PROJECT CONCEPT
HIGHLAND COUNTY
MILL GAP ROAD: ROAD UNDERMINING AND RIVERINE FLOODING

Location Description
38.378816, -79.647386
Approximately the 1000 block of Mill Gap Road (State Route 640) in the Meadowdale area (**Figure 1**), the Jackson River runs alongside and at nearly the same elevation as the road for a mile or more. High priority active failure area located just east of 1451 Mill Gap Road.

Project Purpose
Phase 1: Stabilize eroding stream bank along the vulnerable Mill Gap Road corridor to arrest active road failure and preserve emergency services access for residents west of the failure site in the Meadowdale area.
Phase 2: Assess possible flooding mitigation solutions for the stretch east of the failure.

Additional Information Needed
- Presence/location of utilities
- Topographic survey
- Hydrologic and hydraulic (H&H) modelling to determine flood extents and severity

Background
Just east of 1451 Mill Gap Road, the road surface has begun to break off at the edge of pavement (**Figure 2**). County staff noted that overland flow from the southern hillside spills over the shoulder and down a steep bank with a nearly 8-foot drop between the roadway and the stream. A failure point, understood to have been created during a recent large storm event, has continued to degrade and is endangering the roadway. Riprap has been previously installed along this slope to control erosion, which reinforces the toe of the slope at the stream's edge but does not address the failure at the road edge. A stream restoration project was previously completed along this reach and further upstream, which added many riparian tree plantings. As these establish, they will improve stability of the reach, but the proximity of the stream to the roadway where the erosion has since occurred prevented plantings along this bank.

East of the eroding roadway, the Jackson River runs approximately parallel to Mill Gap Road and at a similar elevation as the road, with only a few feet of elevation difference in some sections (**Figure 1**). During significant rainfall events, the Jackson River will escape its banks and flood the road. This poses a threat to residents in the area. When the road becomes impassable, the alternate route adds an extra 25 minutes of travel time. This increases emergency response times in a rural area where response time is already high.

