St. George Island Living Shoreline and Wetland Restoration Project along MD 249

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)	**St. George Island Living Shoreline and Wetland Restoration Project along MD 249**

Activities

Primary activity type	**Stabilization and restoration**
Primary sub-activity type	**Shoreline and/or bank stabilization**
Secondary activity type (Optional)	**Feasibility, engineering and design studies**
Tertiary activity type (Optional)	**Mitigation reconstruction**
Geographic areas description	**St. George Island, St. Mary's County, Maryland**

Community lifelines

Primary community lifeline	**Transportation**
Primary sub-community lifeline	**Highway/roadway/motor vehicle**
Secondary community lifeline (optional)	**Safety and security**
Secondary sub-community lifeline	**Law enforcement/security**
Tertiary community lifeline (optional)	**Food, water, shelter**
Tertiary sub-community lifeline	**Food**

Hazard sources

Primary hazard source	**Flooding**
Secondary hazard source (optional)	**Severe storm**
Tertiary hazard source (optional)	**Winter storm**
Is this a phased project?	**No**
Are you doing construction in this project?	**No**
Population affected	**100**
Detail/description of stated percentage	**MD 249 serves as the sole route for ingress/egress for the residents of the approximate 177 homes on the island, as well as several businesses ranging from restaurants and inns to camping sites and recreational facilities. The population of St. George Island is approximate 584. The average daily traffic is estimated at 1500 vehicles.**
Provide a clear and detailed description of your proposed activity	**The proposed project will entail final design of a hybrid living shoreline for three sites identified along MD 249. This will include completion of the NEPA documentation, public involvement and permit coordination.**
How will the mitigation activity be implemented?	**Through the final design process, MDOT SHA will work with local, state and federal stakeholders to finalize the design and identify funding partnerships and strategies that can be utilized to move the project from final design to construction.**
Describe how the project is technically feasible and will be effective in reducing the risk by reducing or eliminating damage to property and/or loss of life in the project area. Please include engineering design parameters and references to the following: preliminary schematic or engineering drawings/design; applicable building codes; engineering practices and/or best practices; level of protection (e.g., life safety, 100-yr flood protection with freeboard, 100-yr wind design, etc.):	**Strategy/Concept 1 utilizes natural shoreline protection design and includes a stone sill to dissipate St. George Island Feasibility Study. In consideration of a natural approach considered with Concept 1, the system, hydrodynamic, and terrestrial parameters of the project site are well suited to a living shoreline design. Specifically, the low erosion rate, low tidal range, and nearshore slopes, are easily incorporated into the design. Concept 1 includes three tiers of protection to address coastal flooding and shoreline erosion. The lowest tier includes a sill to dissipate wave energy as it approaches the shoreline by dampening the waves and to provide protection for the created marsh. Other sill materials such as coir logs or shell bags were considered but are not appropriate for this site due to relatively high wave**

energy. Class II riprap was selected as the sill material due to the high wave energy (i.e. wave height) at the site. Stone sizing calculations for the sill were performed using the US Army Corps of Engineers' (USACE) Design of Coastal Revetments, Seawalls, and Bulkheads manual (Engineer Manual 1110-2-1614) and are included in Appendix I. The height of the sill is critical to the success and stability of the created marsh behind the sill because the sill breaks the force of the waves allowing marsh and beach grasses to establish. For the concept design, the top elevation of the stone sill is proposed at elevation 2.5 feet. This elevation will be refined in final design in order to determine optimal wave height reductions. Gaps or windows are located along the sill to allow aquatic organisms to move between the created marsh and the Potomac River. The sill is curved as shown in Figure 14 to allow gaps for aquatic passage while also providing protection from waves. The second tier of protection includes placement of sand/silt fill landward of the stone sill to create a vegetated marsh. The seaward side of the fill begins at the average tide elevation of -0.10 feet and extends landward at a 10:1 slope until it intersects a proposed reinforced dune, which is set at elevation 3.9 feet. The vegetated marsh areas not only dissipate wave energy but also provide ecological habitat and water quality benefits. The reinforced dune constitutes the final tier of protection by providing a barrier along the roadway to further mitigate coastal flooding from tide and storm surges, and shoreline erosion from wind generated waves. The reinforced dune top elevation is proposed at 3.9 feet and it will be reinforced with gabion flood protection barrier for structural stability. This proposed barrier prevents stormwater runoff from draining to the Potomac River, potentially causing flooding during rain events. Therefore, a ditch is proposed between the edge of road and the reinforced dune to collect roadway drainage and a series of 18-inch pipes are proposed to convey the stormwater through the flood barrier to a graded gut in the created marsh and then to the Potomac River. Tide valves are proposed on the 18-inch pipes to prevent backwater from flooding the road during high tides and to provide minimal tidal storage. The elevation of the proposed reinforced dune was set at 3.9 feet because this is the highest flood protection elevation that can be obtained without impacting private property. Along the St. Mary's River

