Roundabout LID

The case for incorporating LID practices into transportation design

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148th and Riverview Intersection

Original Geometry

- Safety – traffic and pedestrian
- Site Drainage

Why a roundabout?

A. Traffic Safety

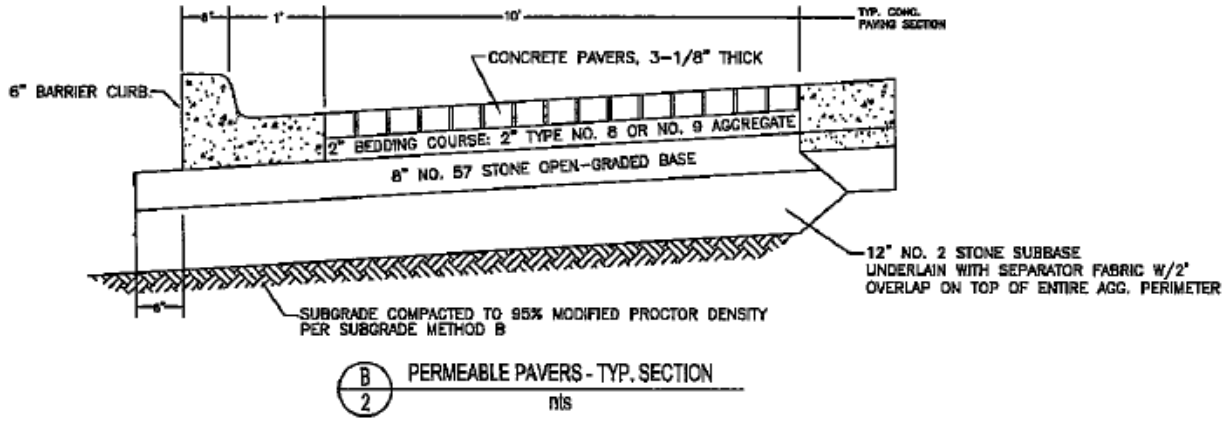
B. Site Impact

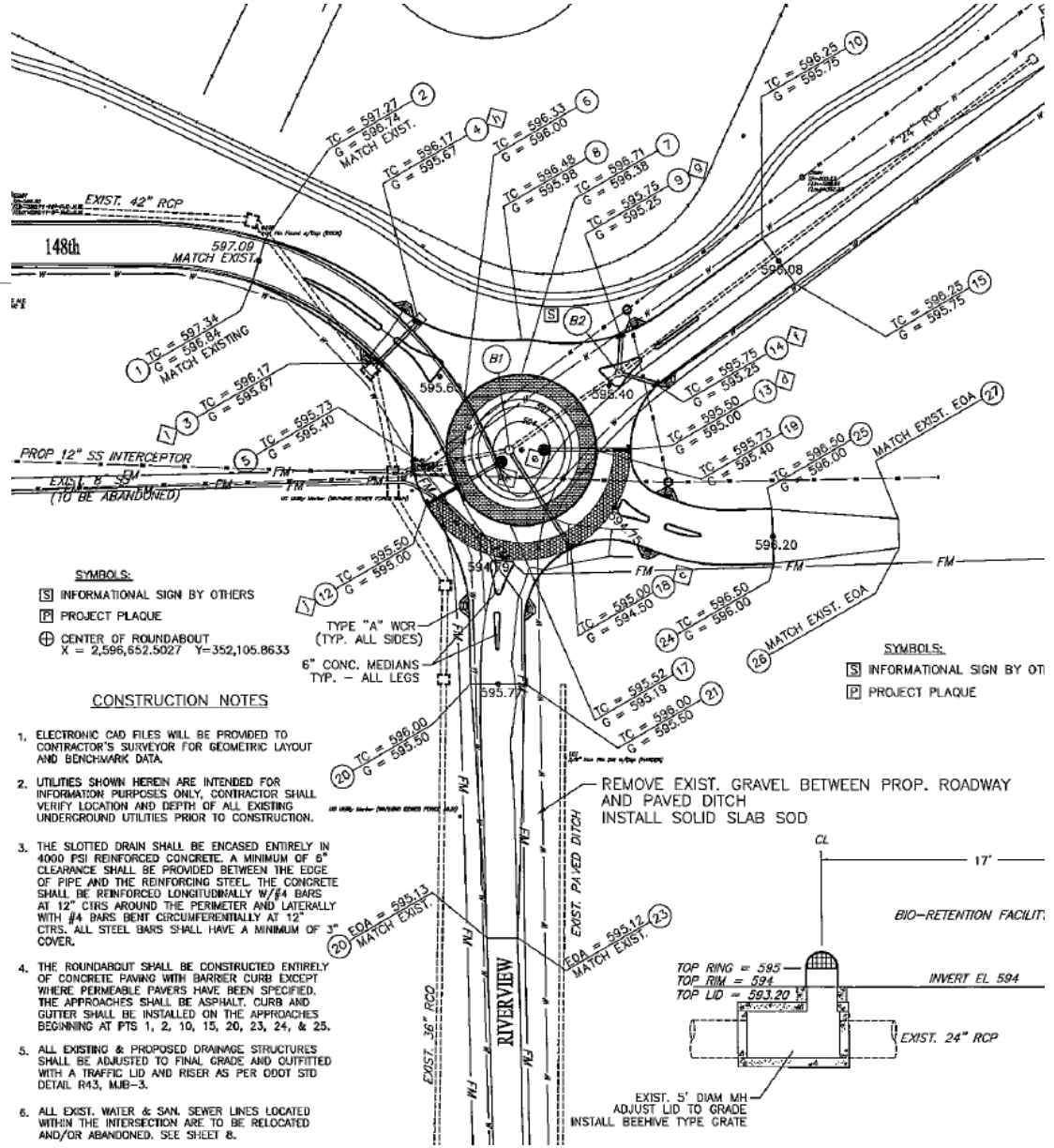
C. Storm Water Management
- LID Opportunity
- Bio-retention/ Rain garden
- Permeable Pavers

