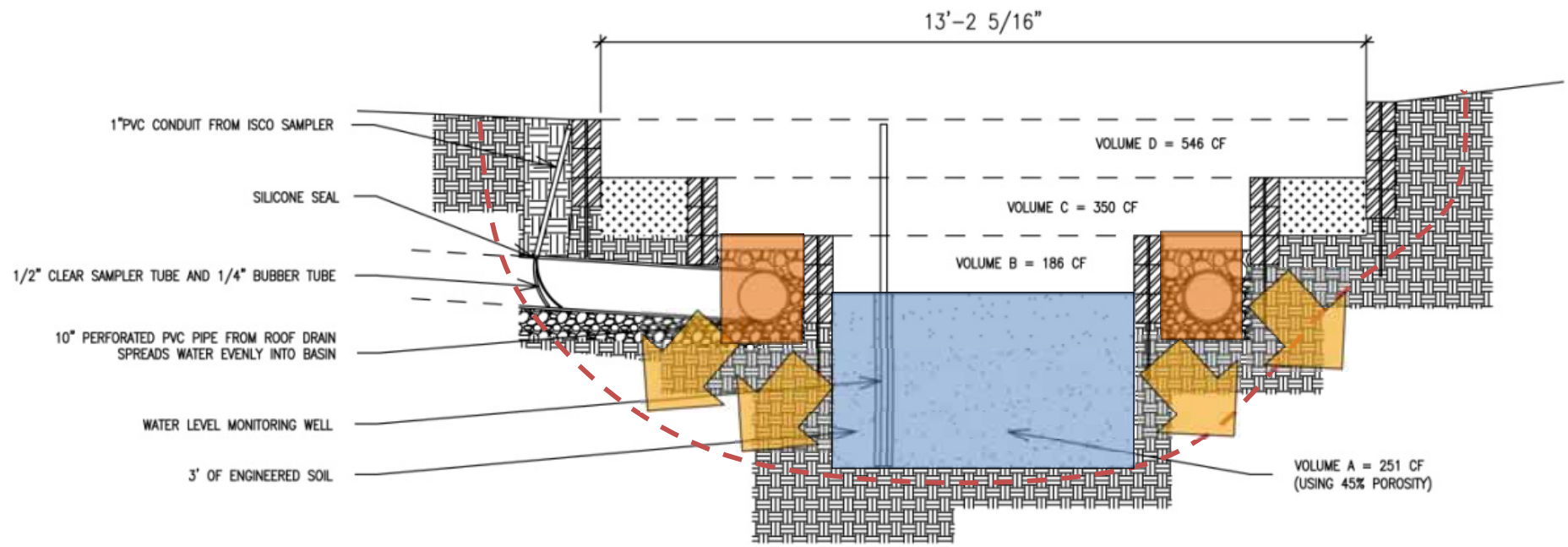
Measured Findings



A. Infiltration Basins

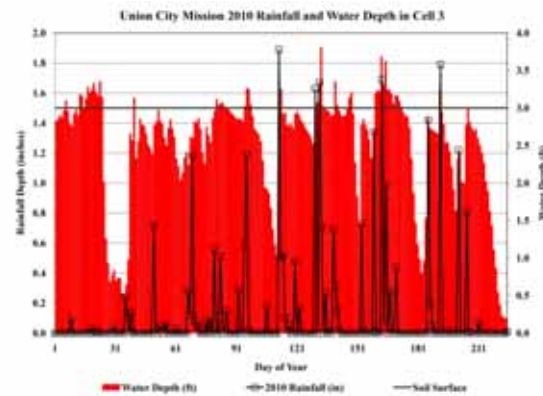
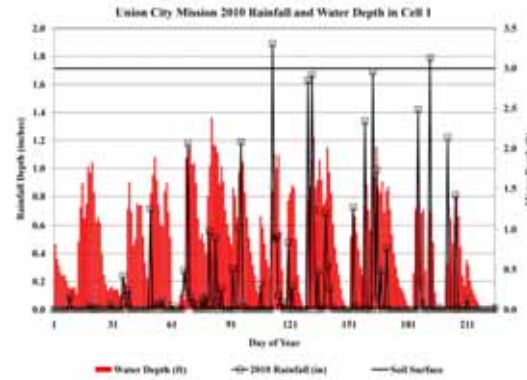
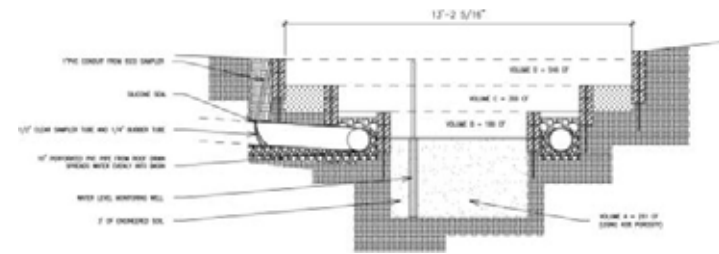
City Union Mission, Kansas City, MO





