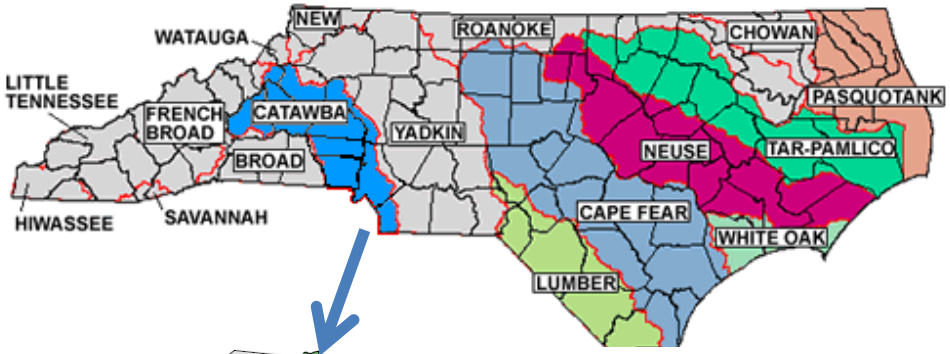
BMP Pre-Construction Phase

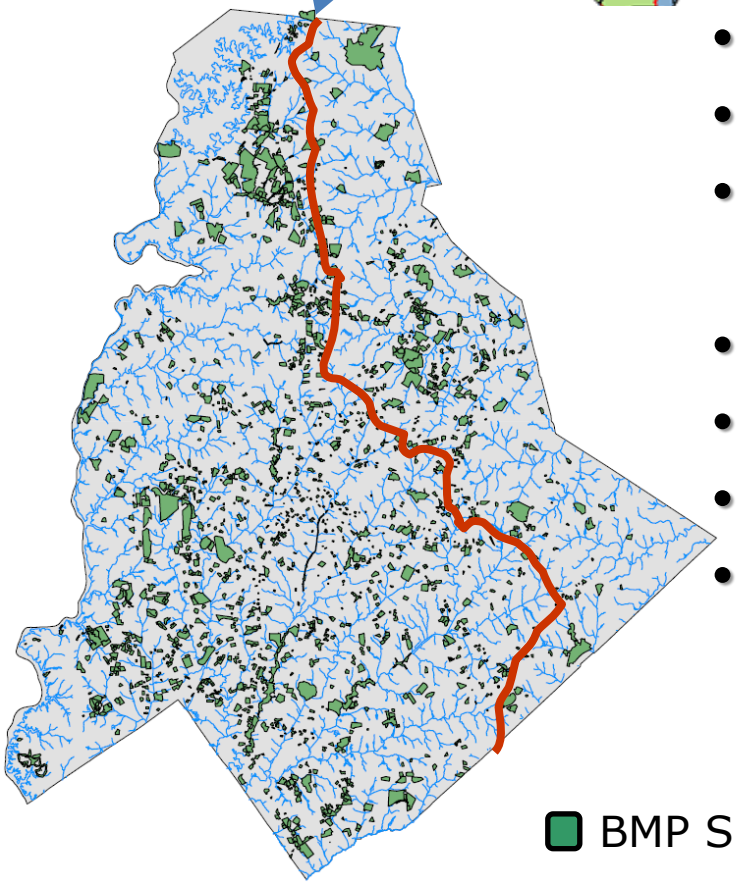
Presented at:
SESWA
Southeast Regional Stormwater Seminar

April 13, 2018

Don Ceccarelli
don.ceccarelli@mecklenburgcountync.gov

Mecklenburg County





- Population: 1.1 million (2.5X in 40 yrs)
- Phase I Community-Charlotte (840,000)
- Phase II Community- Six Towns & County (270,000)
- 3,452 square miles
- Over 3,000 miles of streams
- Over 200 miles of lake shoreline
- 3,065 Storm Water BMPs

BMP Sites

BMP Pre-Construction Keys to Success

Overview:

