



# RESEARCH PROJECT CAPSULE [18-1P]

September 2017

TECHNOLOGY TRANSFER PROGRAM

## Exploration of Drone and Remote Sensing Technologies in Highway Embankment Monitoring and Management (Phase I)

### JUST THE FACTS:

**Start Date:**  
September 1, 2017

**Duration:**  
12 months

**End Date:**  
August 31, 2018

**Funding:**  
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### POINTS OF INTEREST:

*Problem Addressed / Objective of  
Research / Methodology Used  
Implementation Potential*

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### PROBLEM

Over time, many Louisiana highway embankments have experienced surface sliding failures, a safety issue causing traffic disruptions. Since no advance-warning system is available for these highway embankment failures, the Louisiana Department of Transportation and Development (DOTD) can only respond after failure with costly remediation.

Development of a proactive maintenance, management, and warning system is desirable. However, assessing embankment conditions using traditional site inspections by trained personnel is costly with respect to both time and labor.

Recent advancements in commercial remote sensing (InSAR, LiDAR, and optical) provide opportunities to precisely measure displacements and surface moisture conditions of highway embankments in a cost-effective manner. These measurements represent a potentially-valuable alternative to traditional site inspections for determining the condition of a highway embankment.

Development of embankment surface instability is a dynamic process. This study will explore the use of remote sensing and drone technologies for assessing condition of highway embankments and evaluating potential for surface sliding so that they can be captured, described, and indexed by remote sensing technologies.

### OBJECTIVE

The objective of this study is to explore the concept of using remote sensing technologies to evaluate the risk of surface sliding for highway embankments so that a long-term monitoring and management system can be developed in the future.

### METHODOLOGY

Researchers will continue the ongoing extensive and thorough literature search regarding remote sensing/drone technologies for civil and geotechnical engineering applications. Technologies that have potential for use in this study will be identified.

Past experience indicates that embankment surface sliding only occurs when compacted embankment soils are softened due to wet/dry climate cycles. Therefore, the water-storage capability of surface soils can be a good indicator of embankment surface stability



**Figure 1**  
*Example of surface sliding failure*

and potential for sliding failures. If this is true, a long-term embankment monitoring system can be developed using this indicator to monitor and manage potential for surface sliding failures. This challenging job can be accomplished using remote sensing/drone technologies.

Field embankment sites will be selected for controlled experiments with remote sensing/drone technologies. Collected data will be processed and analyzed. Highway embankment safety indicators will be developed, along with an implementation plan for establishing an embankment monitoring/management system for DOTD.

## IMPLEMENTATION POTENTIAL

It is expected that findings from this research will include tools that are needed for monitoring embankment surface stability and potential for sliding. The risk of surface sliding will be quantified, so a long-term monitoring and management system can be developed. If successful, the research team will develop and provide user guidelines for DOTD implementation.