Stormwater in Winston-Salem
History and Background

- What we have done
  - General program history
  - 60/40 program history
  - Fee history
- Where we are now
General Program History

- 1968 – City Starts participation in National Flood Insurance Program (NFIP)
- 1990 - City named a Phase I Community (Initial Regulatory Requirements)
- 1999 – Phase II legislation signed (Water Quality)
- 2006 – EPA Audits City’s stormwater program
- Currently – City expecting a revised permit covering Phase I and II requirements
60/40 Program History

- Pre 1966 – Public Works Department determines when City will participate in private stormwater projects
- 1966-1978 – Council specifies when City will participate in private stormwater projects
- 1978-1983 – City Council stops City participation in private stormwater projects
- 1983-2003 – City Council adopts new rules and policies specifying when City will participate in private stormwater projects - sets $10,000 price cap
- 2003 – present – City Council raises the cap to $30,000 and increases types of private stormwater projects in which the City will participate
## 60/40 Policy projects

<table>
<thead>
<tr>
<th>Council Approval</th>
<th>Location</th>
<th>Project Cost</th>
<th>City Share</th>
<th>Property Owner Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/15/2003</td>
<td>258 S. Gordon Drive</td>
<td>$13,500</td>
<td>$8,100</td>
<td>$5,400</td>
</tr>
<tr>
<td>9/15/2003</td>
<td>1521 Twelfth &amp; 1 1/2 St</td>
<td>$17,000</td>
<td>$10,200</td>
<td>$6,800</td>
</tr>
<tr>
<td>9/15/2003</td>
<td>1749 Camden Road</td>
<td>$25,000</td>
<td>$15,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>10/27/2003</td>
<td>2521 Parkway Drive</td>
<td>$17,200</td>
<td>$10,320</td>
<td>$6,880</td>
</tr>
<tr>
<td>1/20/2004</td>
<td>2934 Buena Vista Road</td>
<td>$13,500</td>
<td>$8,100</td>
<td>$5,400</td>
</tr>
<tr>
<td>2/16/2004</td>
<td>581 and 571 Westoak Trail</td>
<td>$10,600</td>
<td>$6,360</td>
<td>$4,240</td>
</tr>
<tr>
<td>9/20/2004</td>
<td>512 Granville</td>
<td>$13,300</td>
<td>$7,980</td>
<td>$5,320</td>
</tr>
<tr>
<td>10/18/2004</td>
<td>833 Lockland</td>
<td>$16,200</td>
<td>$9,720</td>
<td>$6,480</td>
</tr>
<tr>
<td>2/21/2005</td>
<td>2500 Merrimont Drive</td>
<td>$1,300</td>
<td>$780</td>
<td>$520</td>
</tr>
<tr>
<td>9/5/2006</td>
<td>Greenmeadows Lake</td>
<td>$30,000</td>
<td>$18,000</td>
<td>$12,000</td>
</tr>
<tr>
<td>9/5/2006</td>
<td>1337 Reynolda Road</td>
<td>$11,000</td>
<td>$6,600</td>
<td>$4,400</td>
</tr>
<tr>
<td>3/6/2006</td>
<td>Miller Park Circle</td>
<td>$34,000</td>
<td>$20,400</td>
<td>$13,600</td>
</tr>
<tr>
<td>5/6/2006</td>
<td>245 Gloucestershire Rd</td>
<td>$30,000</td>
<td>$18,000</td>
<td>$12,000</td>
</tr>
<tr>
<td>6/6/2006</td>
<td>1309 Argonne Blvd.</td>
<td>$6,700</td>
<td>$4,020</td>
<td>$2,680</td>
</tr>
<tr>
<td>8/6/2006</td>
<td>1008 Blakeford Ct.</td>
<td>$13,000</td>
<td>$7,800</td>
<td>$5,200</td>
</tr>
<tr>
<td>9/6/2006</td>
<td>Swaim Court</td>
<td>$240,000</td>
<td>$144,000</td>
<td>$96,000</td>
</tr>
<tr>
<td>12/1/2006</td>
<td>2920 Loch Drive</td>
<td>$29,700</td>
<td>$17,820</td>
<td>$11,880</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$522,000</strong></td>
<td><strong>$313,200</strong></td>
<td><strong>$208,800</strong></td>
</tr>
</tbody>
</table>
# Fee History

