**SUBSURFACE LEVEE MONITORING WITH DISTRIBUTED FIBER OPTIC SENSING**

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In 2017 a sand boil was discovered on a section of levee along the Mississippi River in Louisiana in a landside borrow pit and was remediated using a combination of a gravel pad and a series of relief wells. Despite the remediation, the levee is being actively monitored with two Distributed Fiber Optic Sensing (DFOS) systems. The first, a Distributed Strain Sensing (DSS) system developed at the University of California, Berkeley, offers a continuous profile of strain and temperature measurements along an installed fiber optic cable. Using DSS long-term subsurface strain and temperature fluctuations along the landside of the levee can be monitored. The hypothesis is that vertical soil displacement and temperature changes in the subsurface can be measured and correlated with water levels and uplift below the clay foundation. To test this hypothesis, four vertical fiber optic arrays were installed in boreholes at the test site. These data are supplemented by piezometric readings within the borehole arrays and river levels from a nearby monitoring station. The preliminary results have shown that concentrated tensile strains can be observed at the interface of the clay foundation and the underlying sand layer correlating to fluctuations in the river level and foundation water pressures. This research demonstrates that DSS can be used to detect small fluctuations in subsurface movements and temperature. A Distributed Acoustic Sensing (DAS) system was also installed at the site. The system consists of approximately 2 km of fiber optic cable installed parallel to the levee at a depth of ½ m. The accompanying optical interrogator, developed by the Naval Research Laboratory, has a gauge length of 4 m. Signals recorded with the DAS system were analyzed using multi-channel analysis of surface waves (MASW) methods in order to determine Vs profiles at different locations at the site, which will be compared to borehole logging results.