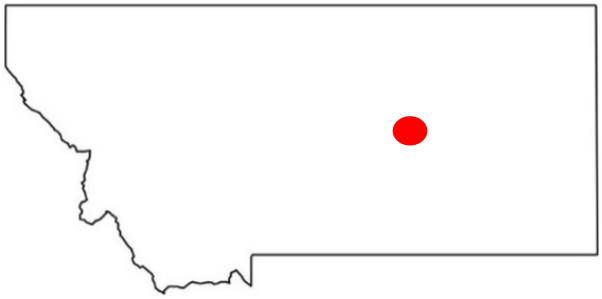
Experimental Feature Evaluation
December 2022

Experimental Feature:	Flexamat Vegetated Concrete Mat
Location:	Billings District, Petroleum County, Valentine Road
MDT Project Name:	Valentine Road Repair
MDT Project Number:	ER 35(21)[9745]
Experimental Project Number:	MT-20-03
Principle Investigator:	Chad DeAustin, Experimental Project Manager, (ExPM)
Technical Contact:	Dave Hedstrom, MDT Hydraulics Engineer
Construction Date:	November 2020
Date of Inspections:	May 2021, May 2022

Project Map



Feature Description & Outline

Flexamat is a mat made of concrete blocks tied together with a high strength geogrid used for stabilizing slopes, channels, low water crossings, inlet/outlet protection, and shorelines. The concrete blocks are 6.5” squares with a 2.25” height. The blocks have a 1.5” spacing that provides flexibility and allows for vegetation growth between the blocks. In a scenario that the product worked as intended, the Flexamat will significantly decrease erosion while still allowing some vegetation growth. Below is an image from the manufacturer’s website.

Evaluation Procedures & Schedule

The measure of effectiveness (MOE) prevalent with this project will focus on:

- Construction practices (constructability, construction time, cost effectiveness, etc.),
- Document any visual distress of the Flexamat,
- Document any erosion.

In accordance with MDT’s Experimental Features Procedures, the Experimental Project Manager will monitor and report on performance for a minimum of five years annually. This includes delivery of a work plan, construction report, annual reports, and final project report.

2020:	Installation/Construction Report
2021-2024:	Annual Inspections/Evaluation Reports
2025:	Final Evaluation/Final Report

A web page will be dedicated to display all reporting from the project.

URL: https://mdt.mt.gov/research/projects/flexamat.aspx

2022 Update – May

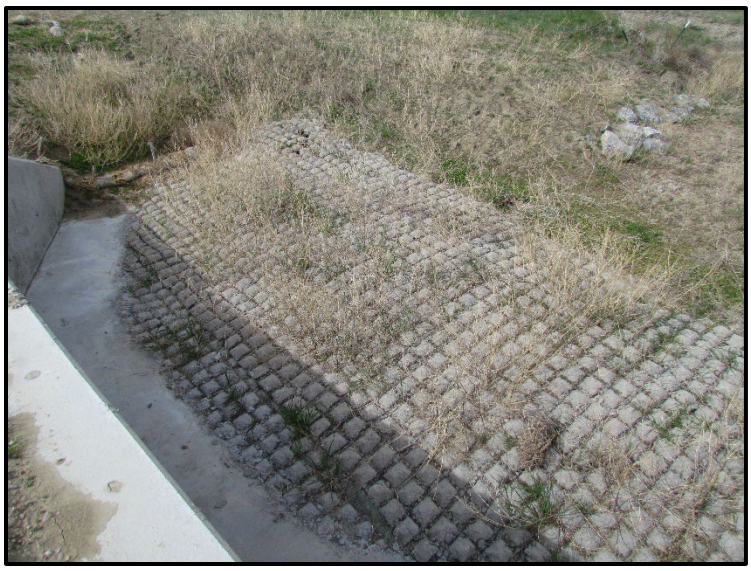
Significant plant growth in the flexamat sections at the box culvert and the bottom of the outlet side ditch. The flexamat appeared to be in good and working condition. A few damaged blocks were noticed most likely from installation. No erosion was noticed.

🡅 Outlet ditch with Flexamat, view south.

🡅 Inlet ditch without the Flexamat, view south.

