

VEGETATING M.S.E. STRUCTURE SUPPORTS HIGHWAY BERTHOUD PASS, COLORADO, USA

SLOPE REINFORCEMENT

Product: Green Terramesh® with permanent erosion control matting

Problem

Berthoud Pass, elevation 11,307 ft, was discovered in 1861 as a mail route over the continental divide for communications with the gold camps further west. These days, U.S. Highway 40 remains a strategic corridor in NW Colorado, used by over 2M vehicles each year.

The route was finally paved in 1938, and although the west side of the pass was widened in the late '60s, the eastern side had not been upgraded. The road was a 25ft wide highway, with almost no shoulders or recovery zones.

Colorado Department of Transportation (CDOT) began the Berthoud Pass Mountain Access Project in May 1999 to widen 6 miles of Highway 40 to the east of Berthoud Pass at an estimated cost of \$73M. The two lane highway would be widened to a minimum of 66 feet, with two uphill lanes, one downhill lane, shoulders, recovery zones, crash barriers and snow storage areas (the area averages 500 in. of snowfall annually).

Along the 6 mile widening, there were many locations where the slope could not be steepened naturally to facilitate the road widening. At an area of the route known as "The Narrows" this problem was significant.

Solution

Mechanically Stabilized Earth (MSE) provided the solution. Combinations of soil nails, wire strand tie backs, near-vertical segmental reinforced blockwork walls and reinforced vegetating slopes were used to provide enough space for the highway.

Maccaferri Inc, was approached by the main contractor, Yenter Companies, to assist in the design of the vegetating reinforced slopes. These MSE structures would reinforce the backfill using geogrids, allowing it to safely stand at a much steeper angle than in its unreinforced state. Yenter excavated a large cut which was then stabilized using soil nails. The excavated material was crushed locally, and returned to site to be used as structural backfill to the MSE structures.

Client:

COLORADO DEPARTMENT OF TRANSPORTATION

Main contractor:

YENTER COMPANIES, ARVADA, CO

Designer:

YENTER COMPANIES & MACCAFERRI INC.

Product used:

GREEN TERRAMESH® (with non-degradable facing)

Date of building:

SUMMER - FALL 2001



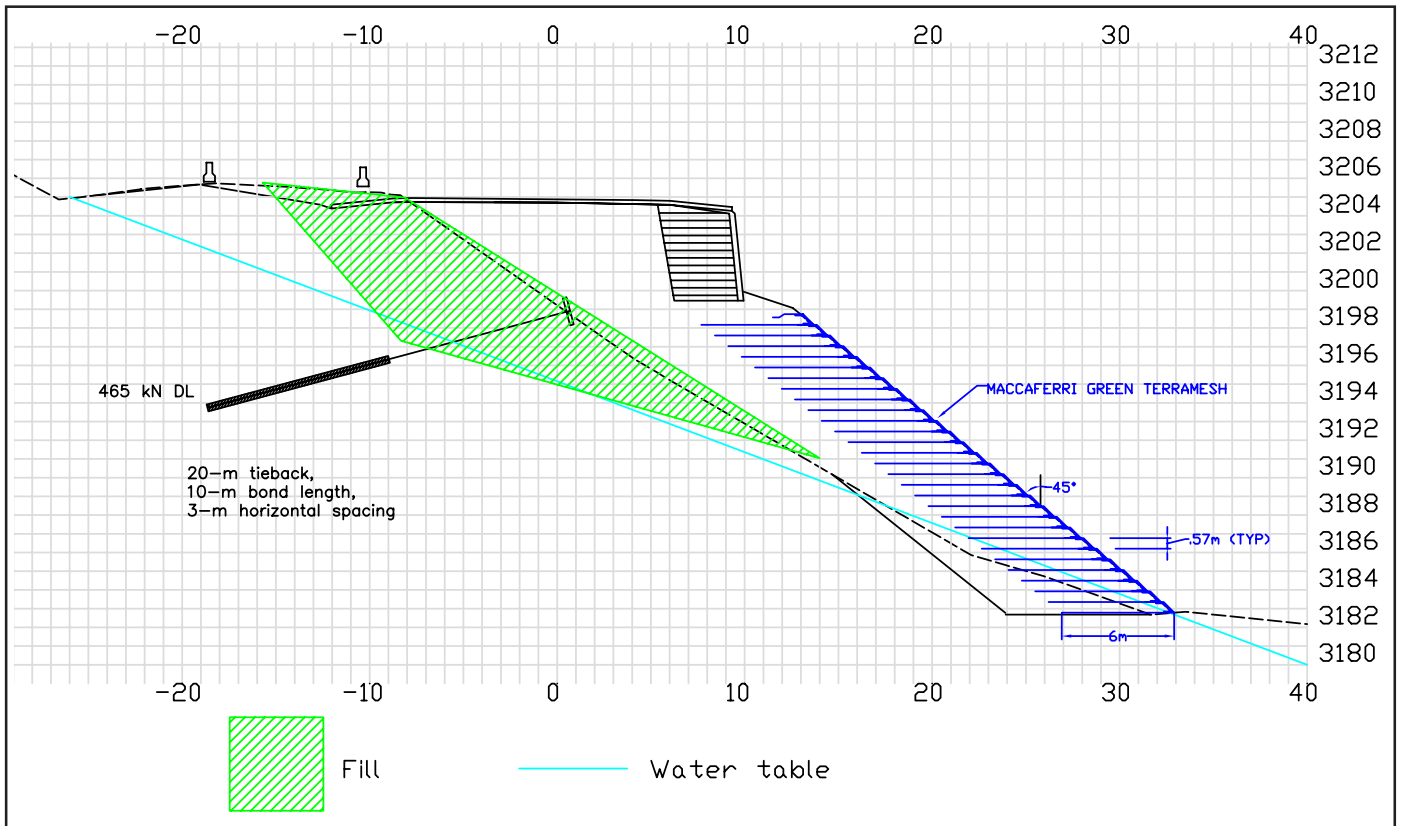
Soil nails used to stabilize slopes



Green Terramesh® MSE slopes after construction



Vegetation establishing on the slope



Typical cross section through reinforced slopes

Maccaferri Green Terramesh® provided the ideal solution for the vegetating MSE slopes as it offered the following benefits;

- Vegetating 'green' face for aesthetic appeal
- Ease of installation due to factory fitted integral reinforced face units
- Cost effective, and easier to install than traditional polymeric "wrapped face" geogrids
- Long design life

Maccaferri Green Terramesh® is manufactured from PVC coated galvanized steel wire mesh.

A non-biodegradable polymer erosion control blanket was specified behind the face of the Green Terramesh® units to limit the backfill from washing out. A 1-1.5 ft thick column of topsoil was installed behind the blanket. The blanket has 95% open area which allows intimate contact between any seeds and the topsoil behind the face, maximizing the potential for seed germination.

The Green Terramesh® structures were a maximum of 110' high, and many also supported a segmental reinforced wall above.

The project also included many features to minimize the impact



of the highway on the surrounding environment including animal crossings, sediment catch basins to contain roadway sand and extensive replanting and vegetation establishment.

Maccaferri Green Terramesh® is the **first vegetating MSE system to be evaluated by HITEC**, an independent organization created through collaboration of the FHWA, TRB and the ASCE to assess innovative solutions for use in public sector Civil Engineering projects. This report is available from the HITEC website at www.cerf.org/hitec.

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