Downtown Drainage Improvements Study and Plan
Outline

- Downtown Flooding
- Concepts for Reducing Flooding
- Improvements Required to Significantly Reduce Flooding
- Redevelopment Concept
- Costs
- Questions and Comments
- Downtown Flooding
Current Drainage System

- King Creek Culvert ~1940
- Old Brush Creek Culvert 1933
- Warehouse Culvert 1940
- New Brush Creek Culvert ~1974

Legend:
- City Streets
- City Parks
- City Waterways
- City Landfills
- City Open Spaces

1 inch equals 100 feet
Causes of Flooding

- **Backwater effects** in Brush Creek culvert from downstream reduce capacity of culverts to move floodwaters out of downtown.
- **King Creek culvert is undersized**
  - Floodwaters overflow the King Creek culvert and flow into the low area of downtown.
- **Brush Creek floodwaters overflow** onto State of Franklin Road, and ultimately into downtown.
King Creek culvert overflow

King Creek Culvert ~1940

Old Brush Creek Culvert 1933

Warehouse Culvert 1940

New Brush Creek Culvert ~1974
Current Drainage System

- King Creek Culvert ~1940
- Old Brush Creek Culvert 1933
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Brush Creek overflow
State of Franklin Rd and Buffalo St (August 2003)
- City Public Works Concept
  - relatively low cost, short-term approach
  - new inlets and storm sewers in downtown area
  - route collected flows to old Brush Creek culvert
City’s Concept - Results

- Not hydraulically effective due to backwater effects

Models available
City’s Concept - Results

- Repairing the Old Brush Creek culvert would be difficult and costly.
not a feasible solution to the downtown flooding problem due to:
- Backwater Effects
- Condition of the Old Brush Creek Culvert
- Continued overflow from King and Brush Creek
City Public Works Revised Concept

- the City tasked AMEC to evaluate an alternative
- **add a pond** (surface sump) in the downtown area
- the pond would serve to capture surface flow much more effectively than a number of inlets
Showed little overall flood depth improvement due to
- backwater effects
- King Creek culvert overtopping
- Brush Creek overflows upstream
City’s Revised Concept - Conclusions

- Revised concept would be ineffective

- **No low cost, short-term solution to downtown flooding**

- Any significant improvement would require that
  - downstream **backwater** must be addressed
  - King Street culvert **capacity** must be increased
  - upstream **overtopping** of Brush Creek must be reduced
  - address the **deterioration** of the Old Brush Creek culvert
Additional Concepts

- City tasked AMEC with evaluating five additional concepts
Additional Concept 1
Re-route King Creek with pipe(s) and/or combination of natural channel and pipes and move outlet downstream of existing outlet of Brush Creek culvert.

- Would keep downtown from flooding during 2-year storm by keeping flow from going overland at King Street and flowing into downtown.
Concept 2: King Creek Bypass, Pond and King Street Open Channel

Additional Concept 2
Maximize natural channel and only pipe water as required to Storage Area, then move outlet of King Creek to downstream of existing outlet of Brush Creek culvert.

- Additional storage and better capture of overland flow improve flood protection to the 5-year storm level
The flood storage volume at Kiwanis Park, Carver Park, and King Street would not significantly improve the protection provided by Concept 2.
The pond and lower bypass would alleviate flooding in the downtown, however:

- Walls to keep overland flow on King Street would increase flow depths by almost two feet on King
  - Safety concerns
  - Stormwater backflow
Concept 5: Separate King and Brush Creeks at Main Junction

- No appreciable improvement in flood levels due to backwater

Additional Concept 5
Isolate existing King Creek/Old Brush Creek Culvert into one (1) barrel and keep Brush Creek in the other two (2) barrels.

Rework connection so that Brush Creek doesn't influence King Creek until the end of pipe.
By inspection, for all concepts studied the reductions in flooding would be minimal compared to the cost of the improvements.

Concept 2 (the King Street Bypass culvert and the U-Haul Pond) would be most beneficial, but still only provide protection for up to the 5-year flood.

