Assessment of Existing Levee Penetrations As Part of a ULDC Analysis

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Pipe Penetrations

- Pipe crossings through the levee embankment and its foundation
- Have the potential to produce rapid breaching
ULDC Requirements

- Hazard Assessment for Each Pipe
  - High Hazard = Remove/Modify in near future
  - Low Hazard = Long-term remediation plan
  - Fully Compliant with ULDC = No Action
- Interpretation and Engineering Judgement is Key
Hazard Assessments

- ULDC guidance says to consider: “the type of utility, pipe diameter, pipe material, pipe joint type, number of joints, angles, thrust protection, pipe bedding and method, age, degree of corrosion, location and depth below the DWSE, performance history, pipe testing or inspection results, and remaining life of facility”

- Not always cost-effective to do TV inspections/pressure tests and detailed analysis on every pipe
Work vs. No-Work Zone

- Is the levee prism being degraded, or is the pipe otherwise being disturbed as part of other levee improvement activities?
Preliminary Hazard Screening

- Conditional Assessment
  - Type of Pipe?
  - Invert vs. DWSE and 55/57 Profile?
  - Positive Closure Device?
  - Age?
Pipe Modifications - Interpreting ULDC Requirements

- New pipes to remain outside of levee prism?

“Theoretical Levee Prism”
Pipe Modifications - Interpreting ULDC Requirements

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![Diagram showing Added Fill at Pipe Crossings, Existing Levee Prism, and Min. Pipe Cover Requirement with "Theoretical Levee Prism" indicated.]

"Theoretical Levee Prism"
Adding a Factor of Safety

- An added factor of safety is recommended where practical
  - E.g. In an area where levee modifications are already occurring

- A more robust design has a better chance to withstand future H&H and regulatory changes
Conclusion

- ULDC leaves room for a lot of interpretation and engineering judgement
- A preliminary, desktop screening is a cost-effective way to conduct a hazard assessment
- When going through the effort of replacing pipes, it is good practice to add a factor of safety to the design
Contact Info

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Interpreting ULDC Requirements

- **ULDC:** Pressure pipes need closure device (e.g., gate valve) at the waterside edge of the crest
- **Title 23:** Pressure pipes need closure device within 10-feet of the landside levee toe

**Interpretation:** Goal of the closure device is to prevent levee failure. Assess whether existing closures will serve this purpose.
Pipe Replacement Responsibility

- Technically it is the responsibility of the owner/permittee.
- As a practical matter, it typically is included in the cost paid for by the sponsor of the overall levee improvement project.
  - Incorporating an independent pipe replacement schedule into the overall project schedule is challenging, etc.