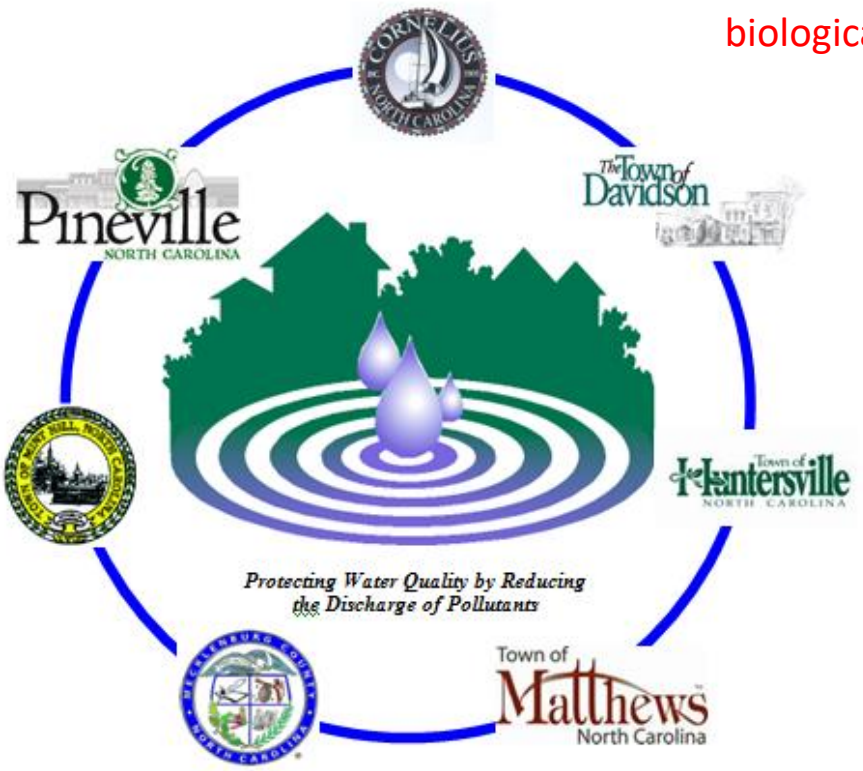
- Ordinances – Understanding Why
- Design Manual Development
- Design and Selection
- Operation & Maintenance

BMP Ordinances

Why are BMPs installed?

Federal Water Pollution Control Act (1948/1972/1987/1995)

"To restore and maintain the chemical, physical and biological integrity of the waters of the United States"



BMP ORDINANCES:

Detention:	1978-1979
Watershed:	1993 -2001
LID Huntersville:	2003
Post Construction:	6/30/2007 County 7/1/2008 City

Other: Conditional Re-zonings,
404/401 mitigation,
SWIM mitigation

BMP Ordinance Evolution

Detention 1978

- "First Shot" at controlling runoff
- Commercial Proj. Only >20,000 ft^2 BUA
- Peak Control for 2-yr, 10-yr storms
- No As-Builts or O&M plans

Watershed 1993-2001

- Protect Drinking Water Supplies
- Require buffers along lakes & perennial streams
- High Density – BMPs Required
- Remove 85% TSS
- O&M plans Required & Inspections
- Built Upon Area (BUA) limits

BMP Ordinances

Huntersville LID 2003

- Mimic pre-development hydrology
- Remove 85% TSS from 1st inch of rain
- Require LID BMPs
- O&M Plan & Inspections required

Post Construction Ordinances 2007

- Comply with NPDES Permit, address current impairment,
- Remove 85% TSS from 1st inch
- Remove 70% Total Phosphorus
- 10-yr & 25-yr Peak Control
- Additional Buffers and Open Space
- O&M Plan, As-Builts, & Insp. Req'd

1. Overview of why Huntersville adopted the LID ordinance.

- Restore Impaired Streams
- Protect Mountain Island Lake Drinking Water Supply
- Protect Endangered Species & Allow Sewer Line Extensions
- Eliminate Moratorium on McDowell Creek Wastewater Treatment Plant

<u>McDowell Creek:</u> Partially Supporting with Biological Impairment

<u>Clarks Creek:</u> Partially Supporting with Biological Impairment

Carolina Heelsplitter

McDowell WWTP

Mountain Island Lake

Charlotte's Water Intake

Post-Construction Ordinance Development Process

Stakeholders were provided training and information prior to the initiation of the consensus building process.