148th Roundabout – Completed in 2012

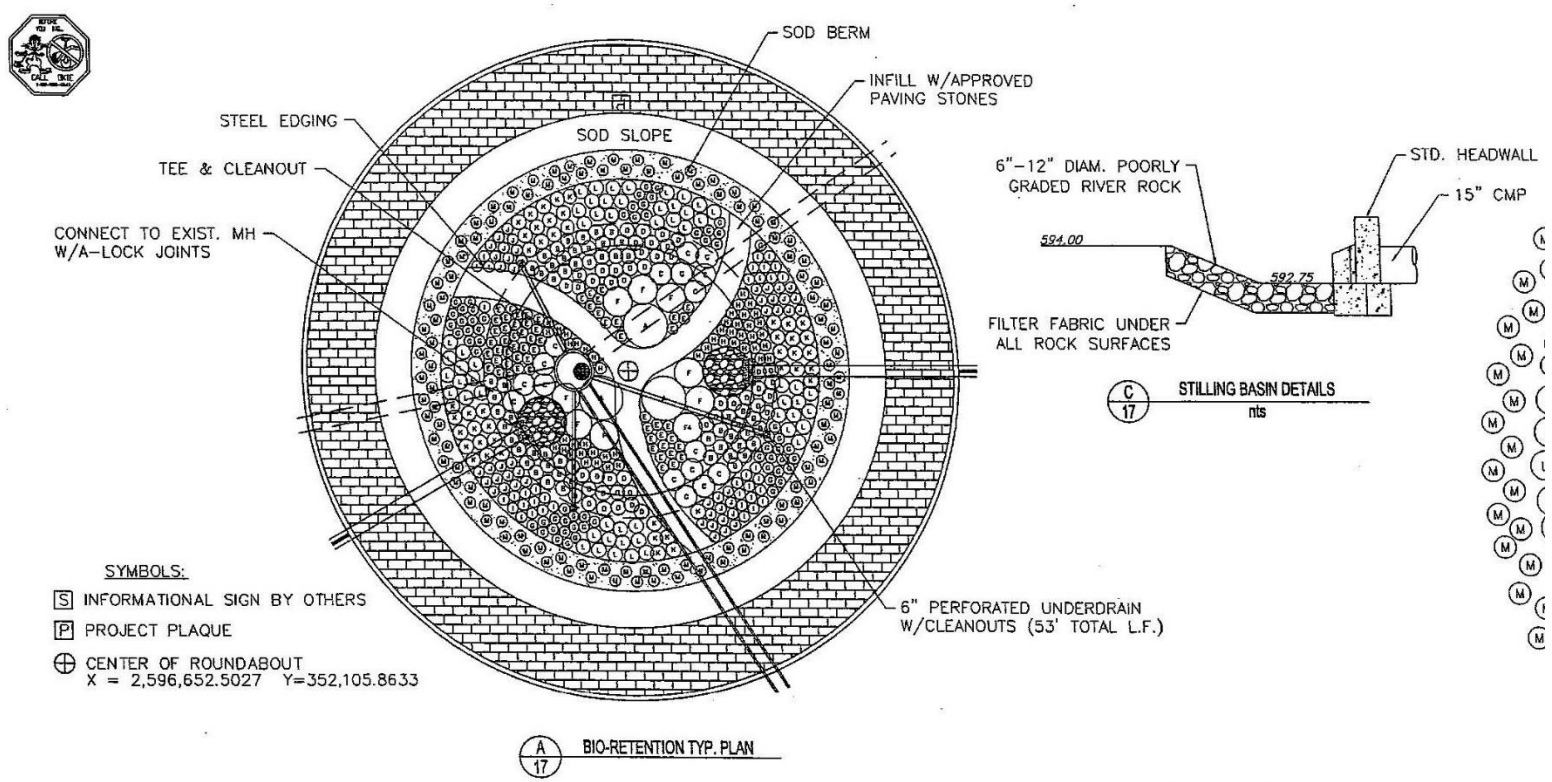
Intersection Layout

- Horizontal Design
- Vertical Design
- Paver Selection – Structural
- Edge Restraint & Laying Pattern
- Subgrade Design