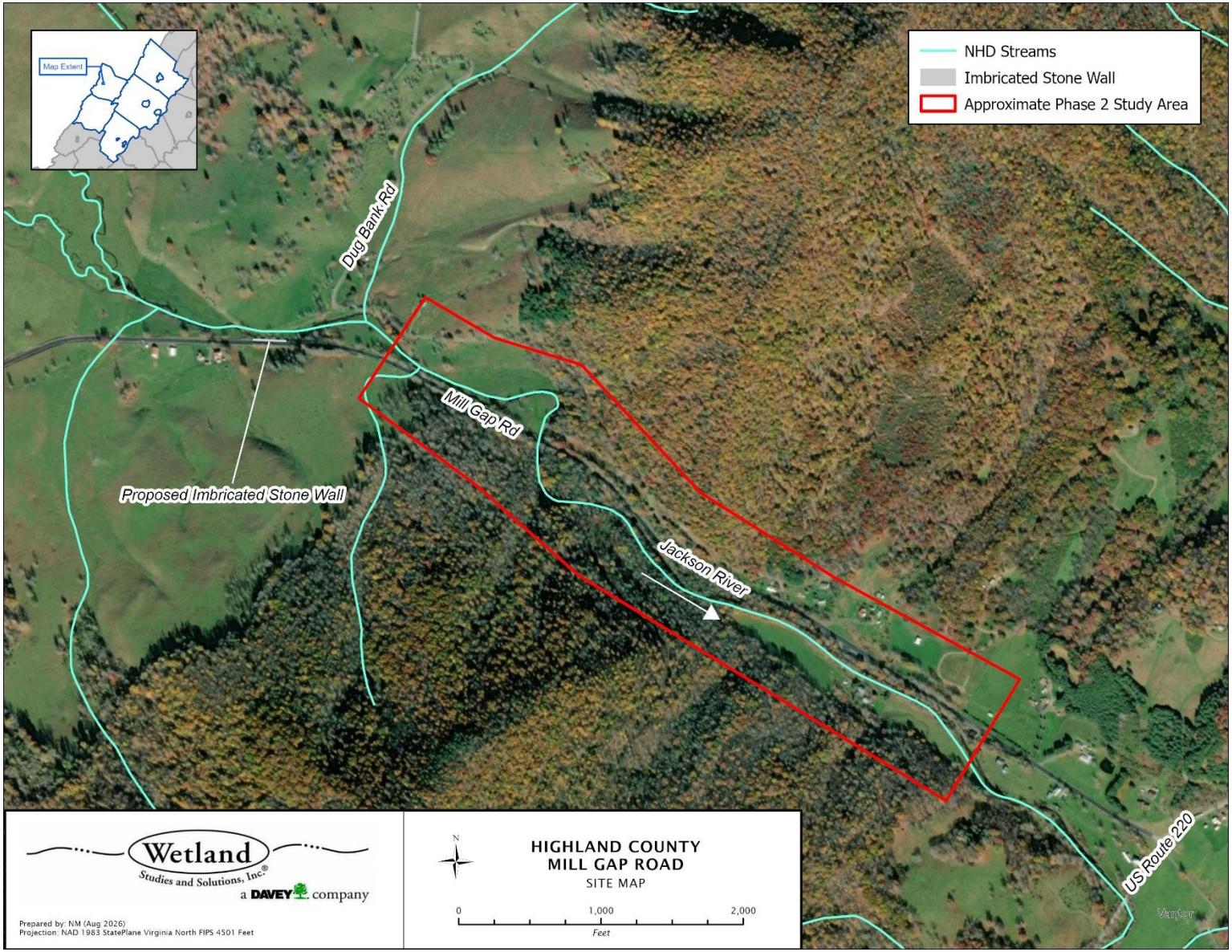

Figure 1. Site map showing the Jackson River as it runs in close proximity to Mill Gap Road. The proposed location for the stone wall between Mill Gap Road and the Jackson River is labeled.



Figure 2. Erosion along Mill Gap Road. Photograph taken facing downstream (east).

Conceptual Design and Planning-Level Cost Estimate

As **Phase 1**, to address the bank degradation along the road, an imbricated rock wall is proposed along the failing bank, extending along approximately 250 feet of the Jackson River (**Figure 3**). A properly installed rock wall will provide a more stable structure than dumped riprap such as what is currently in place. The stone wall will armor the bank, preventing further erosion from runoff traveling either over the roadway or within the channel. The stone wall should be constructed from the toe of the bank at the river and built up to just below or at the elevation of the roadway. A typical detail for an imbricated rock wall along a stream channel is provided in **Figure 4**. A layer of footer rocks buried beneath the toe will be set with the top of the footer stones at approximately the elevation of the current stream invert. The stones should be layered and stepped back (towards Mill Gap Road) at least six inches from the layer beneath. Rocks should be placed in a way that the joints do not align with the layer below to provide more stability. The slope of the wall away from the horizontal should be between 1:6 to 1:4 to ensure structural integrity. The minimum intermediate dimension of the stones should be approximately 3 feet (36 inches) (**Figure 5**). Chinking stones should be placed (from the buried/back side) in larger gaps between the wall stones to provide further structural stability.

Geotextile fabric must be installed beneath the footer stone and behind the subsequent layers of stone to prevent piping of fines from behind the wall. Soil backfill should be installed and appropriately compacted in levels between the geotextile fabric and existing slope as the wall is constructed. After the header layer has been installed, topsoil should be placed on the fill, from the top of the wall to the existing ground, to support vegetative growth. The slope of this topsoil should be no more than 2:1, and native vegetation should be planted between the rock wall and road. The roots of this vegetation will anchor the soil and slow the overland flow, protecting against erosion.

Coordination with VDOT will be necessary as they hold responsibility for maintenance of the roadway. There is currently no guardrail in this section of roadway, but installation of one could be incorporated into the wall design with VDOT coordination. This would provide further protection to traffic, as the rock wall will not soften the already steep drop from the roadway to the river, and installation while work is active for the wall would limit mobilization costs and prevent potential damage to the wall if installation were planned later.

Phase 2 assesses options to address flooding along the stretch of Mill Gap Road to the east of the proposed imbricated stone wall. A channel and floodplain survey and flood impact study should be completed to better capture the site limitations and identify potential avenues for reducing flood inundation of Mill Gap Road in the approximately 1-mile long study area (**Figure 1**). This study would inform possible flooding solutions in a preliminary engineering report (PER) from the high priority site of erosion, eastward along Mill Gap Road. The Jackson River throughout this corridor is largely confined by bedrock. Thus, projects involving planform adjustments or channel lowering would be limited. Other projects to address flooding, like raising the road elevation, would be infeasible due to increased costs relative to the volume of traffic using Mill Gap Road. Therefore, a bank protection measure is anticipated to be the most viable project – subject to confirmation by the PER.