Phase I: Assess current & future water quality conditions and compare to goals. How wide is the gap?

November 2004

Phase II: Use water quality modeling to evaluate alternative management scenarios for closing the gap. **February 2005**

Phase III: Translate the selected management scenario into ordinance language. **September 2005**

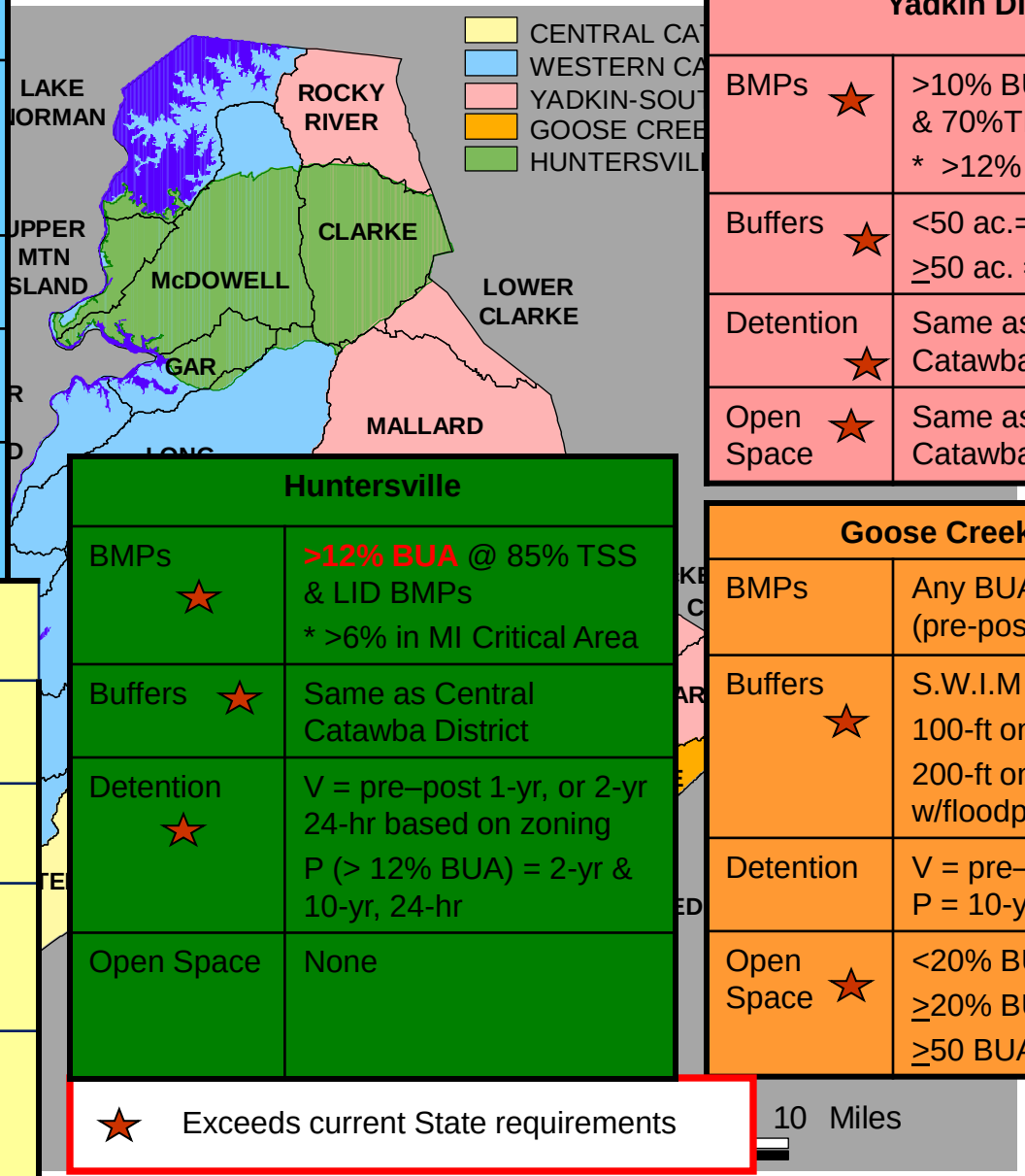
Phase IV: Public hearings, approval and adoption.