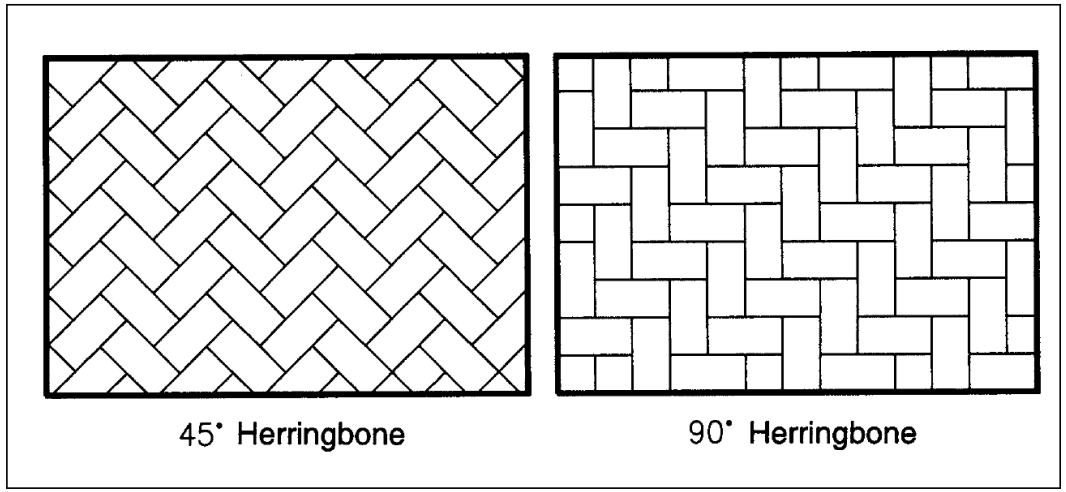


Storm Water Management Features

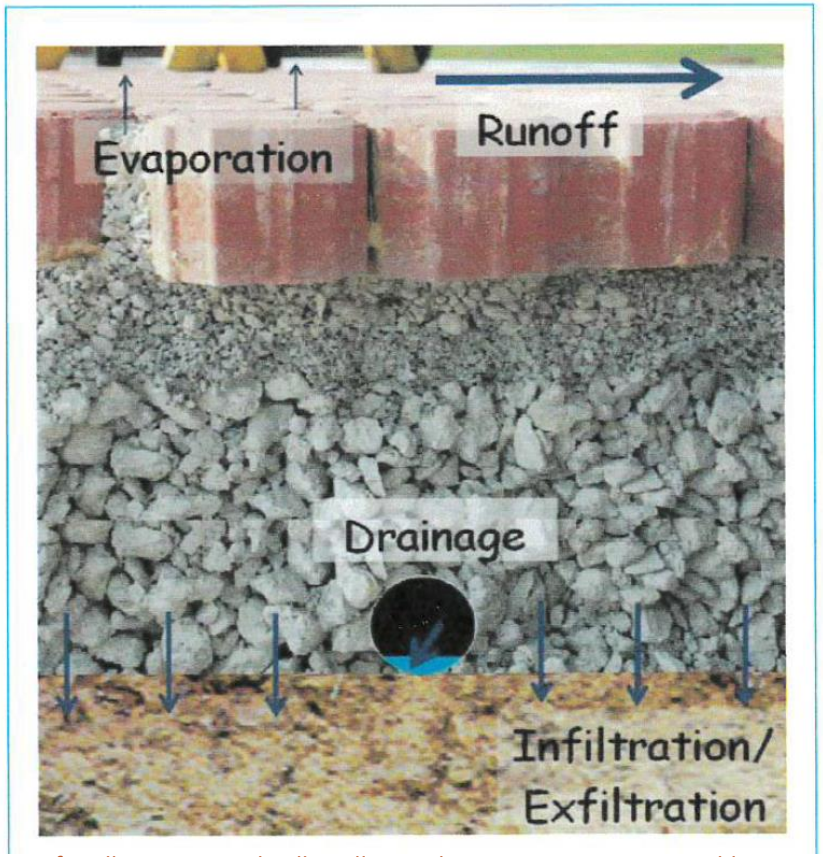


- First Flush Flows
- Permeable Pavers
- 100-year Storm Overflow
- Slotted drains
- Stilling Basins
- Underdrains

Permeable Pavers – Belgard (ICPI – Interlocking Concrete Pavement Institute)

