US Army Corps of Engineers
Engineer Research and Development Center

Sand Boil Formation and Mitigation

Need

Laboratory sand boil test bed.

Sand boils are the outward manifestation of backward erosion piping, a type of internal erosion responsible for many dam and levee failures. As BEP accounts for 1/3 of current USACE portfolio risk for both dams and levees (prior to overtopping), it is an issue of significant concern. Current practice for managing BEP risk relies largely on flood fighting activies involving detection and treatment of sand boils. Reliable management of BEP risks through flood fighting requires that (1) significant sand boils be detected and (2) the sand boil can be effectively treated in a timely fashion. Current approaches for detection rely primarily upon visual detection of sand boils through patrolling of levees. Current approaches for treating sand boils consist of ringing the boil with sand bags or placing a barrel over the boil to raise the water surface above the boil. These methods have been effective as raising the water surface decreases the flow and reduces the amount of erosion; however, they are very labor intensive.

Research and Development is needed to enhance current practice for both sand boil detection and treatment. Enhanced knowledge of where sand boil formation is likely will improve detection. New technologies for treating sand boils can make flood fighting activities faster and more efficient.

Approach

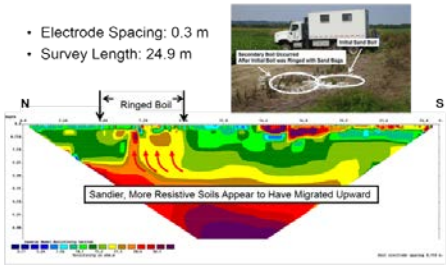
Studies of historical sand boil observations along the Mississippi River have been conducted that document “problem” areas with high sand boil activity. This documentation will aide in future detection. Current efforts are focused on developing innovative alternatives for treating sand boils, and testing these products in the laboratory sand boil test bed (see figure).

Outcomes

This R&D will result in (1) documentation of historical sand boil activity which can be used to familiarize new employees with problem areas and (2) technologies for treating sand boils in a more efficient manner.

New research needs are continually submitted by USACE FRM Communities of Practice to focus future research investigations and products. Statements of Need can be submitted by USACE on the R&D Gateway (https://gateway.erdc.dren.mil/son/index.cfm?Cop=Flood&Option=Start).

Ringed sand boil in the field.



Geophysical and CPT investigation of foundation conditions at boil.

Measurements of sand boil hydraulics in the field.

More Information

For more information on this project, please visit the project wiki page (available here) or contact Bryant Robbins at bryant.a.robbins@usace.army.mil.

For more information on FRM R&D, see the ERDC FRM wiki:
https://wiki.erdc.dren.mil/Flood_and_Coastal_Storm_Damage_Reduction_Research_Program