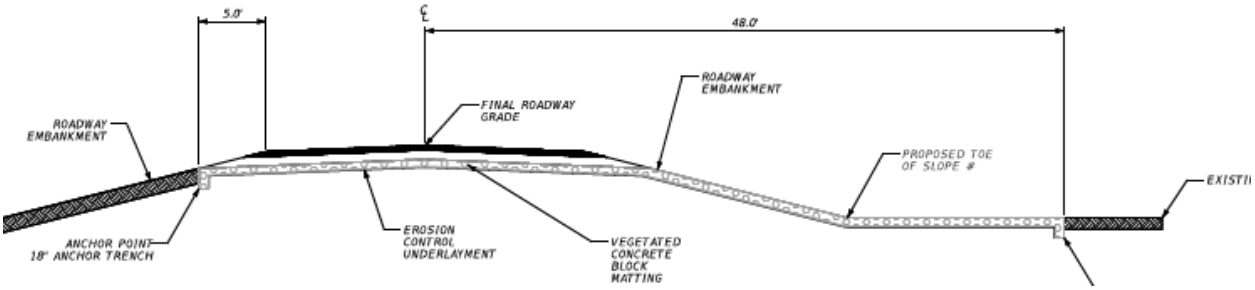
← View of some of the vegetation the has begun to grow through the Flexamat. Note that the bottom half of the ditch has more growth than the top.

← Close-up view of the concrete blocks and geogrid making up the Flexamat in the outlet ditch. A few damaged blocks were noticed, most likely from installation.



← Inlet side of the box culvert with noticeable plant growth through the Flexamat.

Construction – November 2020



Above is the detail for the Flexamat section with the left side of CL being the inlet and right being the outlet. The Flexamat is anchored just off the road slope in a trench, stretches across the roadbed and down the ditch slope on the other side. Additionally, through the roadbed there is a geofabric to aid in separation of subgrade and base course. The Flexamat is then covered with the surfacing gravel to grade.

⬆ View of how the Flexamat was anchored on the inlet side of the road.

⬆ View of the Flexamat being laid over the geofabric separating the subgrade and surfacing gravel.

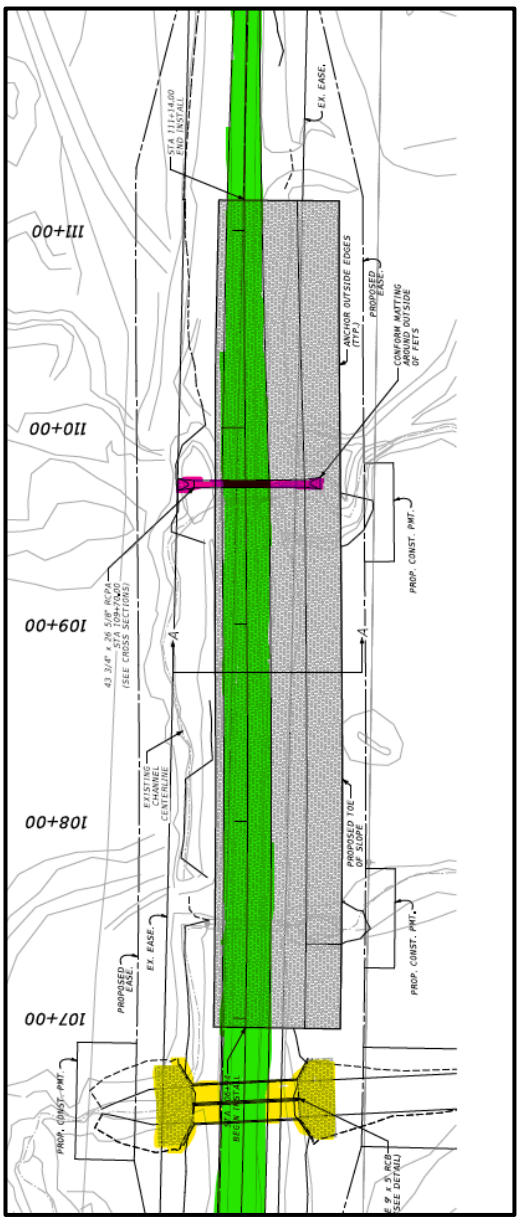
In the right photo you can see the geogrid edge of the Flexamat. To connect multiple sections, the 2 pieces are overlayed and metal zip ties are used for connection. There is one of these seems shown in the left photo. U anchors are also used to keep the mat in place.

Surfacing gravel being placed.

Outlet side of roadway.

Inlet side of roadway.

Flexamat was also placed at the inlet and outlet of the box culverts.



⬆ Seen above is a comparison of the detail from the plans and a satellite image of the finished project. The yellow highlights the box culvert and pink is the location of an additional culvert. The Flexamat on the outlet side of the roadway is easily visible in the satellite image.

A few other things to be noted about the product. Flexamat was specified at 67’ x 15.5’ however, most were short of those measurements. Lengths varied from 62’-67’ and widths were 14.6’-15.5’. This resulted in the need to order another section which caused delay.

The other issue was the overlap section of geogrid was on the wrong edge of the Flexmat, resulting in the mat needing to be rolled uphill rather than down, slowing progress, and raising concerns of damaging the product due to the extra force required to work against gravity.

Preconstruction – Summer 2020

A 2010 storm event caused a dam upstream to fail and resulted in water flows higher than designed to flow through the culvert. This resulted in eventual failure of the culvert causing drainage issues and road washout.

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