- the recent storm of July 8th would not have caused flooding if Concept 2 had been in place.
A large-scale project would be required to obtain significant flood protection.
Requirements of an Effective Concept to Significantly Reduce Flooding

- The City tasked AMEC to develop a concept that would be effective in significantly reducing downtown flooding
- AMEC extended Concept 2 (bypass culvert and pond) to include:
  - an open channel to replace the Old Brush Creek culvert
  - additional culvert capacity at S. Commerce Street and Watauga Street
  - three large regional detention ponds in the headwaters of Brush Creek
Effective Concept - Downtown

A. King Street open channel and culvert
B. King Street bypass culvert
C. Pond at U-Haul
D. Open channel along old Brush Creek culvert alignment
E. Additional culvert capacity at South Commerce Street and Watauga Street
Effective Concept – Regional Detention Ponds

Downtown Flooding Area

LP Auer

Antioch

Lone Oak

Regional Detention Ponds
Lone Oak Pond
Effective Concept - Results

- **Phase 1.** Construct the King Street bypass culvert and the King Street collection pond (at U-Haul); would provide 5-year protection (a version of Concept 2)

- **Phase 2.** Replace the old Brush Creek culvert with an open channel and associated infrastructure improvements; would provide 25-year flood protection

- **Phase 3.** Add three regional detention ponds in Brush Creek watershed; would provide 50 to 100-year protection
Existing 50-Year Flood
50-Year Flood with Effective Concept
**Effective Concept - Results**

- **Phase I.** Construct the King Street bypass culvert and the King Street collection pond (at U-Haul); would provide 5-year protection (a version of Concept 2)
  
  Estimated Cost: $11.2 million

- **Phase 2.** Replace the old Brush Creek culvert with an open channel and associated infrastructure improvements; would provide 25-year flood protection
  
  Estimated Cost: $9.7 million

- **Phase 3.** Add three regional detention ponds in Brush Creek watershed; would provide 50 to 100-year protection
  
  Estimated Cost: $4.8 million
Existing Conditions

- Property Statistics
  - Total Assessed Value: $14,277,200
  - Property Tax Revenue: $110,200

- Flood Damages
  - Annual Cost: $809,000

- Using FEMA limited-data methodology and existing assessed values
The concept would be effective in significantly reducing flooding in downtown.

However, the reduction in flooding would be achieved at a high cost.

It is apparent that the feasibility of any such project would require realization of substantial benefits other than flood protection for existing flood-prone properties.
Goals of Redevelopment:

• Re-establish the downtown district as the city center
• Acknowledge the intrinsic value of a historic downtown
• Highlight “unique spaces”
• Provide range of uses and activities
• Combine new retail and residential opportunities
• Incorporate storm drainage systems into plan
Proposed Redevelopment Plan

- Public Plaza
  - Interactive Kid's Zone
  - Water Play
  - Pond Overlook

- Future Development

- Public Park

- Natural Flood Plain

- Renovated Commercial & Retail (Typical)

- Landscaped Channel

- First Presbyterian Church

- Anchor Commercial Development

- Parking/Public Events Market

- New Parking

- Pedestrian Oriented Paving

- New Parking

- Public Park/Outdoor Learning Environment

- City Entry Signage/Fountain Park

- Redevelopment Gateway

- Renovated Commercial Retail

- Existing Parking to Remain

- Visual Icon Tower

- EMBARQ

- Water Retention Feature

- First Tennessee Bank

- Natural Flood Plain

- Proposed Bicycle Greenway

- St. John's Episcopal Church

- Central Baptist Church

- Public Library

- Carver Park
Retail and Commercial Redevelopment

Streetscape Improvements

Bus Station

Open Plaza

Landscaped

Open Channel for Drainage

First Presbyterian Church

Pedestrian Friendly Crossings

West Market Street and Commerce Street Area
Bethesda, Maryland
Charleston, South Carolina
Quincy Market, Boston, Massachusetts
Redevelopment Gateway
Outdoor Learning Environment
Pond and Park Area
Public Parking
Proposed Bike Trail

South Commerce Street Area
Existing Conditions

- Property Statistics
  - Total Assessed Value: $14,277,200
  - Property Tax Revenue: $110,200

- Flood Damages
  - Annual Cost: $566,000

- Using FEMA limited-data methodology and existing assessed values
With Proposed Project

- Property Statistics
  - Total Assessed Value: $101,736,400
  - Property Tax Revenue: $785,400

- Flood Damages
  - Annual Cost: $23,000

- Using FEMA limited-data methodology and redeveloped assessed values
Changes

- Property Statistics
  - Increase Assessed Value: $87,460,000
  - Increase Property Tax Revenue: $675,200

- Flood Damages
  - Decrease Annual Cost: $543,000