Figure 3. Extent of proposed imbricated stone wall along the Jackson River.

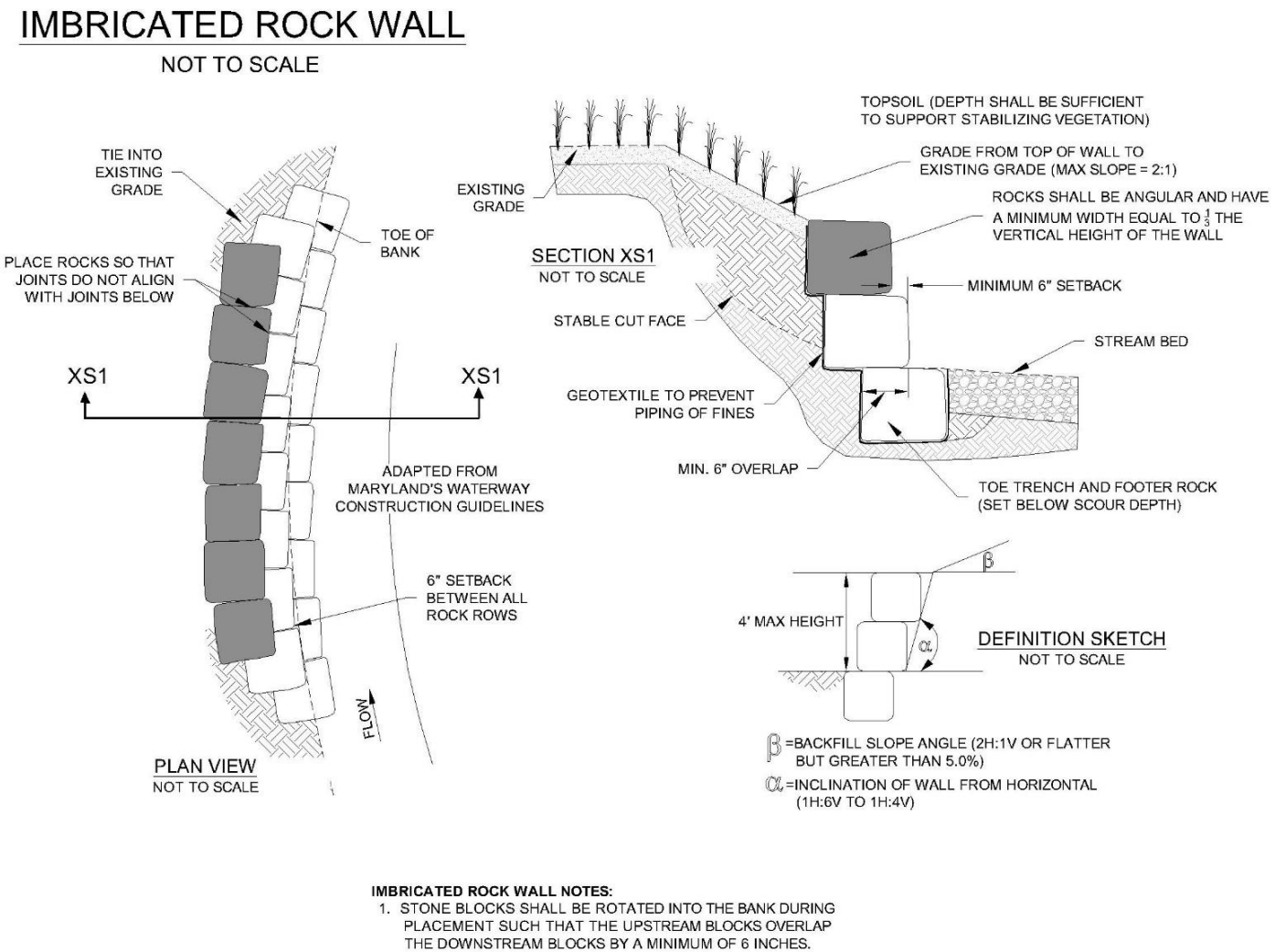

Figure 4. Typical construction detail for an imbricated rock wall.

