

**POOLED FUND PROJECT REPORT**  
Quarterly Report—7/1/2009

<b>Project Title:</b> <i>Application of Three-Dimensional Laser Scanning for the Identification, Evaluation, and Management of Unstable Highway Slopes</i>	
<b>Project Number:</b> TPF-5(166)	<b>Budget:</b> \$240,000
<b>Lead Agency:</b> Arizona Department of Transportation	
<b>Reporting Period:</b> April 1, 2009–June 30, 2009	
<b>Project Administrator:</b> Frank Darmiento <a href="mailto:fdarmiento@azdot.gov">fdarmiento@azdot.gov</a>	<b>Principal Investigator:</b> Dr. John Kemeny University of Arizona
<b>Participating States:</b> AZ, CA, CO, NH, NY, PA, TN, TX	
<b>FHWA State Contact:</b> Karen King <a href="mailto:Karen.King@fhwa.dot.gov">Karen.King@fhwa.dot.gov</a>	
<b>FHWA HQ Contact:</b>	

**Project Description:**

Despite the advantages of rockfall management systems, the identification, evaluation, and categorization of comparatively high-risk slopes remains a labor intensive task that is further complicated by the broad range of geologic conditions that influence rockfall hazards. In the past several years LIDAR (Light Detecting And Ranging) has gained acceptance as a potentially valuable new technology for rock mass characterization. In that period of time the LIDAR hardware has improved, automated point cloud processing software has been developed specifically for rock mass characterization, and best practices are starting to be developed for field scanning and 3D data processing. However, there are several issues that still need to be addressed. These include:

- Lack of documented, and fully qualified, procedures for data acquisition to ensure accuracy and fitness for purpose of the terrestrial LIDAR data.
- Terrestrial LIDAR produces very large 3D clouds of points that are visually interesting but not immediately analyzable by traditional software products.

**Objectives:**

This study will focus on the development and application of three-dimensional terrestrial LIDAR technology for geotechnical applications affecting the construction and maintenance of highways. The objectives include:

- a. Using three-dimensional information from a LIDAR survey to estimate dimensions and volumes at a site.
- b. Using LIDAR surveys for rock mass site characterization.
- c. Using successive LIDAR scans along with "change detection" algorithms to determine the location and rates of rockfall events at a site.

**Scope of Work:**

1. Evaluate and assess the recommended field procedure for the scanning and rescanning of highway rock cuts developed by the currently funded FHWA study.

2. Field-test procedures and algorithms for the processing of laser scan data (point clouds) developed by the current Federal Highway Administration and National Cooperative Highway Research Program (NCHRP) IDEA projects.
3. Evaluate the Integration of laser-scanned data into Rockfall Hazard Rating Systems.
4. Facilitate widespread systematic use of laser-scanned data by state transportation agencies.
5. Produce a draft Recommended Practice document for submission to and review by the American Association of State Highway and Transportation officials (AASHTO).

**Comments:**

Minimum state commitment is \$30,000 over two years (\$15,000 per year). Additional states can still join the study.

**Activities During Quarter:**

The technical advisory committee (TAC) held conference telephone calls on May 6, 2009 and June 9, 2009. Field visit checklists have been provided by six of the eight participating states. Field visits are being planned for the summer of 2009 to begin the first phase of the study.

**Future Activities:**

Field site selection checklists from all participating states will be completed. Field visits to all participating states will be conducted over the next 24 months.