Planning Highway Embankment Protection Strategies to Reduce Flood Hazard Risk in Maryland

Status: Submitted to recipient

Scope of work

The project Scope of Work (SOW) identifies the eligible activity, describes what will be accomplished and explains how the mitigation activity will be implemented. The mitigation activity must be described in sufficient detail to verify the cost estimate. All activities for which funding is requested must be identified in the SOW prior to the close of the application period. FEMA has different requirements for project, planning and management cost SOWs.

Subapplication title (include type of activity and location)	**Planning Highway Embankment Protection Strategies to Reduce Flood Hazard Risk in Maryland**

Activities

Primary activity type	**Evaluate facilities to identify mitigation actions**
Secondary activity type (Optional)	**Develop or conduct engineering, environmental, feasibility and/or benefit cost analyses**
Tertiary activity type (Optional)	
Geographic areas description	**The locations will be limited to MDOT SHA maintained right-of-way at risk of overtopping erosion (washout) during 500-year flood events (FEMA Floodplain). At the time of this application, all counties in Maryland, except Allegany, have an effective 500-year flood plain mapped. The preliminary 500-year flood plain in Allegany County will be used until effective boundaries are established.**

Community lifelines

Primary community lifeline	**Transportation**
Primary sub-community lifeline	**Highway/roadway/motor vehicle**
Secondary community lifeline (optional)	**Health and medical**

Secondary sub-community lifeline	**Patient movement**
Tertiary community lifeline (optional)	

Hazard sources

Primary hazard source	**Flooding**
Secondary hazard source (optional)	**Landslide/Debris flow**
Tertiary hazard source (optional)	**Tropical cyclone (Hurricane/Typhoon)**
How will the mitigation activity be implemented?	**This first phase (Phase I) of a planned, multi-phased project to improve highway resilience to flooding will be implemented by a team of in-house engineers within MDOT SHA, managed by the Division Chief of the Engineering Geology Division within the Office of Materials Technology. The team will develop criteria for establishing an inventory, preliminary condition assessment and field condition assessment for MDOT SHA-maintained highway embankments and cut slopes. For the purposes of this phase, the inventory will be limited to locations at risk of overtopping where the roadway surface lies within the 500-year floodplain in Maryland. The inventory data and preliminary condition assessment will be developed using GIS tools. A limited number of field assessments will be conducted for the highest risk geotechnical assets after preliminary assessments are complete. A brief report will be developed identifying preliminary mitigation treatments, unit costs, and applicability.**
What is the scope of work of the proposal? Will it result in a complete project application for future funding opportunities?	**The scope of work for this first phase (Phase I) of a planned, multi-phased project to improve highway resilience to flooding is limited to a planning function, and is intended to lead to subsequent applications for design and construction mitigation in the future. The scope of work includes the following elements: 1) Identify MDOT SHA Maintained embankments and cut slopes at risk of overtopping erosion where the roadway surface intersects with the 500-year FEMA flood plain. 2) Develop GIS-based inventory of embankments and cut slopes. 3) Correlate the embankment inventory with highway centerline to enable subsequent analysis using highway**

	attributes. 4) Develop a preliminary (computer-based) assessment protocol for embankment and cut slope condition. 5) Develop a field assessment protocol for embankment and cut slope condition. 6) Conduct preliminary desktop condition assessments of embankments and cut slopes inventoried. 7) Develop a basic a risk assessment protocol for embankment and cut slope failure by overtopping erosion. 8) Conduct field condition assessment at select locations with the most risk. 9) Identify feasible preliminary appropriate protection measures along with preliminary design and construction costs, assuming regional pre-disaster mitigation construction contracts. 10) Prepare a report summarizing findings and general recommendations for subsequent phases of embankment and slope protection, including design, construction and maintenance phases. 11) Provide GIS data layers for each embankment and cut slope which intersects the effective FEMA flood plain. Data development will directly improve MDOT SHA's ability to identify, prioritize and manage risks associated with embankments and slopes. The data will be added to MDOT SHA climate viewer to increase the state's database catalog and capabilities of managing multiple risks across the state. This planning project will benefit internal decision-making processes, prioritize needs an ultimately benefit the citizens of Maryland as well as the traveling public in and across the state.
Who will manage and complete the mitigation activity?	**In-House engineers within MDOT SHA will conduct the GIS analysis, develop inventory, develop assessment protocols, conduct site assessments and develop the report.**
What are you doing to consider other risks in the project area?	**Landslide risks will be considered where the floodplain intersects with cut slopes. Sinkhole hazard risks will be considered where embankments or cut slopes are on over carbonate bedrock. Financial risks will be considered in network level strategy development for mitigation.**
Is there an estimate for when the mitigation activity will take place?	**The planning work will take a maximum of 2 years, taking place place in 2021 and 2022.**
What alternatives will be considered?	**This work will include planning-level identification of embankment protection mitigation alternatives to be considered during subsequent design phases. Preliminarily, various treatments will include hydroseeding, turf establishment, re-grading, rip rap, grouted rip rap matrix, live stakes,**

	imbricated stone wall, geo-web, plate piles, sheet piles, soldier piles and lagging, gabions, surface drainage and subsurface drainage.
Do activities being considered align with hazard mitigation plan?	**Yes. This first phase (Phase I) of a planned, multi-phased project aligns with the 2016 Maryland State Hazard Mitigation Plan, particularly high priority mitigation actions # 14, 22, 24 and 33 and medium priority actions #21, #31, and #34. It also addresses mitigation action #29 and 32 improving knowledge and data availability for all Marylanders. The project also supports hazard identification and risk and vulnerability assessment components MDOT SHA maintained highway embankments and cut slopes tied directly to floodplain management and local mitigation plans, specifically State capabilities, programs and policies, including: floodplain management, highway project development and maintenance. This project also supports hazard identification and risk and vulnerability components of the Maryland Coast Smart Construction Program (and Maryland Stormwater Management Program and Design Guidance (if applicable)). Reductions of sediment is a major component of the Chesapeake Bay Restoration Watershed Implementation Plans. This effort to manage embankment and slopes will identify protection measures and mitigation approaches that also demonstrate opportunities to protect and improve water quality in line with Chesapeake Bay TMDL goals.**
Additional comments (optional)	

Attachments

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