



# ***Conditions Affecting Missouri Levee Systems Reliability***

***by***

***Mark Alvey, PE,  
Chief, Geotechnical and HTRW Branch  
St. Louis District***

***November 26, 2007***



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# **Levees Are Affected By The Following Adverse Conditions**

- **Uncontrolled Seepage**
- **Deteriorating Corrugated Metal Drain Pipes**
- **Pipe Joints Separating**
- **Scour and wave wash.**
- **Structural Instability**

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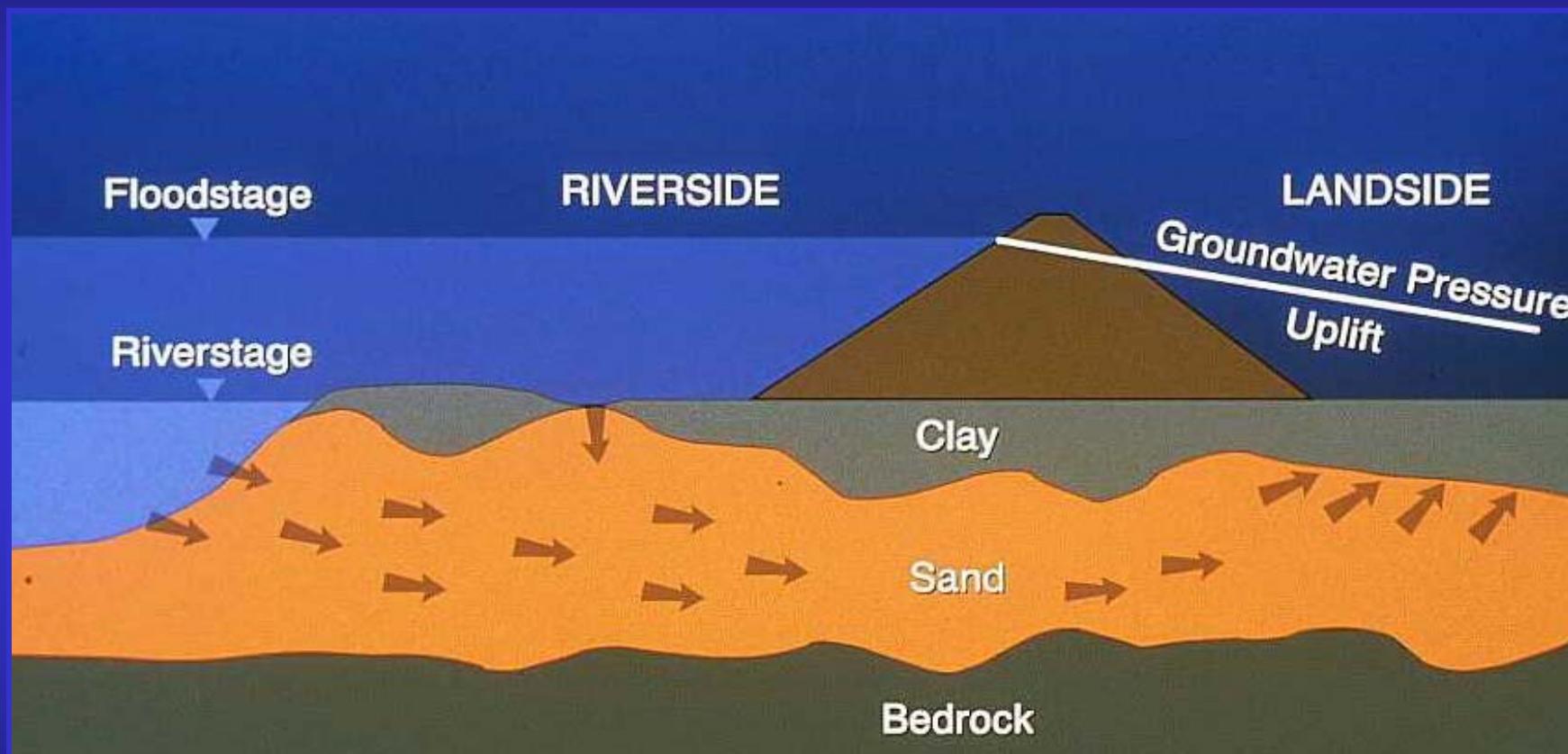
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# Groundwater Pressure Uplift