Findings

- Site Characterization
- Plant Root Benefits
- Cost

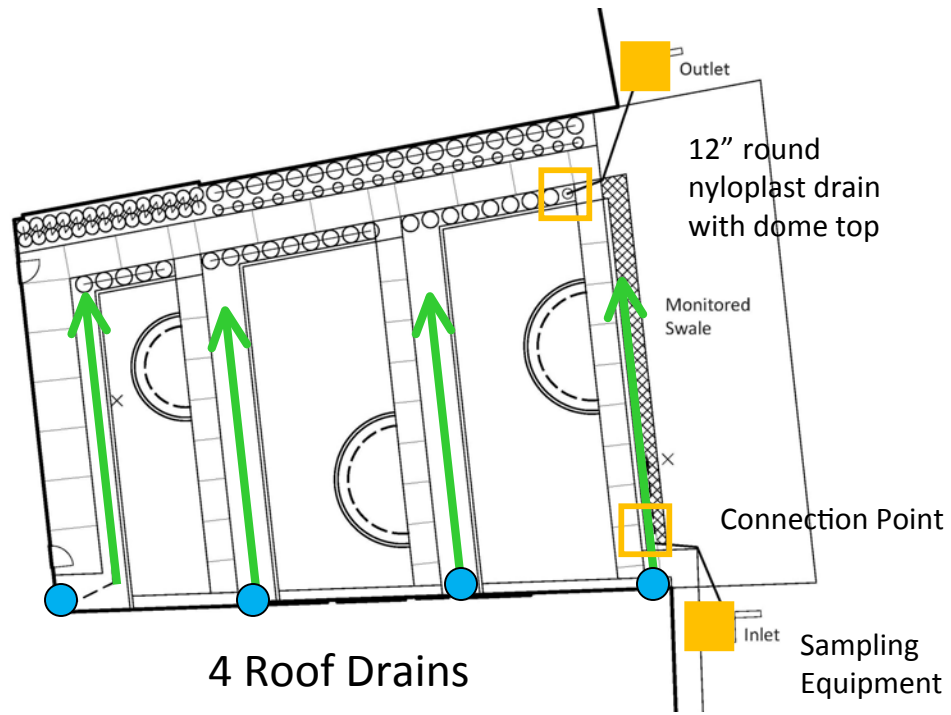


B. Raingarden

EPA District 7 Headquarters Courtyard



Photo: © Assassi



Typical Downspout



Equipment Attachment



Outlet Structure

Findings

- **Undersized for Larger Storm Events**
- **Modest pollutant removal**
 - 56% Reduction of TN
 - 50% Reduction of TP
- **Exported some constituents**
- **Distribution of Flows**