<table>
<thead>
<tr>
<th>Ordinance Adoption Date</th>
<th>Annual Residential Fee</th>
<th>Annual Commercial Fee (per impervious acre)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/16/1996</td>
<td>$30</td>
<td>$220</td>
<td>Initial fund set-up to cover drainage maintenance and basin studies</td>
</tr>
<tr>
<td>6/21/1999</td>
<td>$36</td>
<td>$264</td>
<td>Increased operating, capital, and basin study expenses</td>
</tr>
<tr>
<td>7/1/2002</td>
<td>$36</td>
<td>$264</td>
<td>Stormwater fund began funding 50% of street sweeping in FY 02-03.</td>
</tr>
<tr>
<td>6/17/2003</td>
<td>$46</td>
<td>$335</td>
<td>Covered 75% of leaf collection and remaining 50% of street sweeping in the General Fund*</td>
</tr>
<tr>
<td>6/22/2004</td>
<td>$49</td>
<td>$359</td>
<td>Covered remaining 25% of leaf collection (ZBB recommendation)</td>
</tr>
<tr>
<td>7/1/2006</td>
<td>$51</td>
<td>$487</td>
<td>Increase to cover the cost of high priority capital projects identified in basin studies</td>
</tr>
</tbody>
</table>

Note: The plan review fee of $220/site has remained unchanged since 1996
### Possible tiered residential rate

<table>
<thead>
<tr>
<th>Residential Tier</th>
<th>Impervious Area Range (square ft)</th>
<th>Rate Adjustment</th>
<th>Number of Residential Parcels</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-500</td>
<td>0</td>
<td>410</td>
</tr>
<tr>
<td>1</td>
<td>500-1000</td>
<td>0.75</td>
<td>4,506</td>
</tr>
<tr>
<td>2</td>
<td>1000-2000</td>
<td>0.85</td>
<td>17,745</td>
</tr>
<tr>
<td>3</td>
<td>2000-4000</td>
<td>1</td>
<td>27,564</td>
</tr>
<tr>
<td>4</td>
<td>4000-6000</td>
<td>1.5</td>
<td>7,829</td>
</tr>
<tr>
<td>5</td>
<td>&gt; 6000</td>
<td>2</td>
<td>3,873</td>
</tr>
</tbody>
</table>
## Where the money comes from

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan review fees</td>
<td>$5,000</td>
<td>0.10%</td>
</tr>
<tr>
<td>Residential Stormwater Fees</td>
<td>$2,911,030</td>
<td>43.4%</td>
</tr>
<tr>
<td>Non-residential Stormwater Fees</td>
<td>$3,784,090</td>
<td>56.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$6,700,120</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
## City Comparisons
### Programs Funded by a Stormwater Utility

<table>
<thead>
<tr>
<th>City</th>
<th>Water Quality</th>
<th>Drainage Maintenance</th>
<th>Seasonal Leaf Collection</th>
<th>Street Sweeping</th>
<th>Litter Collection</th>
<th>Drainage Maintenance on Private Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlotte</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes, partially</td>
<td>No</td>
<td>Yes, but only with an easement</td>
</tr>
<tr>
<td>Durham</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes. Cost share waived for private property single-family residents</td>
</tr>
<tr>
<td>Greensboro</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Raleigh</td>
<td>Yes</td>
<td>Yes in part</td>
<td>No</td>
<td>Yes, part</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Winston-Salem</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
## City Comparisons continued

