

<i>Project Title</i> Subsurface Drainage for Landslide and Slope Stabilization		<i>Agmt./Task No.</i> T4120-10	<i>Item No.</i>	<i>Agency Bgt. No.</i>
<i>Research Agency</i> WSU/Desert Research Institute (DRI)		<i>Start Date</i> 3/2007	<i>Estimated Completion</i> 12/2010	<i>Revised Completion</i> 6/2011
<i>Principal Investigator(s)</i> Balasingam Muhunthan (WSU) and Greg Pohll (DRI)		<i>Technical Contact</i> Tom Badger 360.709.5461		
<i>WSDOT Program Manager</i> Kim Willoughby 360.705.7978		<i>FHWA or Other Technical Contact</i> Mike Adams		
<i>Funding Source</i> CA, MD, MS, MT, NH, OH, PA, TX, WA, WY		<i>Schedule Status</i> <input type="checkbox"/> On schedule <input type="checkbox"/> Ahead of schedule <input checked="" type="checkbox"/> On revised schedule <input type="checkbox"/> Behind schedule		
<i>Research Area</i> <input type="checkbox"/> Bridges & Structures <input type="checkbox"/> Environment <input checked="" type="checkbox"/> Highway Design & Safety <input type="checkbox"/> Mobility & Intermodal Planning <input checked="" type="checkbox"/> Operations & Materials <input type="checkbox"/> Traffic & Intelligent Transportation Systems Evaluation				
<i>Original Estimated Cost</i> \$ 300,000	<i>Revised Cost</i>	<i>% Funds Expended</i> 35%	<i>% Work Completed</i> 40%	
<i>Objective</i> (1) Provide best practices and guidance for subsurface drainage applications for slope stabilization, including subsurface investigation and testing, groundwater-flow characterization, analysis, drain configurations and design, installation methods, monitoring, and maintenance. (2) Evaluate new applications of existing materials and technologies, such as trenchless technologies (horizontal directional drilling, micro tunneling, guided boring, etc.) and other innovative technologies and materials, for stabilizing slopes using subsurface drainage.				

Project Progress:

The initial phase of this study was completed by Professor Muhunthan and his graduate student, Marie Pathmanathan, at WSU in early 2009. Roger Beckie at the University of British Columbia was originally going to perform the second phase, but was not able to obtain a graduate student. Therefore, we spent some time finding someone who could perform the hydrology work.

We were able to retain the services of Dr. Pohll and his associates at the Desert Research Institute. They will begin the project in November 2009.

New Period Proposed Activity:

The team at DRI will begin Phase 2 in November 2009. It will consist of the following:

- Compile and examine the excellent data set for the Red Top landslide project in California presented by Tom Whitman at the 2007 TAC meeting. It will also include recent data compiled by CALTRANS.
- Evaluate sites where subsurface drainage has not been effective, to better characterize limiting conditions.
- Recognizing that more drain discharge data is needed, WSDOT instrumented some selected WA sites. These measurements will be analyzed.
- The various analyses methods and instrumented data will be used to develop a simplified design methodology for horizontal drains, and/or design tables that would be applicable for a variety of geologic conditions.
- From this work, a design manual will be developed as well as proposed training once complete.