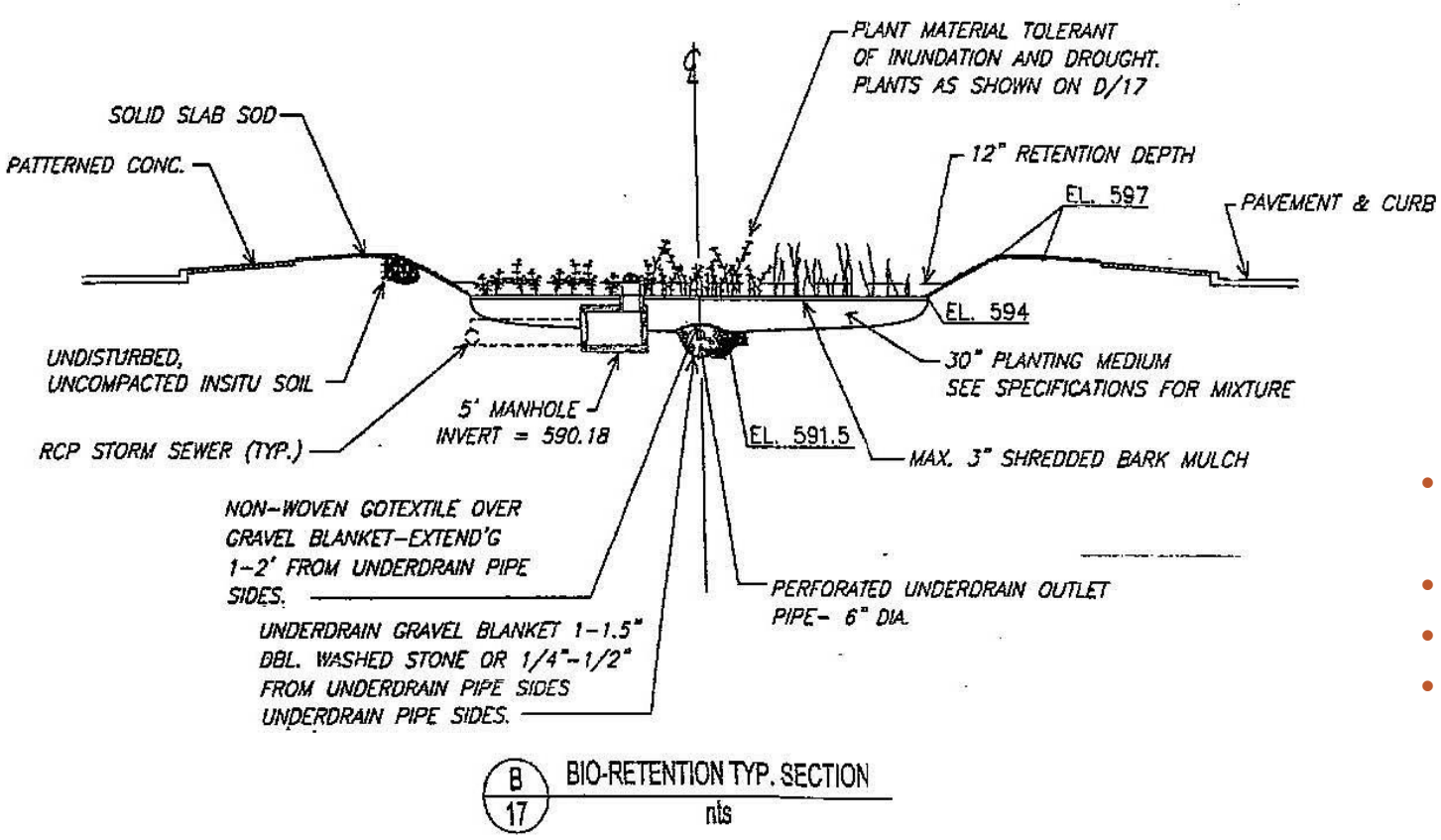


Ref. 1995 ICPI Tech Spec Number 4; June 2006 Rev – Fig. 3



Ref. William Hunt and Kelly Collins, *Urban Waterways – Permeable Pavement: Research Update and Design Implications*, North Carolina State University

