Co-Presenter Randy Luensmann  
Director of Public Works, City of Universal City, Texas

**Highlights**
- 14 years as Director of Public Works
- Manages 37 employees
- City Project Manager for the National Outfall Project

**Pre-project Challenges:** "As the embankment continued to erode over several years, we kept losing joints of the 72” RCP which was now eroding to the point of endangering the adjoining residential properties."

**Post-project Comments:** "This was an unbelievable project that took some creative work by the engineers as well as our contractor, VK Knowlton, to successfully design and construct this massive structure. I can now sleep better on rainy nights knowing that it’s done and citizens as well as personal property are no longer in danger."

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Co-presenter Steven W. Spreen, P.E.  
V.K. Knowlton Construction & Utilities, Inc.

**Highlights**
- Construction Management and Estimating
- Civil Engineer since 2007
- 13 years in Engineering
- 6+ Years in Construction

**Pre-project Challenges:** "We understood from day one that safety would be an every day concern for our work crews. We also saw the opportunity to construct a unique structure literally from the ground up..."

**Post-project Comments:** "It is great to look the structure over and know the hard work we put forth to get it there..."
Primary Issues

- Threat to public safety
- Threat to property due to slope failure
- Ongoing damage to outfall system
- Need for viable/stable outfall
- Cibolo Creek streambank stability
- Street flooding
- Access difficulties
- High solution costs
- Construction phase safety

Eroding Bluff

- Top bluff to bottom – 45’
- RCP flowline to bottom – 27’

72-inch RCP Exiting Bluff

- Bottom area contains broken RCP sections, concrete, and other past stabilization materials
Contributing Watershed

- Based on Garcia & Wright 1988 Study
- 250 acres drainage area
- Residential and commercial uses
- 25-year peak flow = 540 cfs
  - 340 cfs (63%) in storm drain
  - 200 cfs (37%) stored in street and overflowing bluff
- Bluff overtops at 5-yr to 10-yr event
- Overflow channel handles 100-year event

Outfall Conditions April 2012

Summary of Design

- Stabilize outfall
  - build on solid ground
  - redirect outfall
  - headwall, wingwalls, and apron
  - handle large flows – storm drain, overflow channel & Cibolo Creek
- Direct discharges onto porous rock structure
  - infiltrate most flow near outlet
  - spread/infiltrate high flows along slope
- Dissipate energy
  - large, angular rock at surface
  - 40° flat section, then reverse grade
  - 3:1 rock slope
  - large rock at toe
- Prevent erosion beneath rock
  - geotextile
  - layered rock sizes
- 404 permit – Nationwide 33
Redirect and Stabilize Outfall

• Gabions accommodate steep sloped areas
• Railing provides safety

Headwall to Stabilize Outfall

• Outlet grate prevents access into the storm drain

Downstream Inlet and Overflow Channel
Storm Damage - Temporary Outfall Conditions

Large Rock on Reverse Grade at Outlet

Large rock maximizes inflow into rock fill

Gabions needed for steep sloped areas

Structure’s Large Rock Toe

• Large rock stabilizes the rock structure against Cibolo Creek flows and flows exiting the structure
Lack of available rock and weather slowed progress.
Outfall Completed in May 2013

Downstream Perspective / Size Indication

Management, Planning, Design & Construction Team
Construction Highlights

- Construction - $773,000
  - Rock Layers (82% of costs)
    - Geotextile (on ground)
    - 3" - 5" rock (bottom layer)
      - 1,115 CY
      - 2' - 3' depth
    - 12" rock (middle layer)
      - 3,171 CY
      - 6' - 7' depth
    - 30" rock (top layer)
      - 1,816 CY
      - 3' - 4' depth
      - 10' - 12' depth near outlet
  - Other Key Items
    - Mobilization, ROW Prep, insurance & bond (13% of costs)
    - Gabions (9% of costs)
    - Concrete - headwall, channel (4% of costs)

Bird’s Eye View of Completed Project

Contact Information

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