E. Pre-Filtration

7,000 SF Roadway/month

19 cups

13.9 pounds

1 acre/1 month

117 cups

86 pounds

1 acre / year

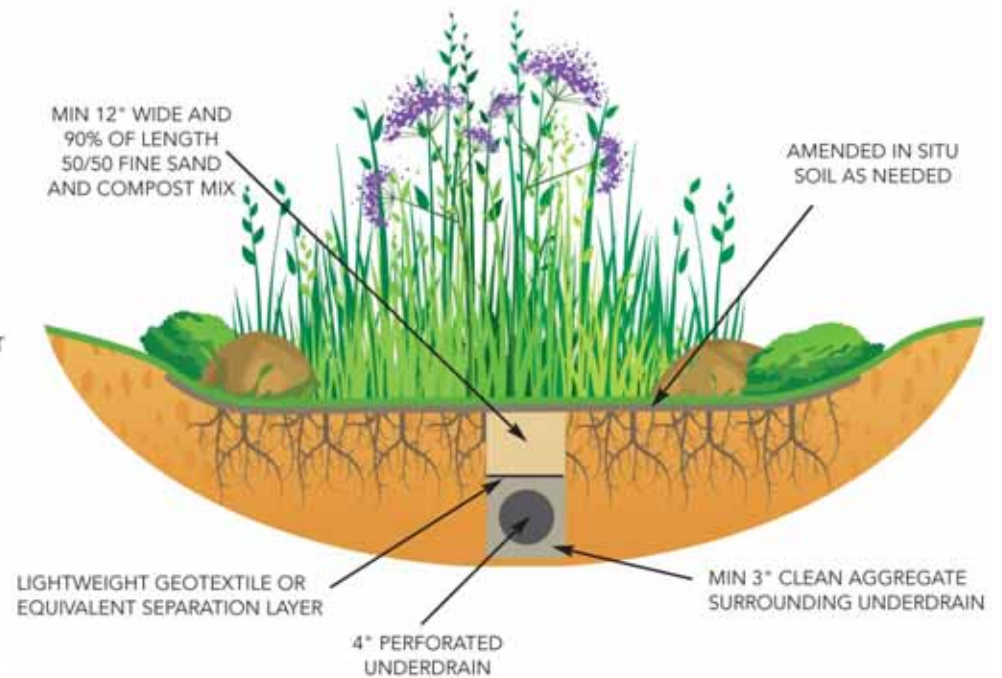
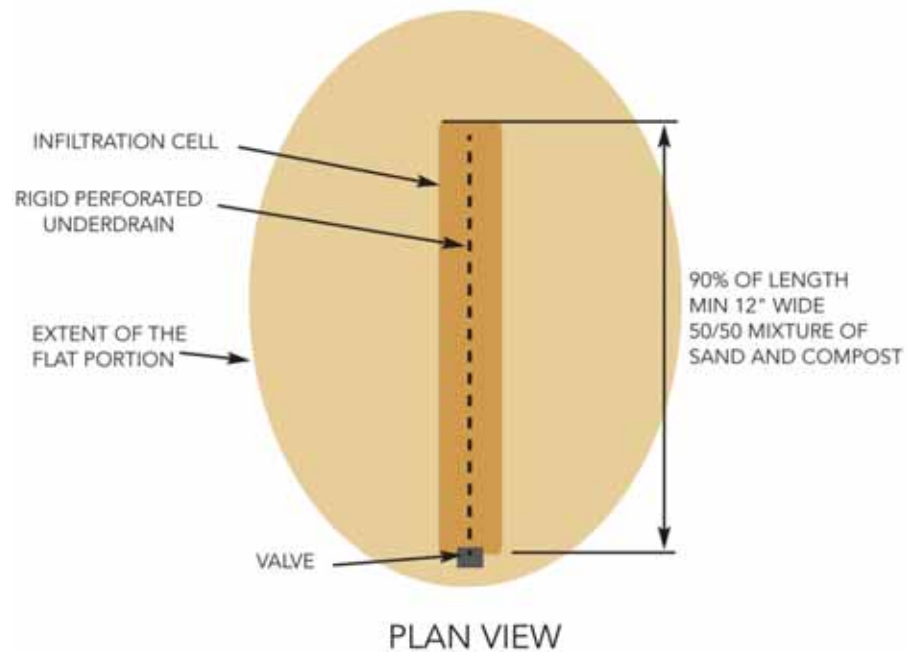
1,413 cups