June 2007

Requirements for Post-Construction Ordinance Watershed Districts

Western Catawba District	
BMPs ★	>12% BUA @ 85% TSS & 70%TP removal * >24% in Cornelius
Buffers ★	Same as Central Catawba District
Detention ★	Same as Central Catawba District
Open Space ★	Same as Central Catawba District

Central Catawba District	
BMPs	>24% BUA @ 85% TSS removal
Buffers ★	S.W.I.M. + 30 ft on int. streams
Detention ★	V = post 1-yr, 24-hr storm; P = 10-yr & 25-yr, 6-hr
Open Space ★	<24% BUA = 25%; ≥24% BUA = 17.5%; ≥50 BUA = 10%



Huntersville	
BMPs ★	>12% BUA @ 85% TSS & LID BMPs * >6% in MI Critical Area
Buffers ★	Same as Central Catawba District
Detention ★	V = pre–post 1-yr, or 2-yr 24-hr based on zoning P (> 12% BUA) = 2-yr & 10-yr, 24-hr
Open Space	None

Yadkin District	
BMPs ★	>10% BUA @ 85% TSS & 70%TP removal * >12% in Mint Hill
Buffers ★	<50 ac.= 50 ft.; ≥50 ac. = 100 ft
Detention ★	Same as Central Catawba District
Open Space ★	Same as Central Catawba District

Goose Creek District	
BMPs	Any BUA @ 85% TSS (pre-post, 1-yr, 24-hr)
Buffers ★	S.W.I.M + 100-ft on streams; 200-ft on streams w/floodplain
Detention	V = pre–post 1-yr, 24-hr P = 10-yr & 25-yr, 6-hr
Open Space ★	<20% BUA = 0%; ≥20% BUA = 15%; ≥50 BUA = 10%