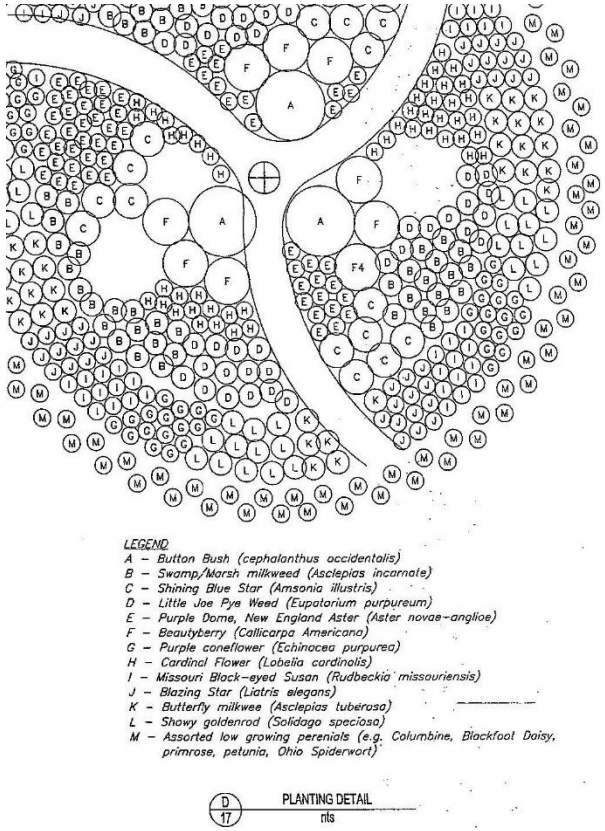
Bio-retention

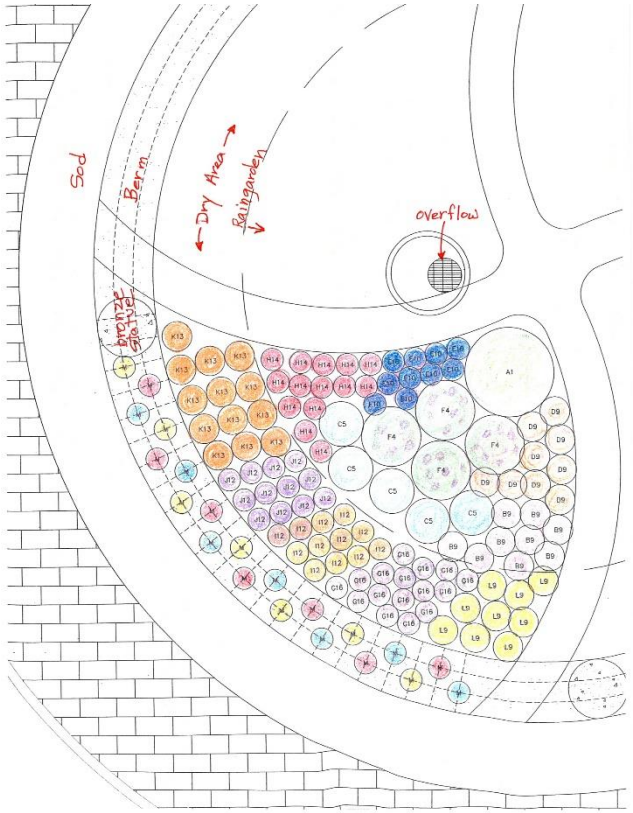


- Historical Rainfall – 90% of events ≤ 1.1” (Mesonet, previous 10 years)
- Percolation rate – planting medium, sand subgrade
- Available volume – geometry, pooling depth
- Net treatment area (0.75 acres)

Plant Selection and layout

- Native Varieties
- Butterflies





Cost and Funding

- Bio-Retention Facility (OWRB funded) - $43,584.60

Schedule E - Bio-Retention Facility (OWRB funded)						
73	231	RAINGARDEN PREPARATION	LS	1		$ 25,200.00
74	233	VEGETATIVE MULCH	SY	236		$ 10,620.00
75	613(Q)	6" PVC SCH 40 PERFORATED UNDERDRAIN	LF	53		$ 689.00
76	735.03	PLANTING SOIL MIX	CY	84		$ 6,300.00
77	306	GRAVEL BLANKET - CLASS 57 ROCK	CY	10		$ 430.00
78	230A	SOD	SY	192		$ 345.60
						$ 43,584.60

*Because of the green infrastructure components of the intersection, the **project as a whole received a 15% principal forgiveness on the overall project loan, covering almost all of the intersection reconstruction and storm sewer costs**.*

- Plants - $2,909.50 (funded by Conservation Commission) + $728 (City funded)

INCOG and the Oklahoma Conservation Commission funded the purchase of the plats as part of a number of Rain Garden demonstration projects in Tulsa County.

- Pavers - ~$15,000 (OWRB funded)

If you put your name on it…

Project Buy-in:

1. Award Winning concept

Green Infrastructure — U.S. Environmental Protection Agency - Region 6

Rain Garden

Bentley Athletic Park,
Bixby, Oklahoma

Bentley Athletic Park in Bixby, Oklahoma, is home to a rain garden in the middle of a new roundabout. Water drains into the rain garden through pipes from the surrounding athletic fields and soaks into the ground. Excess water enters the storm sewer system through a riser within the rain garden.

A collaborative effort between the City of Bixby, Indian Nations Council of Governments, the Oklahoma Conservation Commission, and the Oklahoma Water Resources Board, this project won the 2013 Environment Project of the Year from the Oklahoma Chapter of the American Public Works Association.

The rain garden at Bentley Athletic Park is one of four in the Tulsa Area Rain Garden Project.

Project Point of Contact:
Bea Aamodt
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Bixby, Oklahoma 74008
918-366-4430
baamodt@bixby.com

EPA United States Environmental Protection Agency

EPA Region 6 seeks to provide information and recognition for green infrastructure projects within our Region. If you would like your project featured, please contact **Suzanna Perea** at 214-665-7217 or perea.suzanna@epa.gov.