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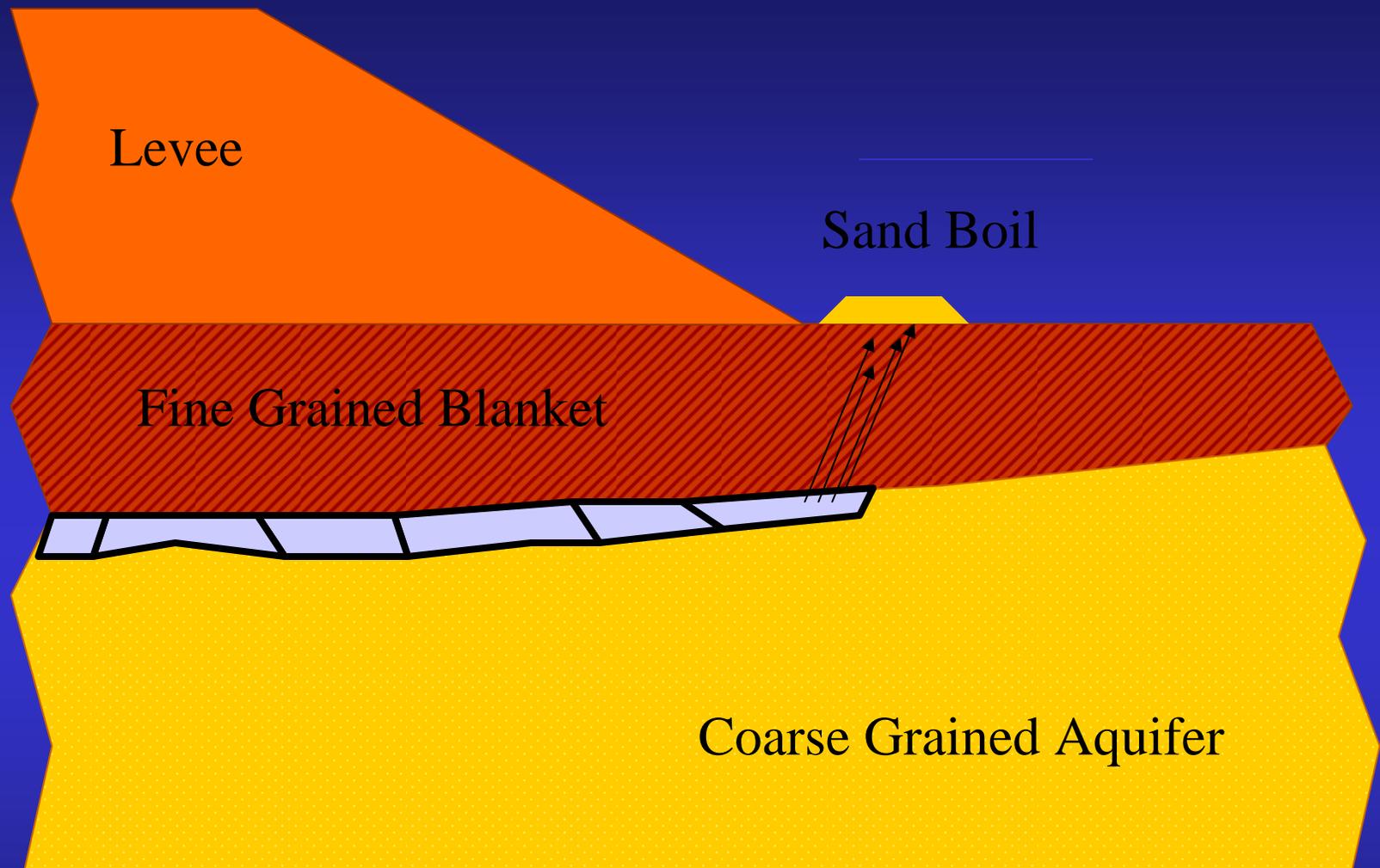
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# Kaskaskia Island D&LD

## Uncontrolled Seepage July 1993 Flood



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## Piping in the Aquifer

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# Kaskaskia Island Breach

July 22, 1993



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# Kaskaskia Island D&LD Failure

## Uncontrolled Seepage July 1993 Flood



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# Aerials of Bois Brule Levee Breach and Scour Hole



View toward levee district



View toward Mississippi River



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# St. Louis Flood Protection

## Uncontrolled Seepage Flows From Under The Floodwall

July 1993



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# St. Louis Flood Protection