<table>
<thead>
<tr>
<th>City</th>
<th>Annual Residential Fee (based on square footage of impervious area)</th>
<th>Annual Commercial Fee per impervious acre</th>
<th>Revenue from fee</th>
<th>FY 05-06 Stormwater Capital Projects Budget</th>
<th>Funding Sources for FY 05-06 Capital Projects</th>
<th>Number of Stormwater Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlotte</td>
<td>&lt;2000 sq ft - $62.50 &gt;2000 sq ft - $80.70* *includes $12.70 for county stormwater program</td>
<td>$1,116</td>
<td>$33,600,000</td>
<td>$36,400,000</td>
<td>SW Rev Bonds $11,800,000 pay as you go $27,100,000</td>
<td>25 Admin 67 O&amp;M</td>
</tr>
<tr>
<td>Durham</td>
<td>&lt;2000 sq ft - $26.04 &gt;2000 sq ft - $54.00</td>
<td>$980</td>
<td>$7,377,545</td>
<td>1,675,000</td>
<td>pay as you go 1,675,000</td>
<td>15 Admin 38.5 O&amp;M 6.42 Other</td>
</tr>
<tr>
<td>Greensboro</td>
<td>600-1900 sq ft - $18 1900-2999 sq ft - $32.40 2900+ sq ft - 46.80</td>
<td>$555</td>
<td>$9,109,336</td>
<td>1,755,728</td>
<td>pay as you go 1,755,728</td>
<td>10.75 Admin 63.165 O&amp;M</td>
</tr>
<tr>
<td>Raleigh</td>
<td>400 - 1000 sq ft - $19.20 1000 - 3899 sq ft - $48.00 &gt;3870 sq ft - $81.60</td>
<td>$925</td>
<td>$12,169,757</td>
<td>$5,938,000</td>
<td>pay as you go $5,938,000</td>
<td>40 Total for Admin, O&amp;M contracted to other City Divisions</td>
</tr>
<tr>
<td>Winston-Salem</td>
<td>$51.00 all residential lots</td>
<td>$487</td>
<td>$6,200,000</td>
<td>$855,000</td>
<td>pay as you go $855,000</td>
<td>7 Admin 36 O&amp;M</td>
</tr>
</tbody>
</table>
Where we are now

- Drainage maintenance (within Right-of-way)
- Basin studies
- Capital projects in the right of way
- Annual mailings from Emergency Management to homeowners in the flood plain
- 5% discount on flood insurance due to compliance with National Flood Insurance Program
- Stream cleanup programs
What the money pays for

Stormwater Utility Expense

- Capital Projects Reserve, $777,560
- Public Education, $76,910
- Drainage Maintenance, $2,421,440
- Seasonal Leaf Collection, $1,199,210
- Street Sweeping, $365,530
- Vector Control, $20,000
- Administration/NPDES Compliance, $962,940
- Water Quality, $427,530
- Public Education, $76,910
What is Drainage Maintenance?

- 1/3 of the program cost
- Routine maintenance of pipes, catch-basins and other stormwater structures in the R/W.
- Repairs/Upgrades to the public drainage system.
- Private property owner drainage assistance under the 60/40 policy.
Routine Maintenance of Storm Drainage Systems.
Drainage improvements at Wicklow Road.
What are basin studies and why do they?

- They are master planning documents for stormwater basins
  - They identify stormwater “hot-spots”
  - This helps reduce flooding
  - This helps protect the public infrastructure
- They estimate cost/benefit ratios
  - This allows us to prioritize projects
  - Which allows us to spend money wisely
- They allow us to evaluate water quality
- They allow us to meet regulatory requirements
Capital projects

- Currently public system only
- Over 30 projects in throughout the City
- Cost of over $24,000,000 and growing
- 15 years to complete
- Does not include recently annexed areas
- New projects will develop in the future
So what is the problem?

- Flooding
  - Yard flooding
  - Dwelling flooding
  - Out of date FEMA flood mapping
- Erosion
  - Mud from new developments
  - Erosion of Stream banks
- Adequacy of 10 year standard
- Maintenance of water quality
- Maintenance of private storm drainage systems
What is the problem (cont)

- Clogged storm drains
- Public education on who owns the streams
- Cleaning of debris from streams
- Public information on where the floodplains are
- Development in the floodplain
How widespread is the problem?