2. Education – INCOG's Grant Project

3. Multi Purpose Facility

Four years later – Performance Analysis

Roundabout

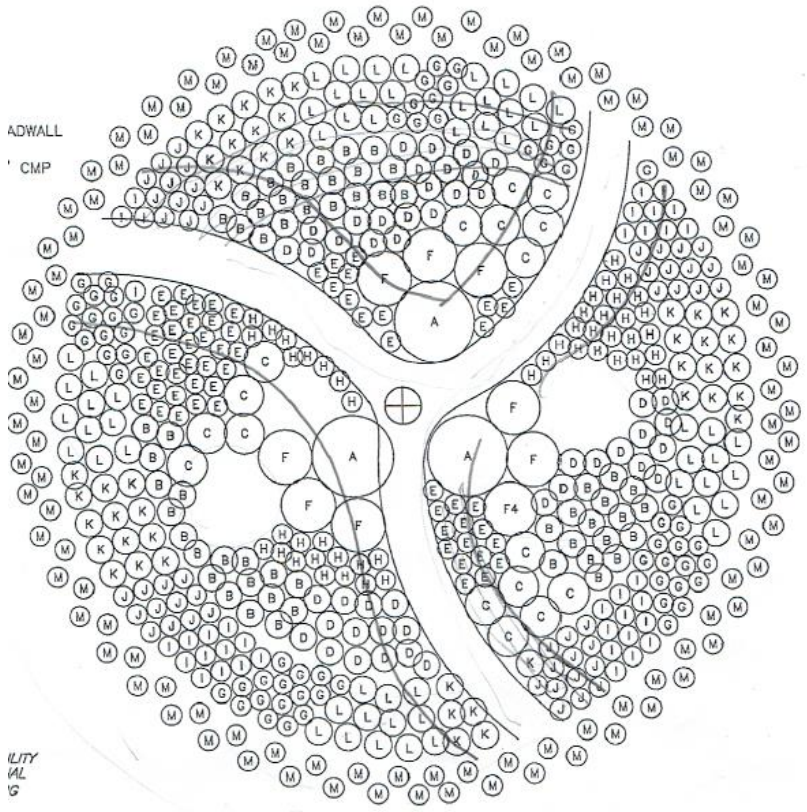
1. Traffic Safety
2. Permeable Pavers
3. Storm Water Management

Bio-retention

1. Plant Selection
2. Maintenance
3. Year-round Appearance

Permeable Pavers

Additional Plant Selections



Grogg's Green Barn

Groundcover – Outlining Top Areas

Rose Verbena
Poppy Mallow
Short Grasses: Sand Love or Prairie Dropseed
Short Asters or Goldenrod

Perennial – Dry Areas

Rattlesnake Master
Little Bluestem
Joe-Pye Weed
Blazing Star
Tall Goldenrod
Coneflowers
Blue Vervain

Moist to surround Drain Areas

Swamp Milkweed
Palm Sedge
Side oats
Indian Grass
Mist flower

Bio-retention – Summer 2016

Resources and Thanks

Special Thanks to:

- Dr. Kevin Gustavson
  Environmental Educator and Technical Writer
  Blue Thumb Program
  Water Quality Division
  Oklahoma Conservation Commission
- Richard B. Smith
  Manager, Environmental & Engineering Services
  INCOG

Resources:

William Hunt and Kelly Collins, *Urban Waterways – Permeable Pavement: Research Update and Design Implications*; North Carolina State University

ICPI Tech Spec Numbers 2-4; *Construction of Interlocking Concrete Pavements, Edge Restraints For Interlocking Concrete Pavements, Structural Design of Interlocking Concrete Pavement for Roads and Parking Lots*

Iowa Stormwater Education Program, et. al., *Rain Gardens: Iowa Rain Garden Design and Installation Manual*

Nancy-Jeanne Bachmann, *Rain Garden Design and Construction Guidelines: Rooftop runoff capture for homeowners in suburban, urban, and rural areas;* Michigan Technological University

Bioretention Manual, 2007; Environmental Services Division Department of Environmental Resources, The Prince George's County, Maryland

Questions?