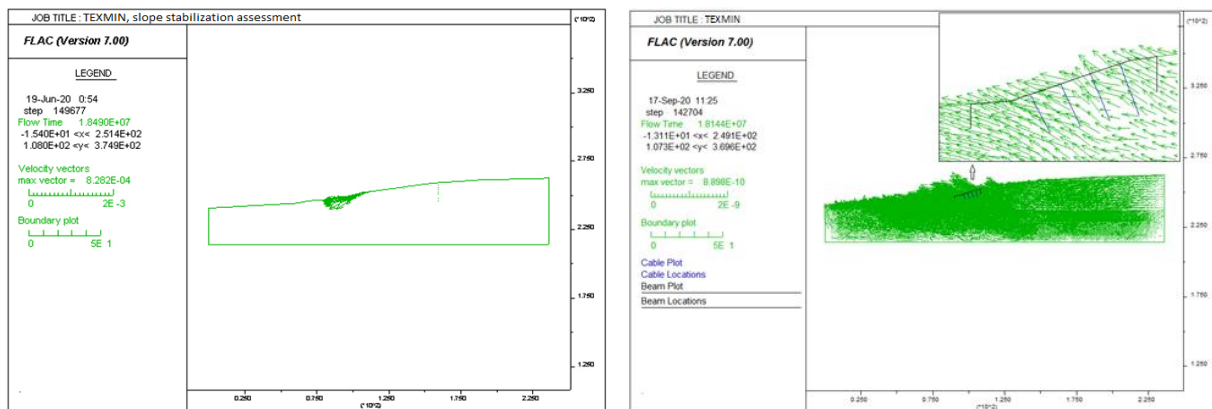


Within TEXMIN project, **an application in pilot scale the remedial measures for stabilization of mine spoil dump in situation of extreme weather events occurrence**, has been planned.

The Janina Mine spoil heap (waste disposal facility) in Libiąż (PL) was selected as the site for the pilot study. In recent years, under the pressure of a growing waste heap, especially after intensive rain, landslides have been repeatedly observed here, which poses a threat for the surrounding residents. Hence the need to secure and then revitalize the site.

After studying the potential impact of extreme weather events affecting landfill stability, it was noted that the most significant climatic factor affecting landfill stability is precipitation. Precipitation is the source that supplies surface groundwater. This means that the water level in the landfill structure itself and in its substrate are being altered due to the intensity of precipitation.

A numerical model was developed to determine the boundary conditions and technical parameters necessary to effectively increase the stability of the facility in changing weather. The numerical modelling results indicate the loss of slope stability under the impact of high rainfall intensity (figure on the left) value of velocity is higher than permissible value ($1e-5$), while slope is considered stable in case of using selected reinforcement (figure on the right) – value of velocity is much lower than the permissible value.



Velocity vectors of slope model: without any preservation (left) and with preservation using nailing and steel mesh (right)

Source: Project TEXMIN archive, Central Mining Institute (GIG)

Author: Phu Minh Vuong Nguyen, Central Mining Institute (GIG)

The pilot installation has been located at the mine waste dumps of the Janina mine site in the area of Krakowska st. in Libiąż. The testing ground dimension is 20 m x 30 m.

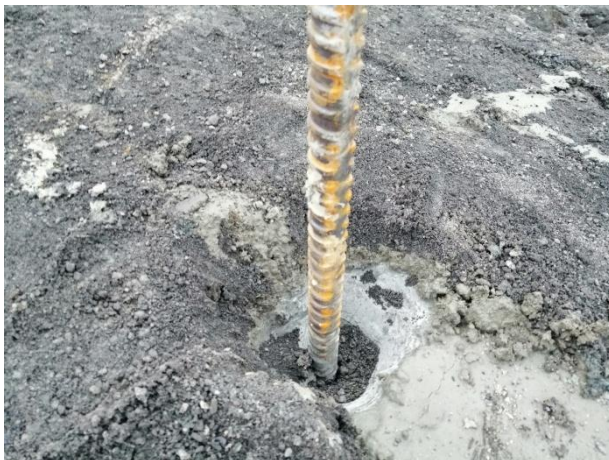
The aim of works was to implement slope preservation of the mine waste dumps against the impact of extreme weather events. Based on the results and analysis, the most appropriate technical solutions have been identified. Slope stabilization is to be performed with the use of soil nailing with facing of steel mesh and an anti-erosion geogrid along with humusing and grass seeding.