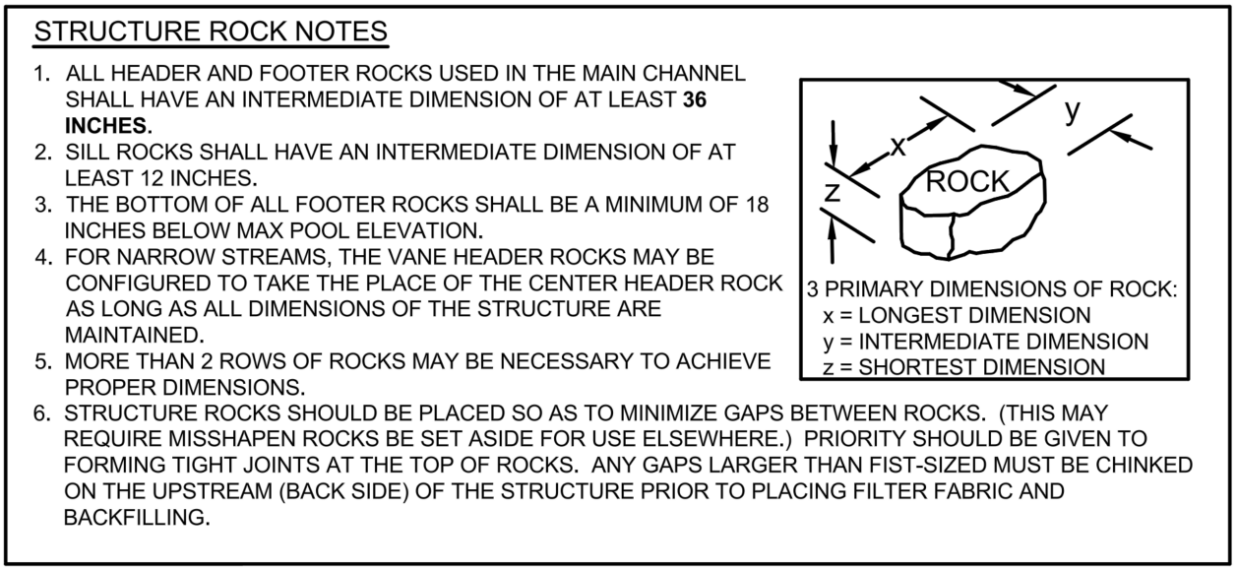

Figure 5. Typical construction details for structure rocks.

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Phase 1: Stabilization of Failing Bank					**$358,443**
Design					**$58,000**
Channel and Utility Survey	1	LS	$14,000	$14,000	
Design	1	LS	$30,000	$30,000	
Permitting	1	LS	$14,000	$14,000	
Construction Administration and Oversight					**$7,000**
Construction Oversight	1	LS	$7,000	$7,000	
Access and Erosion/Sediment Control					**$27,850**
Traffic Control	30	DAY	$500.00	$15,000	
Pump Around Diversion/Dewatering	5	WK	$2,500.00	$12,500	
Filter Bag	1	EA	$350.00	$350	
Construction					**$182,875**
Stakeout	1	LS	$18,000	$18,000	
As-Built Survey	1	LS	$18,000	$18,000	
Mobilization	1	LS	$10,000	$10,000	
Imbricated Rock Wall	250	LF	$400	$100,000	
Geotextile Fabric	225	SY	$3	$675	
Native Seed and Natural Fiber Matting	225	SY	$12	$2,700	
Excavation and Haul Off	225	CY	$60	$13,500	
Guardrail (250 lf and end terminals)	1	LS	$20,000	$20,000	
Phase 1 Contingency (30%)					**$82,718**

ITEM/DESCRIPTION	QTY	UNIT	UNIT COST	ITEM SUB-TOTAL	EXTENDED SUB-TOTAL
Phase 2: Floodplain/Stream Study					**$114,400**
Floodplain/Stream Study					**$88,000**
Survey	1	LS	$18,000	$18,000	
H&H Study	1	LS	$30,000	$30,000	
PER	1	LS	$40,000	$40,000	
Phase 2 Contingency (30%)					**$26,400**
TOTAL ESTIMATED BUDGET					**$472,843**

Estimation of costs associated with construction-phase efforts identified in the floodplain/stream study will require additional study and scoping.

Assumptions

- Watershed (via StreamStats 8/27/2026) is 12.1 square miles from the bridge on Mill Gap Rd.
- Approximately 250 lf of imbricated stone wall, estimated to stabilize the failing roadside at a maximum of 8 feet high along current site of bank erosion.

Recommended Next Steps

Reach out to VDOT regarding partnership for project implementation and restrictions/desire to add a guardrail in this area. Evaluate funding options.

References

USGS. StreamStats v4.33.0. Accessed online 27 August 2026