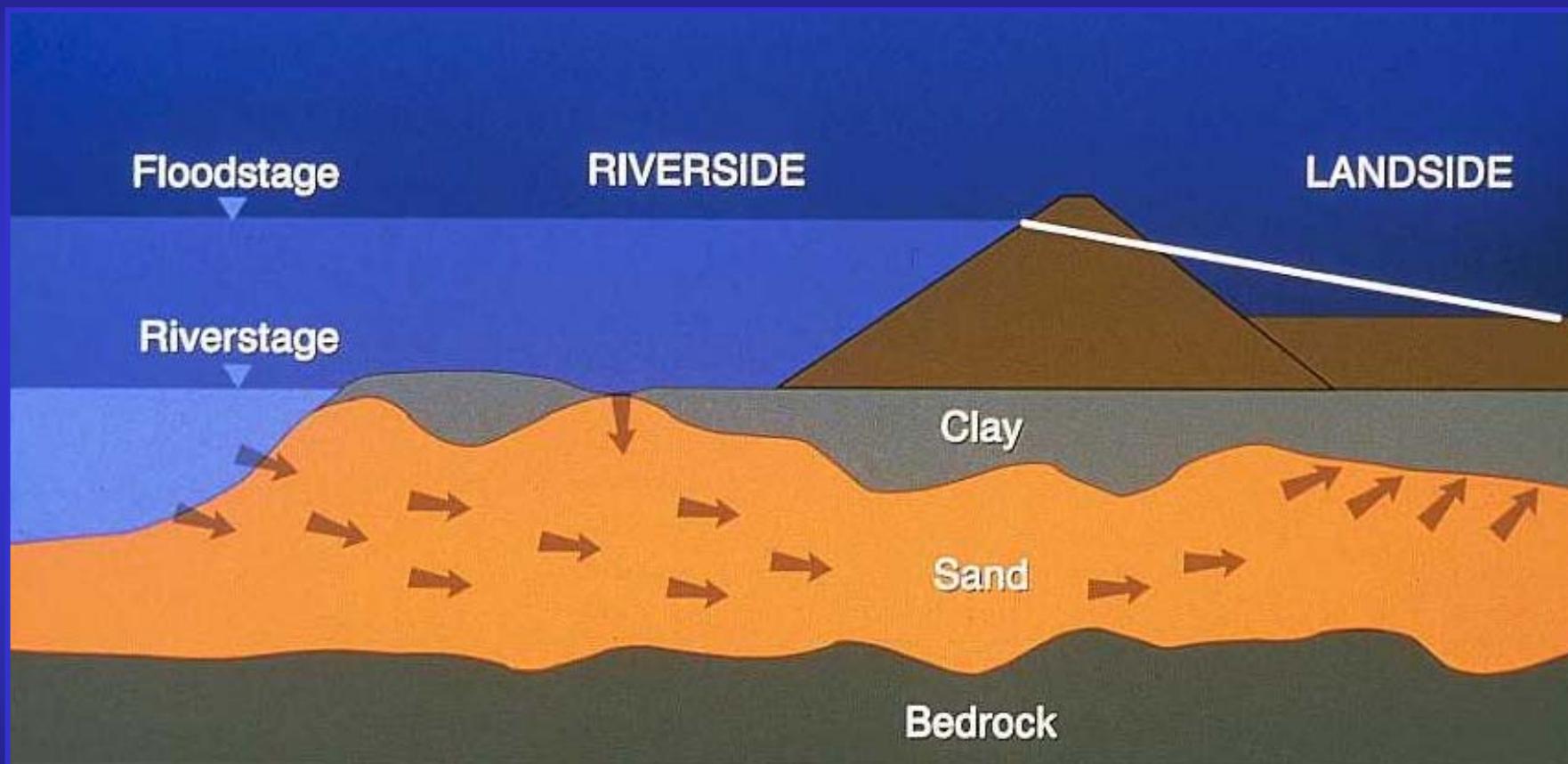
## Uncontrolled Seepage Flows From Under The Floodwall

