

# Capping of the Excavation Cut for a New High-Speed Railroad Line in Spain

In high speed railroad lines, continued rainfall periods may cause problems due to the presence of soils sensitive to moisture changes. The ground can respond by shrinking (settlement) when it dries, or swelling (heave) when it becomes wet again. This may result with instability of excavation cuts. Many railroad structures and embankments founded on such sensitive, unprotected soils require constant monitoring and remedial measures to prevent a potential failure.



## PROJECT DETAILS

Construction of new railroad line Córdoba to Málaga, Spain

## LOCATION

Railroad section Puente Genil – Herrera, Spain

## PRODUCTS USED

BENTOMAT® AS GCL

CETCOCELL  
(geocell system)

## CHALLENGE:

Córdoba – Málaga railroad line belongs to Madrid – Southern Spain high-speed railroad system, one of the most important transportation networks in Spain. The original construction design for the new line did not call for a lining solution. After an uncommon period of heavy rain, studies based on topographical survey and volumetric analysis demonstrated slope geometry changes and instability hazards. Detailed investigation identified soils sensitive to moisture changes. The footprint of exposed susceptible soils was 90,000 m<sup>2</sup>, mainly on slopes inclined at 3H:1V and 2H:1V. Length of each slope varied from 10 to 80 m.

## SOLUTION:

CETCO engineers recommended to cutoff sensitive soils from potential rainfall by using a BENTOMAT® AS geosynthetic clay liner (GCL). For steeper slopes a cellular confinement system (CETCOCELL) was also recommended to be installed on top of the BENTOMAT® AS GCL to prevent surface runoff or severe erosion problems. This proposed solution was benchmarked against other lining systems but the CETCO GCL solution proved to be the most efficient and reliable liner for this application. BENTOMAT® AS GCL and CETCOCELL turned out to be the most durable, competitive and cost-efficient solution.

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**RESULT:**

Since construction was already delayed, the installation of BENTOMAT® AS GCL was carried out quickly to allow for consecutive works to be progressed without further delays. BENTOMAT® AS GCL proved to be extremely efficient and feasible for this kind of emergency work.