Coastal Area Dynamics: The Movement Trend Table, Velocity and Inverse Velocity Levels of Slope Risk Matrix -- Supporting Operations and Creating Sectoral Change.

Photo courtesy John Madonna 2017
Our instruments are becoming more versatile, faster, smaller, and less costly!

Ground-based radar monitoring of mines and geohazard areas is now over 15 years old!
"Shifting average conditions will be punctuated by more frequent and severe extreme events, including drought, wildfire, and storms. Together, these changes pose risks to California’s people, natural resources, and infrastructure." ¹

“Resilience is the capacity of any entity – an individual, a community, an organization, or a natural system – to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience.”²
Deployment Dynamics and a Tale of Three Slides

Bridges Creek: Horseshoe Slide Area - US 101
Annual Average Daily Traffic 6,000 vehicles (all) 2016.

Video Link -
https://youtu.be/2TpW33JGWoE
Bridges Creek – Horseshoe Slide
Equipment on the crest, contractors and DOT coordinating below
Pre-deployment UAS acquisition = current digital surface model and orthomosaic products

- Agency LIDAR request took 3 months.
- Data not shared.

- IBIS Planning Tool allows for optimum placing geometry to be viewed and shared with site teams
- Guardian Project uses DTM, we overlay radar data
- Create Areas of Interest
April 30th, 2017 - Bridges Creek (Horse Shoe Slide) monitoring began. Working with Ghilotti Construction and Caltrans, IDSNA staff deployed an IBIS-FM interferometric radar at the site near Bridges Creek, north of Leggett, CA. Data monitoring and interpretation is provided by Global Slope Monitoring.

- Decision supporting data allows for data analysis, reporting, and management services

DOT interface challenges and support opportunity

- Staff
- Experience in Analysis/Reporting
- Decision Making Authority
- Contractor Interface
Horseshoe Slide June 9, 2017
Inverse velocity technique allows for alerting site and staff of impending failure about 3:00 am.
• Call out to deployment was 72 hours
• Data Acquisition and Sharing within next 12 hours
• Data Analysis, Reporting (licensed professional), Dissemination, and Decision Making Within 24 Hours
Paul’s Slide – CA-1
- Narrow Cliff Footprint
- No Power
- No Communications
- Integrated Contractor /Operator Safety Awareness

12 days after Horseshoe Slide deployment we received a call from another State DOT District ……
Paul’s Slide
- Wider dissemination of data necessitated
  - Programmed Sharing
  - Understanding Concepts
  - Communication

- Command Audience Data Sharing
- Georeferencing
- GIS Integration
- Contractor Staff Needs 6-12 hour Updates
Paul’s Slide Hazard-Level Response Protocol
Caltrans / JMC / IDSNA / GSM
7:45am EDT, June 1, 2017

1. Paul’s Slide Slope-Radar Alert and Status Risk Levels

1.1 RISK LEVELS: Low (Green) Stability Risk

Reporting – Operator/Analyst updates
• Radio Comms – Operators and Site Staff
• Administrative Buy-in and Record of Actions

Attn: Ryan Turner, PE, GE
Paul’s Slide Monitoring Project
Prepared By: John S. metzger and Steven Ulrich
Reference No: 095-01_17_MON_R1.4
Date: 06/1/2017
Mud Creek: CA-1
Annual Average Daily Traffic 2,500 vehicles (all) 2016.
• AOI perimeter 1.1 miles
• Area 1,995,401 Square Feet

Mud Creek
• One week after Paul’s Side Deployment we visited Mud Creek
• Major Failure after Initial Site Visit (May 19, 2017)
• Largest Landslide on the Western Coast
• Three radar stages/deployments
Mud Creek -- Consultant and DOT team needed to see the crest and as much of the slide as possible to allow operations to begin.
Mud Creek – All weather, solar integrated trailer created, 2 units deployed
Camp Mud Creek Spotter and Data Viewing Location

Mud Creek North – Displacement View

MC-N Figure 2: Displacement map – data scaled from -5.0" to 30.0" from August 5 – August 12.

Mud Creek South – Hazard Map
Sector Change Products

1. The Daily Movement Table – at 5:00 AM transmitted to Site Project and Contractor Team – Specifies Safe Areas of Work
2. Daily Data Cells report – Where Prisms were installed – Reference data support.
3. Velocity and Inverse Velocity Levels of Slope Risk – ROCKFALL BASED

Mud Creek – Over 325 Reports shared an completed. Contractor remained on schedule throughout the period.
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