★ Exceeds current State requirements

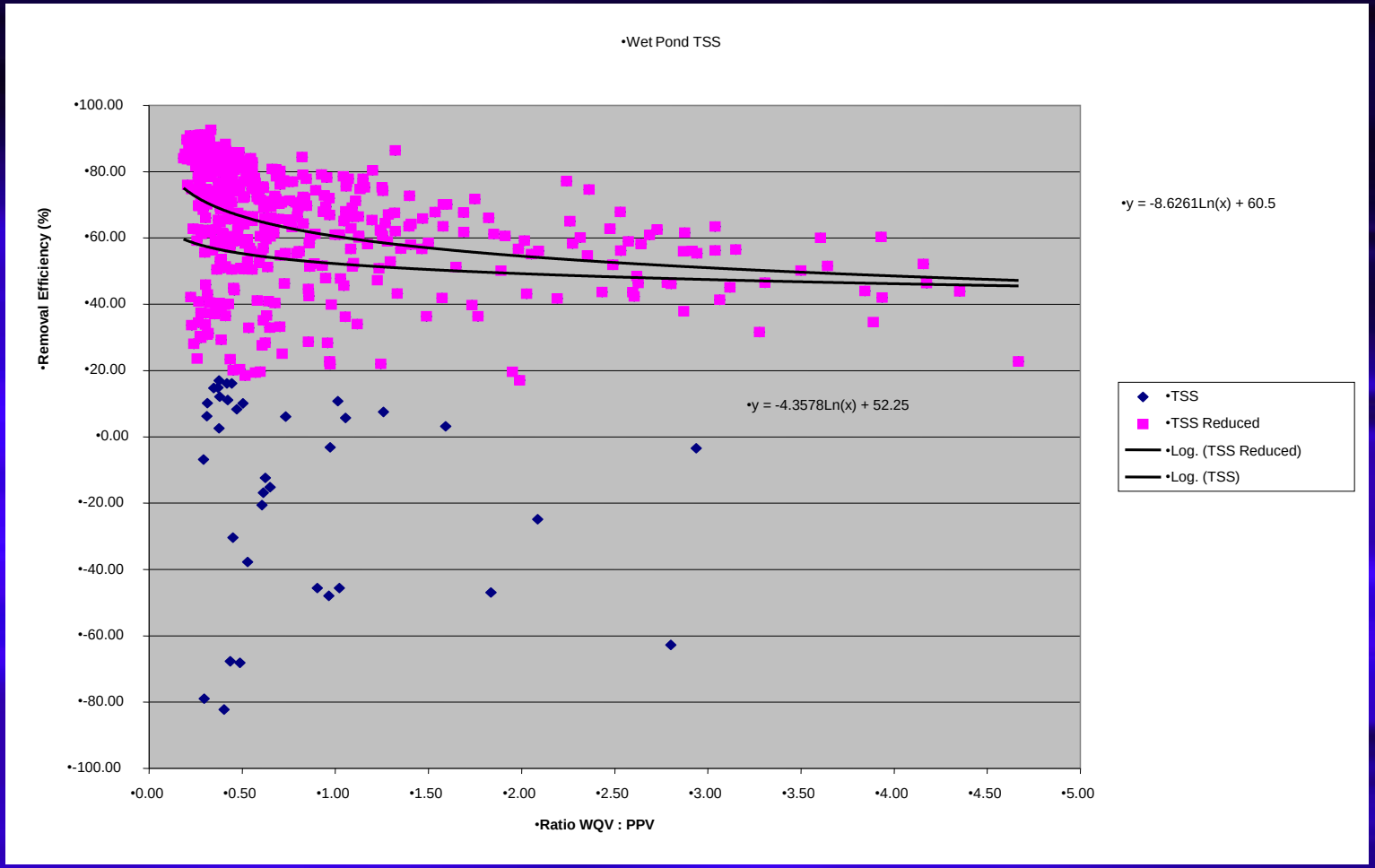
Design Manual Approach (BMP Design Methods)

- Identification of BMP Evaluation Cases
- BMP Assessment Tool (BMP-AT)
- BMP Data Integration
- BMP Performance Evaluations

Design Manual Approach (BMP-AT)

- Sediment Settling (by particle size)
- Sediment Trapping
- Sediment Filtration
- P Sorption onto Solids
- P Sediment/water Diffusion
- P Removal by Biological Uptake

BMP-AT results



Design Manual Approach (BMP-AT Preliminary Results)

BMP		TSS Efficiency*	TP Efficiency*
		(%)	(%)
Hal Marshall Bioretention	Predicted	62	47
	Observed	63	45
Pierson Pond	Predicted	53	4
	Observed	56	41
Shade Valley Pond	Predicted	63	37
	Observed	63	15
Runaway Bay Pond	Predicted	60	53
	Observed	62	36

*concentration based

Design Manual Approach (BMP-AT Preliminary Results)