The progress of work is presented below:

1st step:

As a first step of works, nailing has been performed with the use of self-drilling technology, i.e. drilling with simultaneous injection using liner.

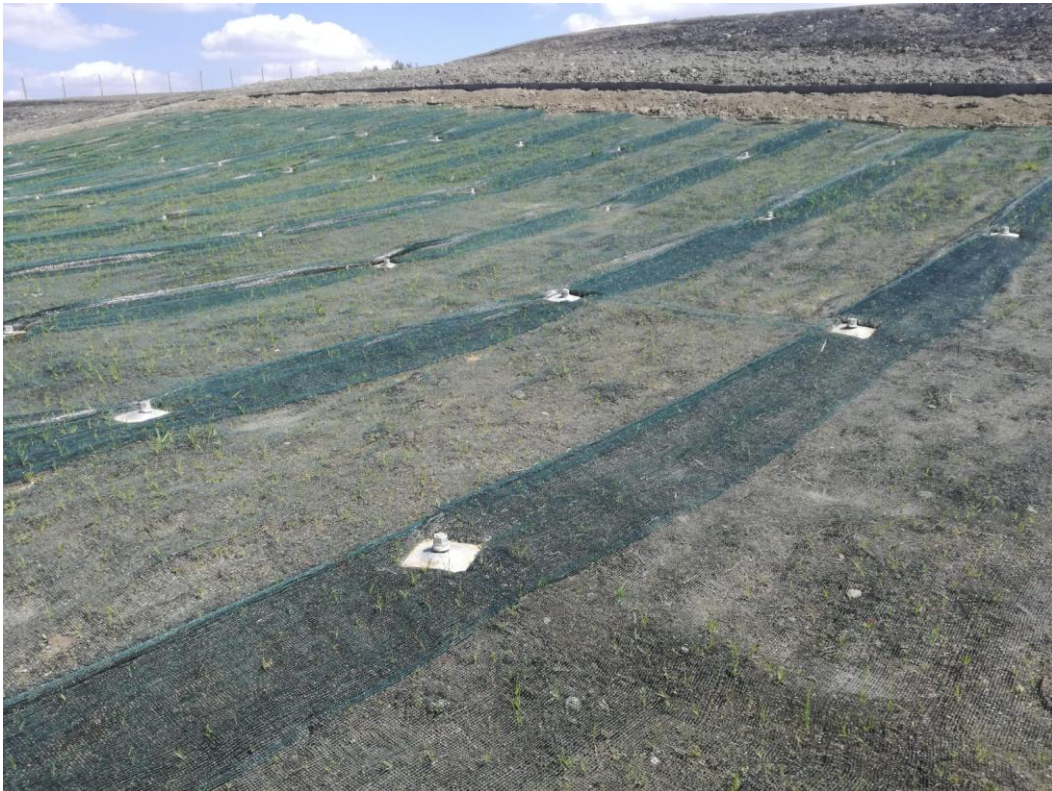
Below – photo documentation of drilling works is presented:



Source: Project TEXMIN archive,
Photo: Aleksander Wrana, Central Mining Institute (GIG) and Robert Fraczek, Tauron Wydobycie (TWd)

2nd step:

After nailing has been completed, facing has been conducted, consisting of anti-erosion protection and steel mesh.