	shoreline, there is an existing low point on a private residential. That low point allows floodwaters over elevation 3.9 feet to reach MD 249 from the St. Mary's River. Therefore, providing protection along the Potomac River above elevation 3.9 feet is not effective without also providing matching design elevation on the private residential property. In addition, an existing roadside ditch and driveway culvert under the entrance to the Piney Point Recreation Area provide connection to the St. Mary's River, allowing floodwaters over elevation 2.0' to reach MD 249. The ditch and driveway culvert are required to convey stormwater away from the road. Therefore, a tidal valve is proposed on the existing driveway culvert in order to prevent backwater from the St. Mary's River flooding MD 249 during high tides. The elevation of the driveway is approximately 4 feet and therefore will prevent coastal flooding with use of a tidal value on the driveway culvert. It is not feasible to address sea level rise with this alternative due to sensitivity of natural shoreline design to existing tidal elevations. Establishment of vegetation is dependent on hydrology as determined by current tidal variations. Designing natural shoreline based on anticipated sea level rise requires planting of marsh grasses at higher elevations and different hydrologic zones than they can currently tolerate and expose replenished shoreline to continued erosion. Additionally, the stone sills are intended to promote tidal flushing and passage of aquatic organisms whereas constructing to anticipated elevations may create obstructions in existing conditions. A hybrid living shoreline is a comprehensive and holistic approach to addressing the primary project objectives to protect MD 249 from erosion and high occurrence of flooding on the roadway that impact island ingress / egress, stabilize and restore targeted shoreline areas along the Potomac River to restore marsh and reduce accelerated erosion, and attenuate wave energy generated by wind and tidal action to reduce erosive forces. The multi-tiered approach of this alternative provides the greatest level of protection against storm surge elevations and wave energy. Finally, the vegetated marsh area provides ecological habitat and water quality benefits.
Who will manage and complete the mitigation activity?	**MDOT SHA will manage and complete the final design with technical assistance.**

Will the project address the hazards identified and what risks will remain from all hazards after project implementation (residual risk)?	**The proposed shoreline design considers coastal hazards of daily tidal fluctuations, extreme tides, storm surge elevations, and wind generated waves. The site assessment indicates high wind and waves associated with a hurricane in the 1930s combined with sea level rise and increased frequency of storm events over the last twenty years has led to the loss of marsh and dune features along St. George Island. This loss of marshland and dunes has removed the protection or buffering of the storm (wind and wave) events that cause erosion and lateral migration of the shoreline towards MD 249. The loss of buffer, migration of shoreline and rising sea levels contribute to increased flooding of MD 249. The FEMA Flood Insurance Rate Map for the study area along with supporting FIS map indicate the 10-year storm elevations overtop the edge of roadway in this area by approximately 0.6 feet before considering additional wave heights. In addition, an adjacent water main and overhead electric utility pole are impacted by coastal flooding and shoreline erosion. The study area is especially prone to coastal flooding due to the low elevation of the road and limited natural protection. Continued erosion of the shoreline along the study area will reduce the remaining natural protection at the site, resulting in more frequent roadway flooding. In addition, sea level rise caused by climate change will increase the frequency and intensity of events that flood the road. As a result of this decreased separation between the river and the roadway and subsequent increased flooding, public safety concerns for the community as well as potential impacts to pavement integrity of the roadway will increase. Multiple low lying locations along MD 249 experience frequent roadway flooding and sediment deposition that limit accessibility, as well as shoreline erosion that threatens the MDOT SHA roadway section and adjacent infrastructure such as guardrails, utility poles, and water mains.**
When will the mitigation activity take place?	**Funding will need to be identified in order for the project to go to construction.**
Explain why this project is the best alternative. What alternatives were considered to address the risk and why was the proposed activity considered the best alternative?	**Three different concepts to address coastal flooding and shoreline erosion at the project site were developed through a feasibility study. The three investigated mitigation strategies include: •Natural/Soft shoreline protection (i.e. Living shoreline) • Conventional/hard shoreline protection (i.e. revetment) • Tidal curtain (i.e. wave attenuating**