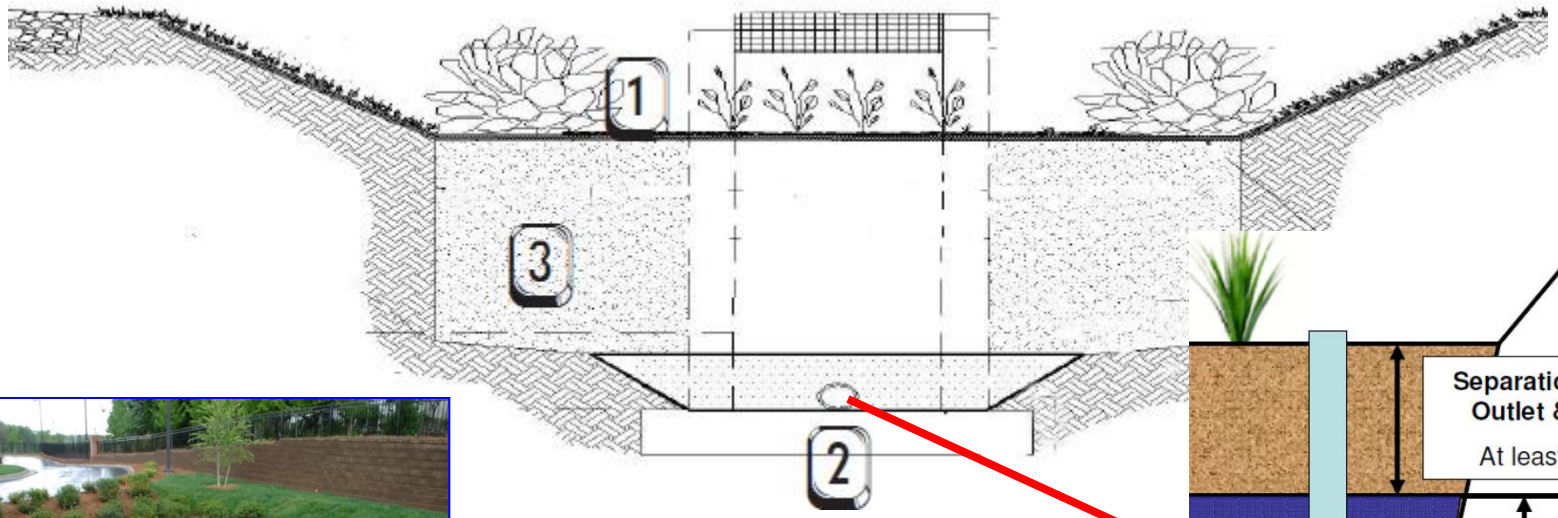
BMP		TSS Efficiency*	TP Efficiency*
		(%)	(%)
Bruns Avenue Wetland	Predicted	70	80
	Observed	66	62
University Park Dry Detention	Predicted	66	10
	Observed	63	8
Morehead Dry Detention	Predicted	58	7
	Observed	71	11

*concentration based

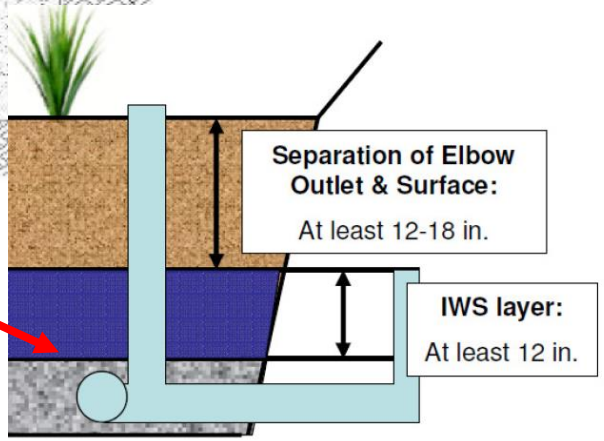
BMP Design & Administrative Manuals

BMP Selection

1. Treatment Capabilities



Bioretention Garden



1. Plants and mulch uptake nutrients, water and other pollutants
2. Internal Water Storage (IWS) reduces stormwater volume by infiltrating stormwater, removes TSS and nitrogen, and reduces temperature.
3. Media removes TSS, nutrients, hydrocarbons, bacteria and reduces temperature.

BMP Selection

2. Site Characteristics

BMP	Size of Drainage Area	Space Required	Stage Allowed	Works with Steep Slopes	Works with Shallow Water Table	Works with Shallow Depth to Bedrock	Works with High Sediment Input	Works in Poorly Drained Soils
Bioretention without Underdrain	S	L	Low	Y	N	N	N	N
Bioretention with Underdrain	S	L	Low	Y	N	N	N	Y
Stormwater Wetland	S-L	L	Low	N	Y	N	Y	Y
Wet Detention Basin	M-L	M-L	High	N	Y	N	Y	Y
Sand Filter	S	S	Medium	Y	N	N	N	Y
Permeable Pavement	S-M	N/A	Low	N	N	N	N	Y
Infiltration Device	S-L	S-L	High	N	N	N	N	N
Filter Strip	S	M	Low	N	Y	Y	N	Y
Treatment Swale	S	S	Low	Y	Y	N	N	Y
Dry Pond	S-L	S-L	High	N	N	N	Y	Y
Rooftop Runoff System	S	S	Low	Y	Y	Y	Y	Y