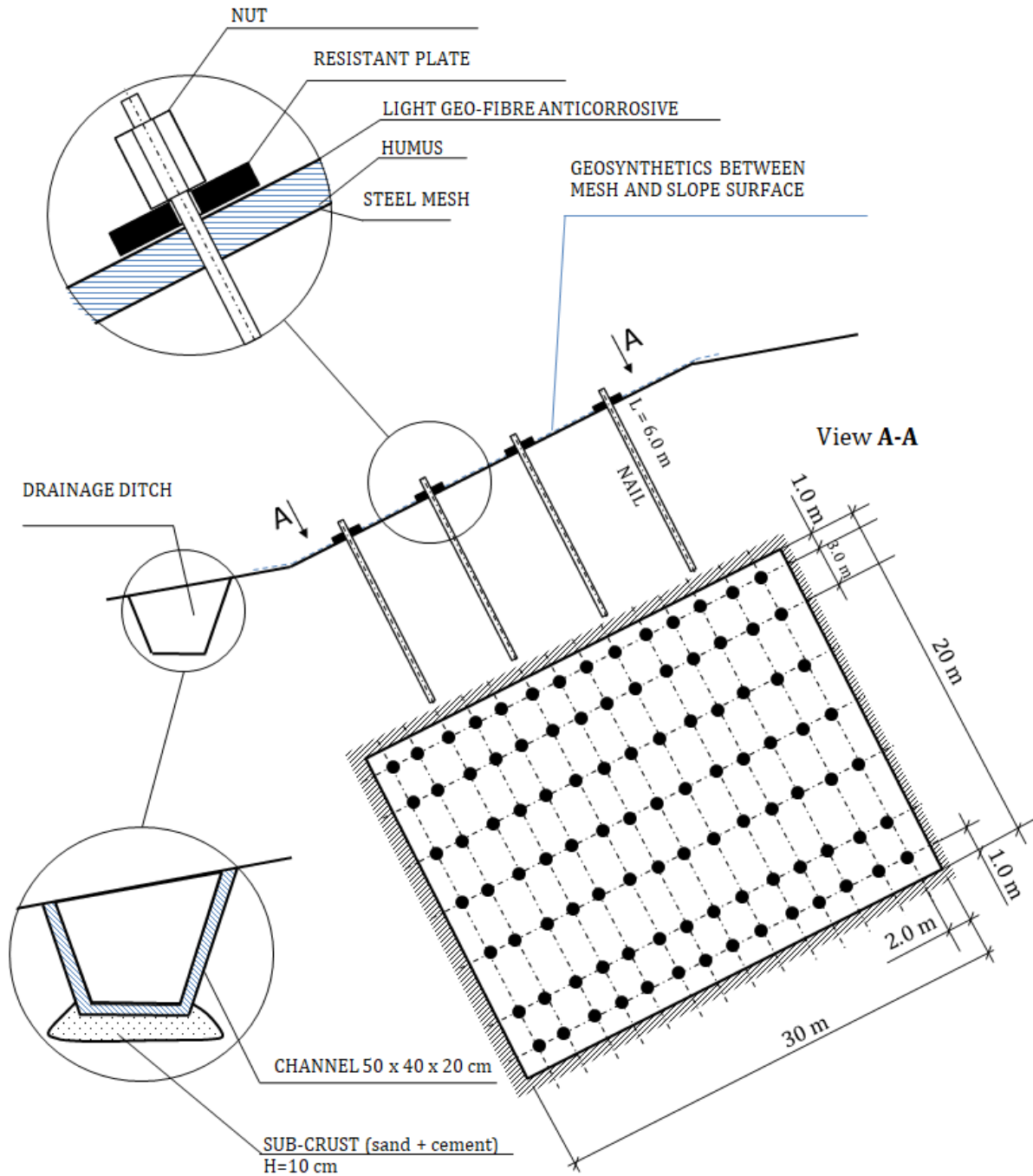
Source: Project TEXMIN archive,

Photo: Aleksander Wrana, Central Mining Institute (GIG) and Robert Fraczek, Tauron Wydobycie (TWd)

Additionally, water drainage has been included in order to drain water into a circular ditch. The form of a ditch has been made of meliorative concrete channels.

1st and 2nd step of the investment work within pilot installation have been implemented in winter 2020 / 2021.

At the figure below, a scheme of the reinforcement is presented.



Scheme of slope preservation of the mine waste dumps against the impact of extreme weather events at the Janina mine site in Libiąż

Source: Project TEXMIN archive, Central Mining Institute (GIG)

Author: Tomasz Janoszek, Central Mining Institute (GIG)

3rd step:

The process of strengthening the surface by sowing grass seeds has consisted of:

- a) creating a layer of fertile soil on the slope by humusing,
- b) sowing the fertile soil layer with grass seed compositions in the amount from 18 g/m² to 30 g/m², selected according to the habitat conditions.

This step started early spring 2021. Photo documentation of on-going results (status at mid-June 2021) is presented below.





Source: Project TEXMIN archive,
Photo: Malgorzata Markowska, Central Mining Institute (GIG)

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