Rockfall Hazard Inventory Development & Maintenance – A 20-Year Perspective

Michael Vierling – NY State Thruway Authority
Richard Cross – Golder Associates
Peter Ingraham – Golder Associates
Background and Early RHRS Development

Program Implementation and Evolution

Current Status and Challenges

The Challenges Ahead
Problem Recognition
Early RHRS Development

- Early Rockfall Hazard Rating work done by Lanza and Ratte (VTrans), Lane (NHDOT) and others
- Railways had similar problems and rated slopes (CN/CP) and developed inventories
- Maintenance District Management for new slopes
- 1985 – Wyllie/Brawner NW States Geotech Conference
First attempts to develop RHRS for New York disapproved – concern for liability and lack of funding.
Early RHRS Development

A fatal rock strike January 21, 1988 changed everything.
NYSDOT RHRS developed based on work by Wyllie and Brawner – added backslope condition to ratings

Pooled Fund Study to develop RHRS Guidelines initiated in 1988 – Oregon DOT lead
Early ratings taken on State-wide by DOT & Thruway

Results of Pooled-Fund FHWA RHRS study presented in 1991
Many slope repairs undertaken from 1988 to 1993

Inventory of ratings kept in file folders and entered into computer system, eventually incorporated into Oracle database.
Implementation/Modification

- Modifications necessary to adapt the program to Thruway System needs -
- Two rockfall events – with 8-car and 21-car collisions (and no rock strikes) led to adding a lane occupancy criterion to the RHRS for high volume traffic
Partnering with Maintenance crews – incident report forms

Maintenance of repairs and Maintenance Directive needed to monitor systems
The Thruway program changed from a reactive program to a management program.

Annual budget provided for rock slope repairs.

Where possible, slope repairs included with contracts for Thruway upgrades, widening, etc.

15-Year Program of improvements/repairs implemented in 1996.
Inventory moved to GIS database in 2000
GIS Inventory includes: GPS, RHRS, geology, topographic maps, ADT....
Implementation/Modification

...earth slope inventory, repairs, photos, history, incident reports, etc.
GIS Database facilitates long-term tracking of slopes/slope conditions
Current Status/Challenges

- Rock slopes aging just as structures are – 50 year old system......maintenance costs climbing and catchment fences/drapes need replacement/repair
- Competition for budgets – but the inventory provides rationale for prioritization.
Challenges Ahead:

- Continue to adapt to Thruway needs and facilitate management of rock slopes
- Incorporate technologies being developed – Satellite PDA/server communications linking statewide geologic, topo and geotechnical data,
- Lidar/photogrammetric measurement of slopes and automated generation of stereonets and kinematic analyses.
Conclusions:

- **RHRS inventory** necessary management tool to track condition and maintenance requirements of these “assets”
- **The System must evolve to keep up with technology.**
- **Pro-Active approach yields best results** – partner with maintenance and structures groups to include geologic hazards as risks to be actively managed.