	device) A separate effort was conducted to evaluate the option of raising MD 249 since several lengths of the roadway are only 2' above MSL. While raising the roadway profile 3.8 to 4' above MSL is an option with drainage structure modifications, it is not the full solution. Shoreline protection would still be needed for protection from erosion, wave energy and sea level rise and provide overall improved asset resiliency. A natural shoreline and establishment of a marshland and reinforced dune design is a natural shoreline approach that includes three tiers of protection (stone sill, constructed marsh and reinforced dune, and constructed gabion flood protection barriers) to address coastal flooding and shoreline erosion. This design will offer protection to MD 249 from shoreline erosion by reducing wave heights and energy which contribute to overtopping and degradation. A hybrid living shoreline would be able to address tidally influenced flooding and 25-year storms more successfully than the other alternatives analyzed in the feasibility study. This is preferred concept identified by the feasibility study due to its: a) protection of MD 249 from erosion and high occurrence of flooding and sediment deposition on the roadway, b) stabilization and restoration of targeted shoreline areas on the Potomac River, c) attenuation of wave energy generated by wind and tidal action, with d) improved conveyance of culvert discharge (regrade of the existing gut area). This multi-tiered approach provides the greatest level of protection against storm surge elevations and wave energy. The increased level of protection also reduces maintenance efforts by limiting sand deposition on the roadway and in front of culvert outfalls and reduces exposure of flood protection barriers to saltwater. The vegetated marsh area also provides ecological habitat and water quality benefits.
Please identify the entity that will perform any long-term maintenance and provide a maintenance, schedule and cost information. The subapplicant or owner of the area to be mitigated is responsible for maintenance (including costs of long-term care) after the project is completed?	**The long-term maintenance activities, schedule and cost information is not available at this time because the project is only at concept level. The materials and details of the final design will determine long-term maintenance needs such as the use of gabions. MDOT SHA provides ongoing maintenance along MD 249 and it is currently analyzed that a living shoreline approach will provide benefit of reduced maintenance effort and cost for the state.**

Additional comments (optional)	**As a result of low island elevation, water elevation increase, and continued shoreline erosion, the roadway is frequently inundated resulting in road closures and significant deposition of sand, especially in the vicinities of O'Connors Lane and Sheaffer Lane, requiring regular removal. SHA crews remove sand from the roadway approximately twice a month, and sometimes as frequently as every other day. Per permitting requirements, sand removed from the roadway and adjacent ditches is disposed of off-site as opposed to replenishing the eroding shoreline. There are two cross culverts located in the project area that convey stormwater under MD 249. The northernmost culvert outfall was completely buried on the March 12, 2020 site visit. The southernmost culvert outfall was partially buried. Deposition of sand from coastal flooding often blocks the northernmost culvert outfall resulting in standing water on private residential property until the culvert outfall is cleared. As a result of the shoreline depletion and reduced offset from edge of pavement, the roadway shoulder is experiencing pavement cracking. On March 10, 2020, SHA declared an emergency to reinforce the MD 249 shoulder to prevent road failure due to tidal impacts and erosion. The newly constructed sill is a Class III riprap barrier between the river and roadway laid on top of geotextile fabric. The sill is approximately 5 feet high, 15 feet wide, and extends approximately 150 feet in length between O'Connors Lane and Sheaffer Lane.**

Attachments

Filename	Date uploaded	Uploaded by	Label	Description	Action
MD 249 Flooding Pictures and Information_2019 Meeting.pdf	11/20/2020	msheffer@mdot.maryland.gov	Scope of Work Attachments	*No description given.*	
MD249 Feasibility Report Site 1 06.19.20.pdf	11/19/2020	msheffer@mdot.maryland.gov	Scope of Work Attachments	*No description given.*	
MD249 Feasibility Report Site 2 06.19.20.pdf	11/19/2020	msheffer@mdot.maryland.gov	Scope of Work Attachments	*No description given.*	

Filename	Date uploaded	Uploaded by	Label	Description	Action
MD249 Feasibility Report Site 3 06.19.20.pdf	11/19/2020	msheffer@mdot.maryland.gov	Scope of Work Attachments	*No description given.*	

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