BMP Selection

3. Costs, Community and Environmental Issues

SCM	Construction Cost	Maintenance Level	Safety Concerns	Community Acceptance	Wildlife Habitat
Bioretention	Med-High	Med-High	N	High	High
Stormwater Wetland	Med	Med	Y	Med	High
Wet Detention Basin	Med	Med	Y	Med	Med
Sand Filter	High	High	N	Med	Low
Permeable Pavement	Med-High	High	N	High	N/A
Infiltration Device	Med	Med	N	Med-High	Low
Filter Strip	Low	Low	N	High	Med
Treatment Swale	Low	Low	N	High	Low
Dry Pond	Med	Med	Y	Low	Low
Rooftop Runoff System	Med-High	High	N	High	Med

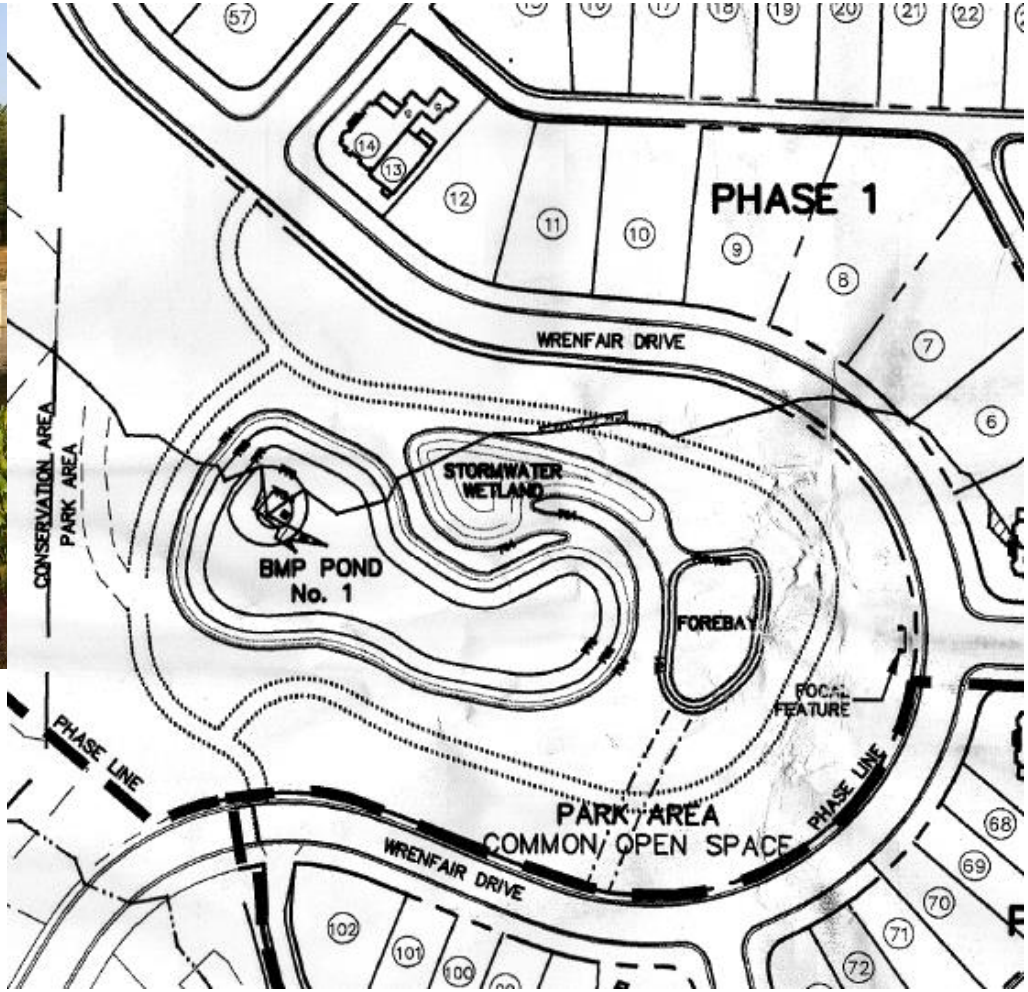
BMP Design – Location

TIPS:

- Create a focal point
- Highly visible areas
- Locate them where community will accept
- Make pedestrian friendly around them
- Design them to increase property values
- Don’t put them in high traffic areas

BMP Design - Create Curb Appeal

BMP Design – Create an Amenity



BMP Design – Create an Amenity

BMP Post Construction O & M Agreement

Ordinance Requirements for Maintenance:

- Operation and Maintenance Agreement (OMA)

  Required at plan approval

INSERT PROJECT NAME (must match plat title)
DECLARATION OF COVENANTS
For Maintenance of Water Quality and Water Quantity Control Structures
Town of (INSERT JURISDICTION)

Recorded at the Register of Deeds

THIS DECLARATION OF COVENANTS, made this ____ day of ____, 20____, by ____ hereinafter referred to as the "Owner" to and for the benefit of the **Town of** (INSERT JURISDICTION) and its successors and assigns.

Exhibit "A"
BMP Maintenance Plan
Toast
Huntersville
26 August 2015

I. General BMP Information [Complete this table with each BMP that is planned within the development. Use the same naming system used on the approved plans, ie. Birkdale Phase I Bioretention 1]

BMP ID Name	Street with Block Number	Parcel Tax ID
Sand Filter	12715 Conner Drive	01716523

Contact Information for Responsible Party	
Name:	Toastery of Huntersville, LLC
Mailing Address:	230 South Main Street, 4th Floor, Davidson, NC 28036
Phone Number:	704.737.7742

II. BMP Site Location Map (attached) [Attach a small site plan map coinciding with the table above to show the general location of each BMP within the development.]

III. BMP Maintenance and Funding Requirements

Documentation that BMP maintenance activities have occurred shall be provided during the annual compliance inspection.

a. For commercial properties under single ownership, the owner may provide maintenance reports, invoices for work performed, etc. as documentation. There are no specific maintenance funding requirements.
b. For property owner associations (POAs or HOAs), the Owner shall establish an Escrow Account or other funding source as approved by the Storm Water

Sand Filter
Maintenance and Schedule

TASK	SCHEDULE
Inspect banks and surrounding drainage areas for erosion and stabilize if necessary	Monthly
Street sweep parking lot	Quarterly
Trash removal	Monthly
Inspect outlet for obstructions	Monthly
Inspect for clogging	Monthly
Inspect inlet grates	Monthly
Skim sand media	Yearly
Pump oil and grit from sedimentation chamber	Yearly or at 50% full
Replace sand media	As needed (expect 3 years)
Grassed Sand Filter Only	
Mow basin to recommended height in alternating patterns to prevent compaction and prevent weed growth. Bag clippings to prevent thatch built-up.	Weekly to bi-weekly during the growing season, as needed other seasons
Light fertilizing to establish healthy roots	Only during the first 2 years
Aerate and dethatch basin floor	Every 2 Years

Budget for BMP Maintenance & Replacement

Item	Description	Estimated Costs	Comments
1	BMP Installation Cost	$21,406.95	
2	Surface Cover Cost (for underground BMPs)	$0	
3	Total Initial BMP Construction Cost [Item 1 + Item 2]	$21,406.95	
4	Down Payment [10% x Item 3]	$2,140.69	
5	Replacement Cost [Item 3 – Item 4]	$19,266.26	
6	Annual Replacement Budget [Item 5 /10 years]	$1,926.62	
7	Annual Inspection & Maintenance Budget [5.4753 x (Item1)$^{-0.0227}$] x Item 1 / 100]	$934.67	
8	Total Annual Budget [Item 6 + Item 7]	$2,861.29	