### July 1993



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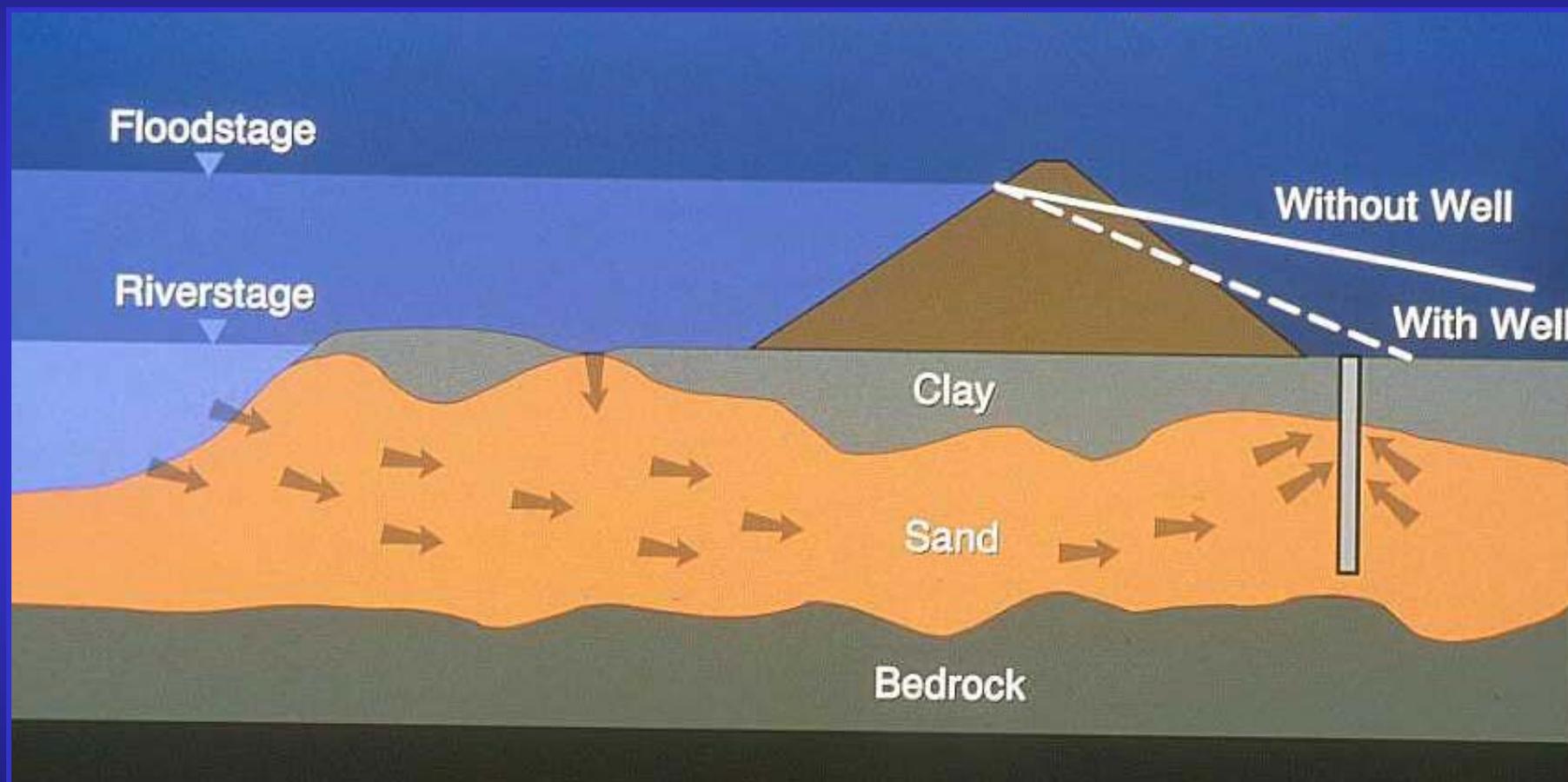
# Seepage Berms Controlling Uplift





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# Groundwater Pressure Uplift Control With Relief Wells



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# Wood River D&LD



## Deteriorating Riverside CMP Gravity Drain, January 2005



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# Grand Tower D&LD



## Two Deteriorating CMP Gravity Drains, July 2002



Top Photos  
Sta 473+12



Bottom Photos  
Sta 501+76



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# Scour and Erosion

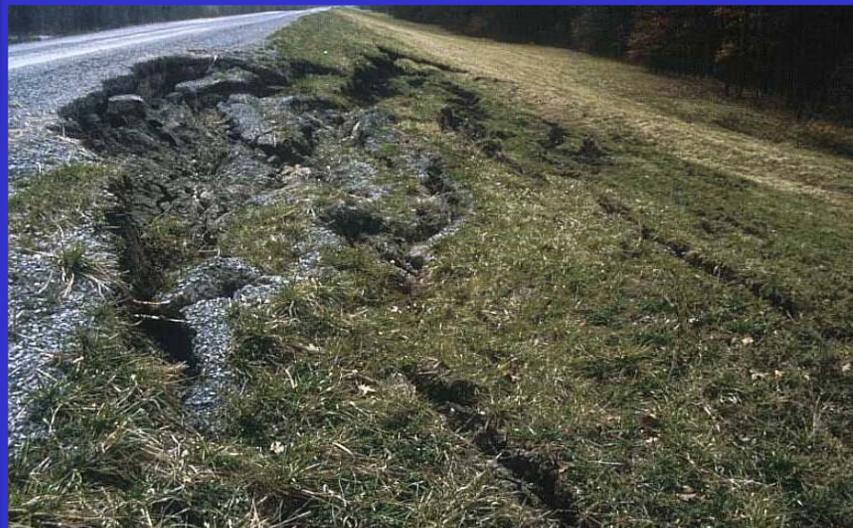


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# Levee Instability from Scour and Uplift



