Rough River Dam Safety Assurance Project

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Presentation Outline

- Tangled Web of Intangibles
- Brief Project Overview and History
- Dam Safety Assurance Project
- Consequences of Dam Failure
- Project Status and Conclusions
Objective

“Our emphasis continues to be public safety and to minimize public inconvenience.”
Reality

“Our emphasis continues to be public safety and to minimize public inconvenience.”

“You can please half of the people some of the time, and some of the people half of the time, but all of the people none of the time.”
Stakeholders

- Project Operations Personnel
- State Resort Park and Golf Course
- State Highway Department
- Old Grist Mill at Green Farm Resort
- Politicians, Tourism, Chamber of Commerce
- Local Residents and Recreational Visitors
- Old Time Fiddlers Contest
- Environmental Activists
Project Overview
Overview of Dam

- Campground
- Tailwater Area
- Stilling Basin
- Dam
- Corps Office
- Spillway
- Golf Course
- Airstrip
- Rough River Lake
- State Resort Park
Typical Existing Cross-Section
Existing Slopes
Project History

- 1955: Construction begins
- 1957: Extensive damage to outlet bucket and channel during flood releases
- 1958: Construction complete
- 1960: Complete flood control operational
- 1971: First Periodic Inspection; erosion and damages noted to channel and apron
- 1975: Damage to apron
Project History (cont.)

- 1979: Extensive erosion damage to channel and apron; deep scour hole
- 1984: Severe apron and channel damage (88 CY)
- 1985: Apron undermining and erosion
- 1989: Record pool; two apron repairs (28+ CY)
- 1991: Two apron repairs (13 CY and 6 CY)
- 1993: Apron damage
Project History (cont.)

- 1998: Apron undermining and failure
- 2002: Sinkhole on downstream slope
- 2003: DSA geotechnical investigation
- 2004: “Short-term” repairs to paved apron; DSAP Evaluation Report
Spillway Inadequacy
Existing Spillway

Looking Upstream from KY 79 Bridge

Looking Downstream at KY 79 Bridge
Pool Frequency Data

- PMF Elevation = TOD
- Threshold Flood = 87% PMF
- Required Freeboard = 5 feet
- BSC = 100% PMF
- No spillway events to-date
- Record Pool = 521.6 feet
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Spillway Vicinity

- KY 79 Bridge
- Driving Range
- Airstrip
- Golf Course
- Buildings
- Rough River Lake
- State Resort Park
Spillway Remediation: Options

- Widen spillway by 85 feet to left or right
- Deepen spillway by 20 feet; add gates
- Raise dam crest by 5 feet with earth fill, parapet wall, inflatable dam or other mechanical-gated structure, or a combination of these options
Spillway Remediation

Construct 3.5’ tall parapet wall along upstream crest of dam to meet KDOH standards

Raise road ±1.5’
New Dam Crest Geometry

CONCRETE PARAPET WALL TO ACT AS “JERSEY” HIGHWAY BARRIER FOR KY79

RIPRAP SLOPE PROTECTION

NEW FILL
EXISTING EMBANKMENT

SHOULDER

ASPHALT PAVEMENT

GUARDRAIL

SHOULDER

2'-0" (MIN.)
12'-0" (MIN.)
12'-0" (MIN.)
4'-0" (MIN.)
Rock Toe Repair
Sinkhole on Downstream Slope

Remnants of Hurricane Isidore

- September 2002
- 6.5 inches of rain in 24 hours
Rock Toe Construction

Rock Toe

River Channel

Outlet Bucket

Looking Downstream
Sinkhole Development

Sinkhole

Rock Toe

Earth Embankment (September 2002)
Downstream Slope Condition

Rock Toe

Depressions

Outlet Bucket

Approx. Location of Sinkhole
Rock Toe Repair

Complete Repair:
Excavate; place granular filter; replace earth fill

Partial Repair:
Place cutoff wall; seal surface with granular filter

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Rough River Lake
Complete Rock Toe Repair: Excavate, Repair, and Replace
Partial Rock Toe Repair: Cutoff Wall; Seal Surface
Stilling Basin Inadequacy
Plan of Existing Stilling Basin
Profile of Existing Stilling Basin
Existing Stilling Basin

Note: Conduit nearly submerged with respect to tailwater
Existing Stilling Basin

Note: Discharge in photographs is 50% of required discharge for the design flood pool and 20% less than the maximum discharge for channel capacity.
Consequences of No Stilling Basin Modification
Stilling Basin Remediation

ERDC 1:25-scale model study:

- **Lengthen Basin:** Move end sill ±90 feet downstream and add baffle blocks
- **Downstream Weir:** Construct a weir downstream of the existing apron in conjunction with some channel armoring
Conceptual Modification I: Lengthened Stilling Basin Plan

- End Sill
- Baffle Blocks
- New Rip Rap
- Lengthened Stilling Basin (±90 feet)
- Existing Stilling Basin (±50 feet)
Conceptual Modification I: Lengthened Stilling Basin Profile
Conceptual Modification II: Construct Downstream Weir
Tailwater Improvements

- Raise grade of access road at toe of dam to prevent flooding during high tailwater
- Expand parking lot; provide turn-around
- Add fishing platform along river bank
- Construct ADA-accessible fishing platform along top of new stilling basin wall
Construction Water Control

Install Bulkhead and Piping

Remove Stop Logs

Diversion Pipe through Spillway

State Resort Park

North
Consequences
PMF Dam Break Inundation
Economic Losses with Dam Failure

- Immediate urban flood damage: $19.8M
- Annual flood control benefits lost: $4.5M
- Annual recreation benefits lost: $8.3M
- Total annual benefits lost: $12.8M
## Economic Losses with Dam Failure (cont.)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>Original construction cost</td>
<td>$2.4M</td>
</tr>
<tr>
<td>Dam replacement</td>
<td>$20.5M</td>
</tr>
<tr>
<td>Rebuild Lafayette Golf Course</td>
<td>$2.0M</td>
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</tbody>
</table>
Economic Losses with Dam Failure (cont.)

- Loss of water supply:
  - Grayson County 25,000
  - Breckinridge County 19,200
  - Total Population 44,200

- Agricultural losses: 28,600 total crop acres

- Environmental/ecological losses
## Human Consequences with Dam Failure

<table>
<thead>
<tr>
<th>Population at Risk (PAR)</th>
<th>Loss of Life (LOL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Permanent</strong> 1,258</td>
<td>5 (1 to 11)</td>
</tr>
<tr>
<td><strong>Transient</strong> 6,750</td>
<td>28 (5 to 56)</td>
</tr>
<tr>
<td><strong>Total</strong> 8,008</td>
<td>33 (6 to 67)</td>
</tr>
<tr>
<td></td>
<td>Design Complete</td>
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<tr>
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**Project Funding**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Description</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2005 CG/Wedge</td>
<td>Model Study, Design</td>
<td>$0.5M</td>
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<tr>
<td>FY 2006 CG</td>
<td>Construction, S&amp;A, EDC</td>
<td>$2.2M</td>
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<tr>
<td>FY 2007 CG</td>
<td>Construction, S&amp;A, EDC</td>
<td>$2.0M</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$4.7M</strong></td>
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Conclusions

“Our emphasis continues to be public safety and to minimize public inconvenience.”

- Common Sense
- Courtesy
- Communication, communication, communication
Contact Information

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Questions?