- Community-wide
  - Map of 100 year flood area
  - Maps of flood prone areas
  - Detailed flooded homes map/pictures
  - Table of flooded properties and prices
  - Pictures of erosion and of poor water quality
  - Pictures of private stormwater ponds
Bethania Station Road (Flooding)
Linda Circle (Flooding)
Queensbury Road (Flooding)
Queensbury Road

[Images of Queensbury Road area, showing a house and a stream nearby.]
Swaim Court

06/09/2006

[Images of an outdoor area with trees and buildings, marked with '06/09/2006']
Cost of acquiring flooded properties

- Approximately 200 homes in flood plain
- $24,000,000 estimated
- Does not address replacement value
- Does not include demolition costs
- Does not anticipate any relocation costs
- Does not include recently annexed areas
- Lost tax base of $116,000 annually
Erosion problems

- Natural erosion is not regulated
- Development of marginal sites
- Infill development proximity to existing homes
- Design storm adequacy
- Cumulative effects downstream from development
- Mass grading of large sites
- Inspection capability
- Diminished natural buffers
Water velocity and energy

- Important because it can cause erosion
- Acceptable maximum velocity determined by subsurface conditions
  - Rip-rap stone can accept high water velocity
  - Vegetated or sandy subsurface condition require low water velocity
- Managed water velocity is reduced by energy dissipation devices before going into streams
Mass grading
Infill development
Reduced stream buffers
Rough terrain
Land graded in floodplain
Overwhelmed erosion systems
Grading in flood plain

NORMAL FLOOD AREA

FLOOD AREA AFTER UPSTREAM DEVELOPMENT FILLS IN THE FLOOD FRINGE AND RAISES FLOOD LEVELS
Diagram of grading in floodplain

100 YEAR FLOOD PLAIN

FLOOD FRINGE

FLOODWAY

FLOOD FRINGE

NEW FLOOD LEVEL
OF STREAM

STREAM CHANNEL

NATURAL FLOOD LEVEL
OF STREAM

GRADED AREA
Audit requirements

- Inventory storm sewers on private property that are connected to the City system, Industrial and Municipal operations as well as existing stormwater management facilities.
- Conduct dry weather screening of outfalls on private property.
- Increase the number of annual pollution prevention inspections of industry and business.
- Develop stormwater pollution prevention plans for municipal operations.
- Implement ordinance addressing post construction stormwater controls for areas outside the Water Supply Watershed.
Future Environmental Requirements

- **Total Maximum Daily Load (TMDL)**
- **Maximum amount of pollutant a stream can receive and still meet water quality standards.**

  - **Salem Creek**: Impaired for Fecal Coliform (bacteria) and turbidity (mud).
  - **High Rock Lake**: Impaired for nutrients (fertilizer) and turbidity (mud).
Stormwater Solutions

- Flooding
- Erosion
- Adequacy of standards
- Water quality
- Maintenance of private systems
- Development in flood plain
Flooding Solutions

- Participate in FEMA housing buyout program
- Develop City only house buyout program for interested sellers
- Grants from State Emergency Management Program
- Loosen requirements for City financial participation in drainage solutions
- Increased City catch basin cleaning
- Partnership with NCDOT for increased catch basin cleaning on state roads
- Increased public education
Erosion Solutions

- Strengthen the erosion control ordinance
- Tree save ordinance
- Increased funding for enforcement activities
- Loosen requirements for City financial participation
Adequacy of Existing Standards Solutions

- Implement new standards to cover 2 year as well as 10 year storms
- Require distributed stormwater control devices
- UDO amendment to uniformly require stormwater management plans for all new development and re-development
Water Quality Solutions

- Implement ordinance requiring Post Construction Stormwater controls to treat water quality (Phase II rules).
- Pursue funding for stormwater retrofit projects in watersheds with impaired streams.
- Pursue funding for stream restoration projects to reduce channel erosion.
- Increase citizen awareness through public education/involvement efforts.
- Increase staffing to address pollution prevention/ good housekeeping issues from business, industry and construction sites.
Maintenance of Private Systems Solutions

- Inventory private systems
- Conduct marketing campaign to inform homeowners about these devices and their maintenance and their responsibility for maintaining devices
- Allow for City participation in device maintenance costs
Development in the floodplain

Solutions

- Revisions to UDO to reduce or eliminate grading in flood fringe
- More stringent requirements for mitigating effects of development in flood fringe
Possible unintended consequences

- Different standards for City and County could redirect normal development
- Some residents may not be able to afford their part of a shared solution
- Requests could exceed the City’s resources (waiting lists)
Next Steps

- Charette with the public
- Communications with State Emergency Management Office about options
- Briefings for the development community
- Additional Public communication through the media
- Council actions
  - Ordinance and policy changes
  - Budget consideration
  - Stormwater rates and tier levels
Questions
Overview of handouts
Public Comments