Four Mile Run Watershed Feasibility Study
Project History

- Initial discussions began in 2003
- Feasibility cost-sharing agreement signed January 2004
- Cost-sharing is 50 percent Federal, 50 percent non-Federal
- City/County share is through in-kind services by staff
- The early years (2004-2007):
  - Detailed survey of existing levee/floodwall/channelization project corridor
  - Hydrologic and hydraulic modeling, leading to determination of new 100-year flow
  - Watershed assessment and stream walk
    - Upstream of Walter Reed Drive, no areas warranted Federal involvement
    - Good upstream stormwater management since 1977
    - Streambed is stable, a lot is bedrock
    - Most of upstream corridor is in parkland
More recent work (2008-2010):

- Detailed field investigations of lower corridor
- Development of feasibility designs for stream restoration
- Identification of real estate needs (upstream of existing levee/floodwall/channelization system)
- Modeling of hydraulic impacts
- Preparation of project cost estimate
- Analysis of ecological benefits

And now, a more detailed presentation of the stream restoration designs
Stream Restoration Design
Presentation Outline

1) Historic Perspective
2) Existing Conditions
3) Objectives
5) Fluvial Geomorphic Design
6) Proposed Solution
Four Mile Run  pre-1885
Historic Perspective

Four Mile Run  circa 1945
Historic Perspective

Four Mile Run channel evolution
Existing Conditions

Four Mile Run today

STRESSORS
- Bridges/Infrastructure
- Increased imperviousness
- Development

Habitat loss
Excessive nutrients
Sedimentation
Flooding
Impaired water quality
Four Mile Run  today

West Glebe Road bridge conveyance problems

Existing Conditions  Do you want this one????
Existing Conditions

Downstream Area

Mudflats at low tide

Excessive sedimentation caused by lack of defined channel, tidal influence and improper sediment maintenance
Existing Conditions

Moving Upstream

Outfall on right bank upstream of West Glebe Road
More than 4 feet of downcutting since levee construction

Saprolite feature that has become exposed
Existing Conditions

West Glebe Road bridge
Existing Conditions

**I-395 bridge**
Remnants of an old bridge structure and sheet piling under the right bridge span

**West Glebe Road bridge**
Upstream view of conveyance problems
Existing Conditions

Fish blockages

Streambed degradation upstream of Shirlington Road
Existing Conditions

Long Branch

Check dam/ grade control
Summary of Problems

- Bridges!
- Gabion baskets
- Development/Outfalls
- Lack of floodplain
- Sediment
- Instability
- Trash
- Lack of vegetated buffer
- Fish blockages

Positive Impacts on Four Mile Run

Municipalities – sewer maintenance
Engineering Objectives

- Maintain flood protection
- Improve conveyance through structures crossing the stream – reduce back eddies and erosion
- Increase stability of the stream system
- Provide self-sustaining geomorphic conditions to reduce/eliminate channel maintenance
- Remove fish blockages
- Establish smooth transition from alluvial system into tidal environment
- Improve aquatic habitat
- Improve visual values
Fluvial Geomorphology

- Channel slope
- Width
- Depth
- Discharge
- Velocity
- Channel roughness
- Sediment size (Leopold et al., 1964)
Fluvial Geomorphology

Further Classification

The Key to the Rosgen Classification of Natural Rivers

KEY to the ROSGEN CLASSIFICATION OF NATURAL RIVERS. As a function of the "continuum of physical variables" within stream reaches, values of Entrenchment and Sinuosity ratios can vary by +/- 0.2 units; while values for Width / Depth ratios can vary by +/- 2.0 units.

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Example

Fluvial Geomorphic Approach

Priority 2 Restoration
New Stable Channel
Lower Floodplain

Priority 3 Restoration
New Stable Channel
Narrow Floodplain

From Doll et al., 2003
Fluvial Geomorphic Approach

Four Mile Run – Combination of Techniques

Provide floodplain access:
1) Raise streambed  2) Cut into terrace to create bench
Cross Vane
Fluvial Geomorphic Structures

J-hook

[Diagram and image of J-hook structure]
W-weir
Fluvial Geomorphic Approach

- Create proper dimension, pattern and profile for Four Mile Run
- Use structures to guide flow and provide grade control

**The instream structures will improve conveyance without increasing the water surface elevations.**
Proposed Solutions
Proposed Solutions
Proposed Solutions
Proposed Solutions
Proposed Solutions
Proposed Solutions
Proposed Solutions
Conclusions

* Improve conveyance through stream crossings, decreasing local flooding

* Proposed cross-vane, J-hook and W-weir structures, in combination with proper stream geometry and profile will create a stable, healthy, functional stream system.
Project Status and Future

- Stream designs are completed
- Project construction cost estimated at $9M
  - Includes real estate, plans and specs, construction, management
- Preliminary benefit analyses were conducted
- USACE to complete internal draft report in September 2011
- Implementation options are being considered:
  - Traditional USACE implementation – cost-sharing = 65-35
  - Section 510 implementation – cost-sharing = 75-25
  - Section 206 implementation – cost-sharing = 65-35
  - Section 1135 implementation – cost-sharing = 75-25
Thank you.