URBANIZED STREAM CORRIDOR: COMMUNITY APPROACH TO ADDRESS EROSION

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Today’s Agenda

• Urbanized Stream Erosion
• Solving Stream Erosion Problems
  – Case Studies
• City Perspective – Grand Prairie
• Closing Thoughts
Urbanized Stream Erosion

• Why do urbanized streams erode?
Urbanized Stream Erosion

• Increased development over time

1958
1984
Current
Urbanized Stream Erosion

- Increased stream flows = higher velocities
Urbanized Stream Erosion

• Channel Evolution Model
  – Low flow, more frequent storm events
  – Drought conditions – then heavy storms (i.e. 2015)
  – Erosion compounds itself
  – Hard substrata leads to widening/meandering

• Geomorphological assessment
Urbanized Stream Erosion

• Streams want to reach equilibrium slope
  – Downcutting
Urbanized Stream Erosion

- Streams want to reach equilibrium slope
  - Meandering
Urbanized Stream Erosion

• Streams want to reach equilibrium slope
  – Widening
Urbanized Stream Erosion

• Threat to properties and infrastructure
Solving Stream Erosion Problems
Solving Stream Erosion Problems

• Variety of solutions will work
• Consider what is preferable to use for your City
• Structural solutions:
  – Channel Banks (Public or Private)
    • Turf reinforcement mats/vegetation, gabions, rock rip-rap, concrete bag walls, pre-cast block walls
  – Channel Bottom (Public)
    • Rock chutes, drop structures, vanes, riffle pools
    • Overflow weirs and diversions
Solving Stream Erosion Problems

• Case Studies
  – Jackson Creek – City of Colleyville (2001)
  – Kirby Creek – City of Grand Prairie (2007)
  – Lennox Lane – City of Arlington (2015)
Jackson Creek - Colleyville

• Overview
Jackson Creek - Colleyville

• Study – 1999

Approx. 600 LF of natural channel downstream of U-shaped concrete-lined flume
Jackson Creek - Colleyville

• Study (1999) - Challenges
  – High velocities from upstream concrete U-channel
  – Plunge pool downstream of U-channel
  – Low water crossing at Sherwood Lane
  – Meandering & channel migration
  – Widening occurring due to larger storm events
Jackson Creek - Colleyville

• Study (1999) - Solutions
  – Rock riprap & gabion mattress at U-channel outfall
  – Re-align meander (less than 300 linear feet)
  – Bench channel 10-20 feet away from homes
  – Gabion mattress protection near structures
  – Vegetated TRMs on all other slopes
  – Raise Sherwood Lane & install box culverts to provide 100-year flood protection
Jackson Creek - Colleyville

• Construction – 2001-02

- Gabion & Riprap Protection at CLC outfall
- Gabion mattress side slopes
- Box culverts @ Sherwood Lane = 100-yr flood protection
- Slopes laid back, vegetated TRM and pretty trees!
Jackson Creek - Colleyville

• 2009

• Today
Kirby Creek – Grand Prairie

• Overview
Kirby Creek – Grand Prairie

• Channel Stability Assessment - 2004

Severe Scour  Toe Failures  Downcutting
Kirby Creek – Grand Prairie

• Grade Stabilization – Rock Chutes
  – At knickpoints
  – Straight reach
Kirby Creek – Grand Prairie

- Construction - 2007
Kirby Creek – Grand Prairie

- Construction - 2007

At 96” RCP Outfall near Christopher Drive
Kirby Creek – Grand Prairie

• 2009

At 96” RCP Outfall near Christopher Drive
Kirby Creek – Grand Prairie

• Today

At 96” RCP Outfall near Christopher Drive
Lennox Lane - Arlington

• Overview
  – Erosion after May-June 2015 floods
  – Meandering & channel migration
  – Emergency Repair

• Solutions
  – Gabion basket wall
  – Sanitary sewer relocation
Lennox Lane – Arlington (May 2015)
Lennox Lane – Arlington (June 2015)
Lennox Lane – Arlington (Jan 2016)
Lennox Lane – Arlington (Jan 2016)
Lennox Lane – Arlington (Jan 2016)
Lennox Lane – Arlington (2017)
City Perspective
City Perspective

Resolution No. 3919 (2003)
(Defines Public and Private Improvements)

• “... The City will focus on improvements to the waterways that will result in a general public benefit, such as lowering erosive velocities and increasing flow capacities in proximate streams for the general prevention of erosion and flooding.”

• Focus is on the Master Plan approach.
City Perspective
Drainage Master Plans

• Provide recommendations for public improvements
• Provide suggestions for private property improvements
• Address erosion hazard setback
• Consider existing and fully developed conditions
City Perspective
Previous Erosion Projects

• Bluegrass Drive (Fish Creek) - 1998
  – Construction for gabion wall & stabilization ✓
City Perspective

How Should Grand Prairie Address Erosion?

• Public/Private defined in Res. 3919 (2003)
• Projects deemed as private responsibility are too costly for residents
• Public projects start out as a small cost to fix but become very expensive to maintain/repair long-term
• Additional cost-effective solution should be considered
  – Voluntary buyout for public and private erosion
City Perspective

Resolution No. 4812 (2016)

- Adopted April 2016
- Keeps previous language
- Provides option for voluntary buyout to address private erosion
- Protect existing utilities
City Perspective
Resolution No. 4812 (2016)

• Case-by-case situation
• If qualifications met, then
  – Property owner signs “Request for Consideration for Voluntary Buyout Program Investigation and Permission to Appraise”
  – Property owner obtains flood insurance for the duration of the buyout process
  – City hires geotechnical engineer to perform more detailed evaluation (bore samples)
  – City obtains appraisal
  – Funding included for Budget consideration
  – City Council makes final decision
City Perspective

Erosion Projects under Res. 4812

• Windhurst Drive (Kirby Creek)
City Perspective
Erosion Projects under Res. 4812

• Windhurst Drive (Kirby Creek)

• Options Considered
  – Gabion wall for residents to design & install ($859k)
  – Purchase property and demo house ($178,900)
City Perspective

Erosion Projects under Res. 4812

• Windhurst Drive (Kirby Creek) - Solution
• Two houses appeared to qualify for the voluntary buyout option
• Only one house met the Resolution requirements
• House is demolished
• Property is dedicated and maintained as Stormwater Management Area
City Perspective
Erosion Projects under Res. 4812

• Sir Roland Drive (Kirby Creek) – 2017 Completion
  – Slope failure & public utility repairs ✓
CLOSING THOUGHTS

• Establish a defined Erosion Policy or Ordinance
  – Voluntary buyouts for severe private erosion issues
  – Set Erosion Hazard Setbacks for new development

• Structural solutions
  – Determine channel evolution stage (geomorphology)
  – Determine type(s) of erosion to understand solutions
  – Focus CIPs on Public Improvements
    • Factor in costs and sustainability
    • Contractor experience is important
    • Inspectors should understand project goals
    • Check NCTCOG resources
Questions?