1,032 pounds



F. Bioretention Cell

University of Nebraska – Welcome Center



- Reduced infiltration rates
- Reduced installation costs

Photo: Big Muddy Workshop

G. Bioretention Cells

University of Nebraska – Welcome Center

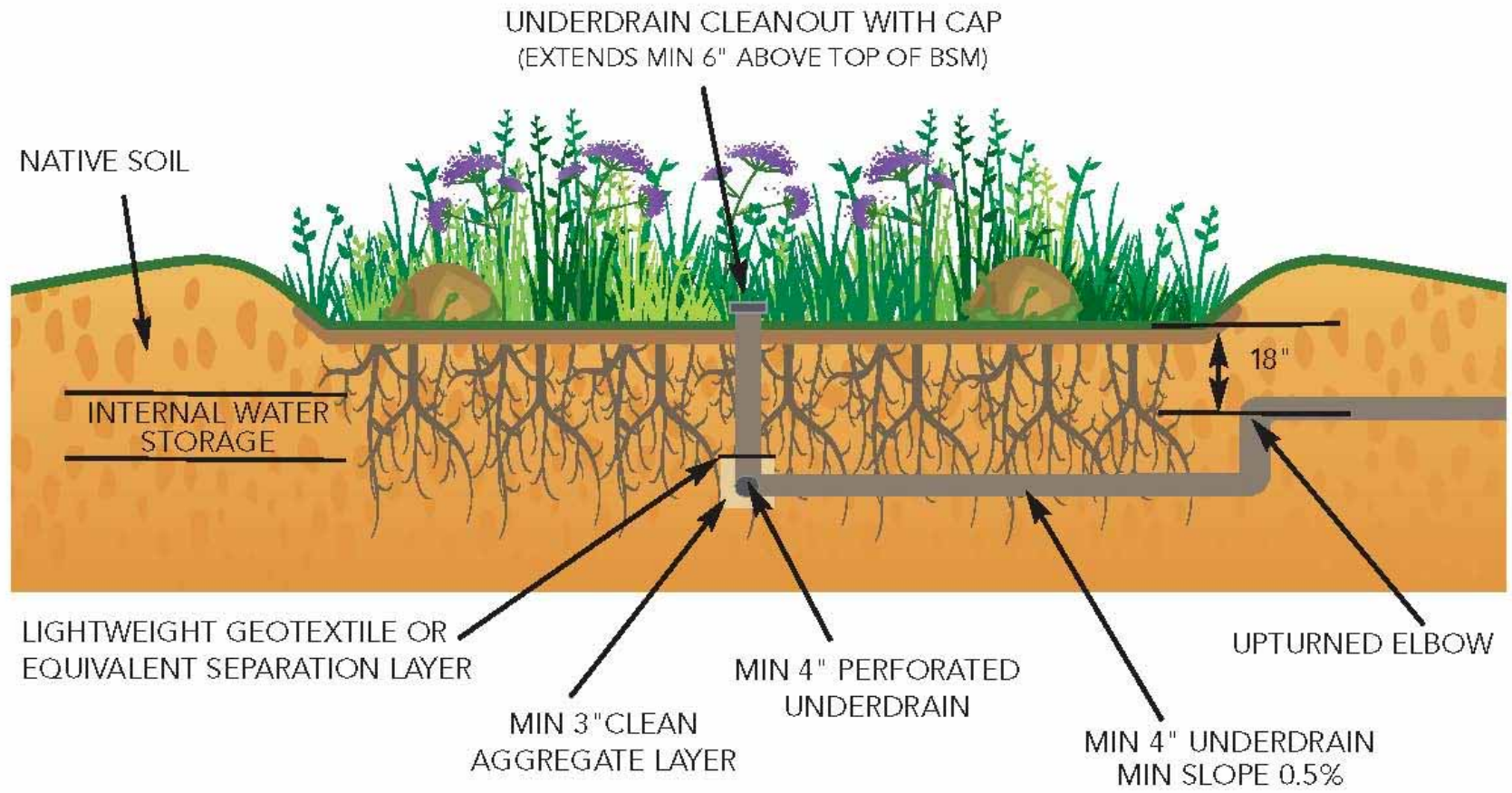


Photo: Big Muddy Workshop

H. Flow Modification

Des Moines, IA Capital Complex

