The Highlands Ravine Stabilization
Channahon, IL

Steve Amann, P.E., CFM
Baxter & Woodman, Inc.
Introduction

Pre-Development Site (1994):

- Farm
- Ponds
- Swales/Field Tiles
- Bluff/Ravine
Development History: 1998
Development History: 2002
Development History: 2005
Development History: 2006
Development History: 2007
Development Design

- Detention Not Required by Ordinance: Direct Discharge to Illinois River
  - 10-year volume released at 0.04 cfs/acre (3 cfs)
  - 7” restrictor
  - 10.2 acre-feet of storage
  - Piped overflow system for 100-year event (156 cfs): 42” pipe
  - Stilling Well per FHWA HEC-14
  - Low-flow pipe installed to empty stilling basin
Unforeseen Impacts

• High-velocity discharge through small restrictor
• Erosion begins during construction:
  – Low-flow pipe increased in size
  – Low-flow pipe plugged; then unplugged
  – Slope armored with rip-rap, etc.
• Constant flow from sump pump discharges
• Downstream sedimentation
Hydraulic Efficiency
Unforeseen Impacts
Ad-Hoc Erosion Control
Continued Erosion
Property Damage
(Real and Threatened)
Analysis

• Met with Village Staff
• Visited site
• Reviewed subdivision design and calculations
• Topographic survey
• Reviewed context-sensitive improvement alternatives
Improvement Alternatives

Alternative #1: Native vegetation
- Steep slope
- Poor lighting
- Wet conditions
- Planting area
  - Poor soils
  - Existing rip-rap
Improvement Alternatives

Alternative #2: Hardscape

- Considered rip-rap, gabions, flume, drop pipe, fabric-formed concrete
- Negative impacts to ravine’s natural aesthetics
- Construction challenges:
  - Steep slope
  - Existing trees
  - Adjacent homes
  - Limited working area
Improvement Alternatives

Alternative #3: Hybrid

• Flexible hardscape with plantings
  – Concrete armor units
  – Articulated concrete block mats

• Stepped profile for energy dissipation
  – Stilling pools
  – Cascades

• Vegetation in block openings
Improvement Alternative #3
“A-Jacks” Concrete Armor Units by Armortec

A-Jacks
High Stability Concrete Armor Units

Summary of A-Jacks Dimensions

<table>
<thead>
<tr>
<th>A-Jacks</th>
<th>L (in)</th>
<th>T (in)</th>
<th>S (in)</th>
<th>C (in)</th>
<th>Vol (ft³)</th>
<th>Wt (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Jacks</td>
<td>24</td>
<td>3.65</td>
<td>3.65</td>
<td>1.84</td>
<td>6.56</td>
<td>96.0</td>
</tr>
</tbody>
</table>

A-JACKS® MATHEX WRAPPED WITH 1/2" POLYESTER CABLE

BAXTER & WOODMAN
Consulting Engineers
Improvement Alternative #3
“Armorflex” Articulated Concrete Blocks by Armortec
Grading Plan
Profile
Construction
Construction
Construction
Completion
Completion
Completion
Long-Term Success
Long-Term Success
Long-Term Success
Long-Term Success
Long-Term Success
Questions?

Thank you!
Steve Amann
708/478-2090
samann@baxwood.com