

## RESEARCH SUMMARY

### ADVANCING GEOTECHNICAL ASSET MANAGEMENT – PHASE I

#### WHAT WAS THE NEED?

*Highway infrastructure is comprised of many asset classes which are managed at varying levels of maturity. The inventory and characterization of geotechnical assets including highway cut slopes, embankments and ground modifications in Maryland made possible with recently available datasets and analysis tools. Geotechnical assets support pavement, structures, and other adjacent infrastructure. Multi-faceted progress was needed to use recent datasets and tools to characterize highway slopes and potential shallow subsurface voids.*

#### WHAT WAS THE GOAL?

*The purpose of this study was to advance progress with the implementation of Geotechnical Asset Management in the State Highway Administration (SHA). Focus areas included highway slope inventory, slope condition assessments, and subsurface void characterization with Ground Penetrating Radar.*

#### WHAT DID THE RESEARCH TEAM DO?

*The research team utilized readily available Lidar elevation data published by Maryland iMAP, USDA soil mapping, historic slope failure location data, and interviews with maintenance staff to develop a statewide inventory and preliminary condition assessment of high and problematic highway slopes along highways maintained by the State of Maryland.*

*The initial GIS-based inventory of the highest and most problematic slopes was developed by identifying areas with at least 50 feet of*

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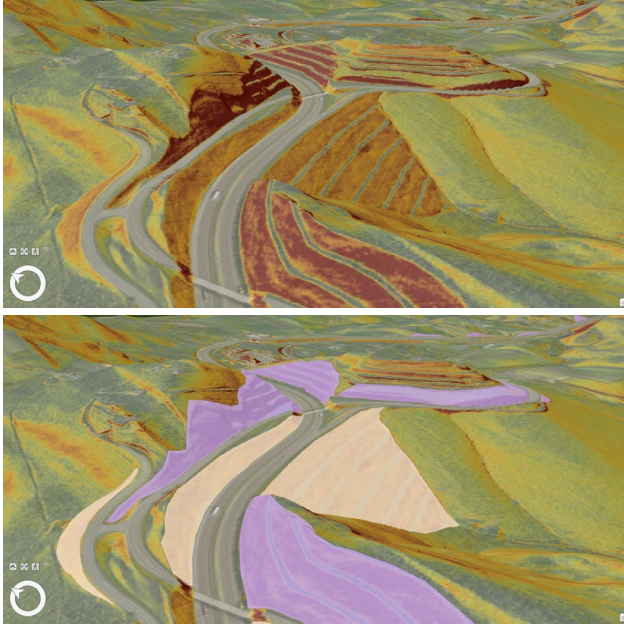
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*elevation change adjacent to highway mile points. Problematic highway slopes were identified using historic slope failure GIS records and meetings with highway maintenance staff. The perimeter of high and problematic slopes was visually and manually drawn to establish inventory polygons. The initial GIS-based inventory of ground modifications was derived from historic as-built project data and sinkhole site investigations.*



*An initial GIS-based, statewide planning-level condition assessment was developed using the estimated sensitivity of soil cut slopes and embankments to precipitation. The precipitation sensitivity of each 1-meter by 1-meter raster cell was estimated within each soil cut slope and embankment inventory polygon. A field-based condition assessment framework*

*was developed to support field condition assessments of highway cut slopes.*

*The research team also conducted several pilot studies with ground penetrating radar where subsurface voids were suspected to assist with the planning of future ground modifications.*

## **WHAT WAS THE OUTCOME?**

*A condition rating framework was developed to classify the condition of highway slopes on a scale from 1 to 5. A GIS-based framework of assigning the criticality of geotechnical assets was also developed on a scale from 1 to 5. The risk of slope instability was quantified by multiplying the condition and criticality scores, leading to a statewide assessment of the risk of slope instability. The slope inventory will be used for geotechnical asset management, resilience planning and to assist with scoping future highway rehabilitation projects.*

## **HOW WILL MDOT SHA USE THE RESULTS?**

*SHA will use the results to minimize the impact of geotechnical asset distresses through informed planning of strategic slope rehabilitation and ground modification construction projects. This research is foundational to support future expansion of slope inventory and refined condition assessments.*

To view the complete report, click [here](#).

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