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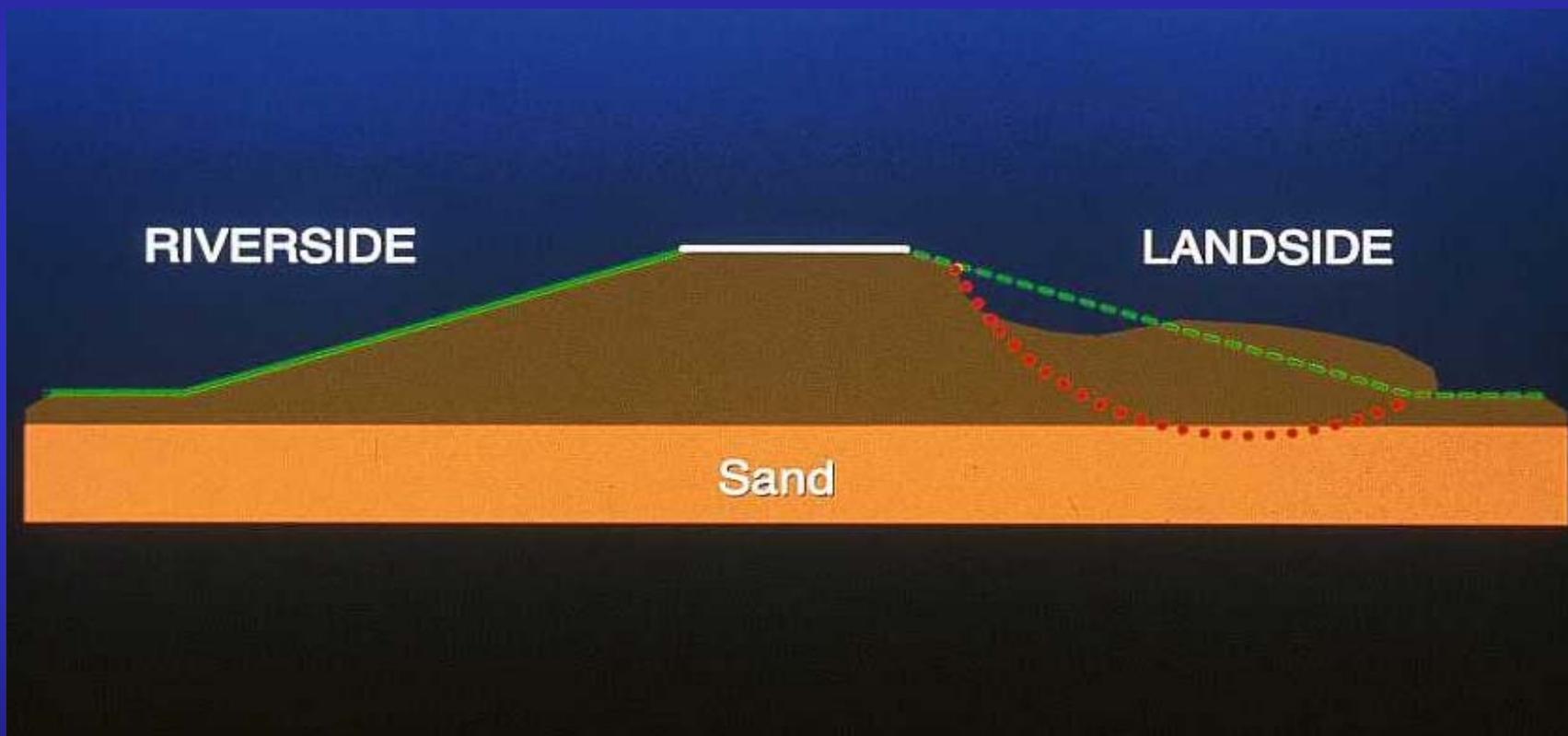
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# Slope Instability Failures



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# Proactive Studies Addressing Under Performance Issues



- Cape Girardeau Flood Protection System, Engineering Documentation For Reconstruction – Pending Approval
- St. Louis Flood Protection Reconstruction Evaluation Report – Approved and Funding Requested

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