"Earthworks" Module

Program: Stratigraphy – Earthworks
File: Demo_manual_46.gsg

"Earthworks" module is used to:
- Modeling buildings, roads, resp. monitoring the terrain changes
- Calculation of earthwork volumes
- Creating cross-sections and ground profiles for further calculations in GEO5 programs
- Visualization of 3D model constructions

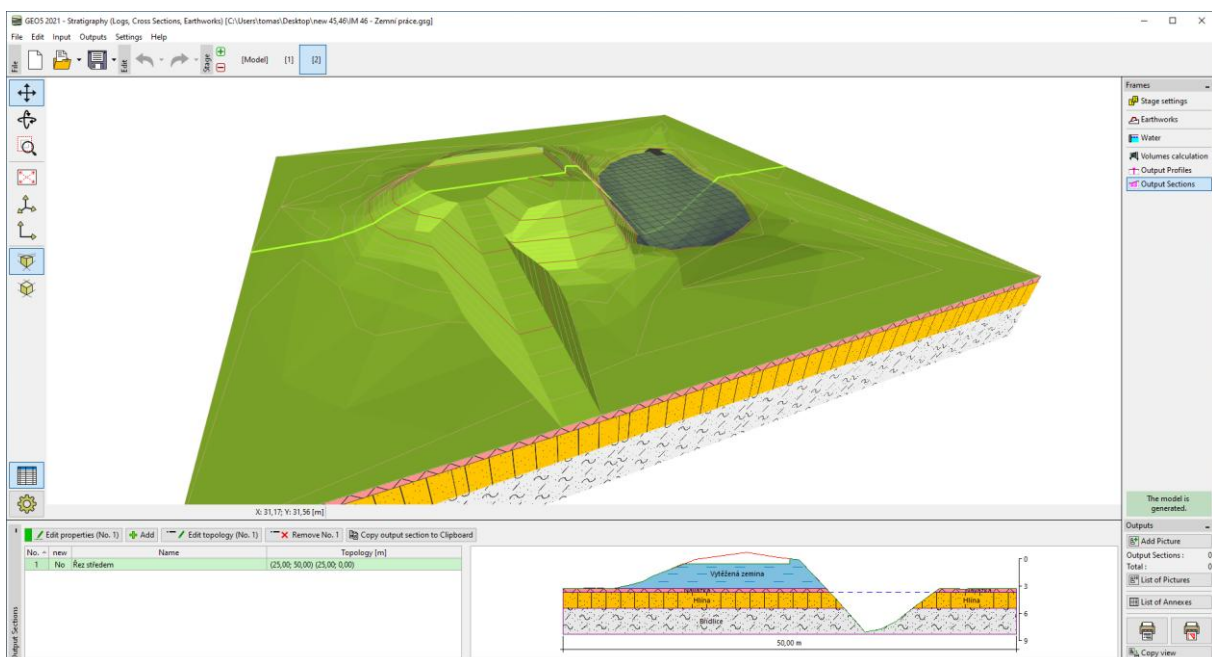In this engineering manual, we will show you, how to work with this module

- Firstly we will create a subsoil model
- In the first stage, model the terrain changes from the focused points
- In the second stage, create a terrace with an access ramp
- Lastly, we will transfer the cross-section of the model into the „Slope Stability" program
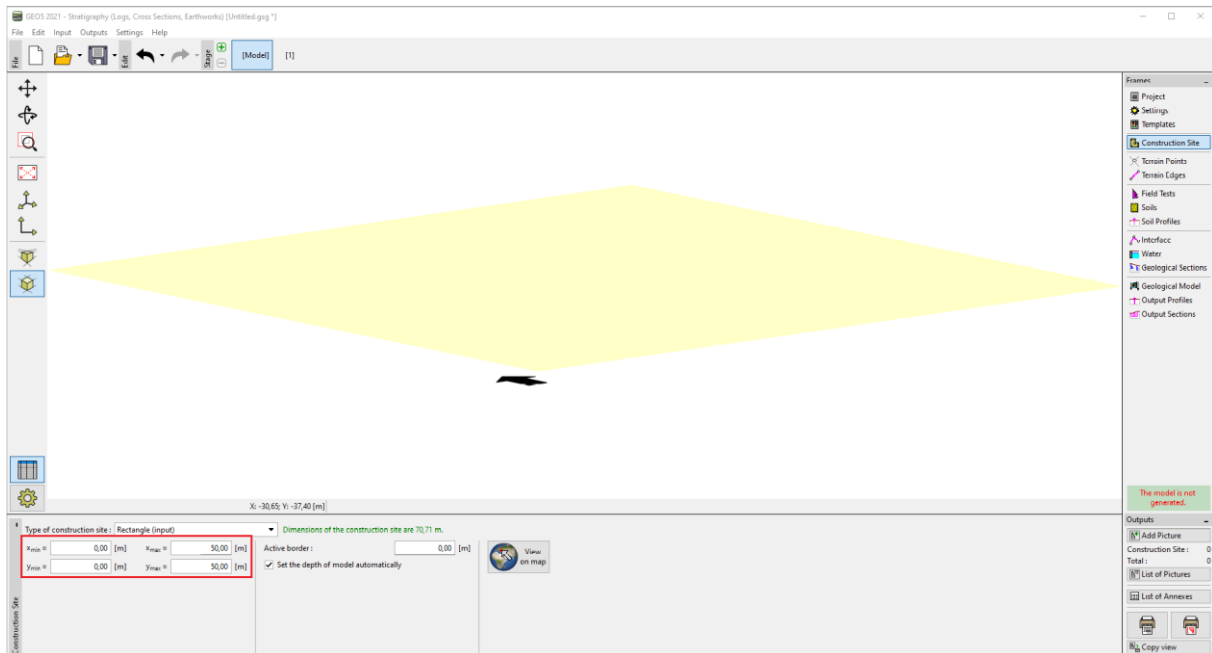
Assignment:

We want to create a pond with a viewing terrace. Create a model of the subsoil with the dimensions of 50x50m and model the performed and planned terrain changes. Next, calculate the volumes of the earthworks and design a viewing terrace above the pond. Lastly, calculate the volume of the water in the pond with the water level 0.4 m from the edge.

The original terrain was flat with horizontal layers of thickness, consisting of – 0.4m made-up ground, 1.8m silt, and then slate. The focused points of modified terrain after the modifications are saved in the IM46.txt format
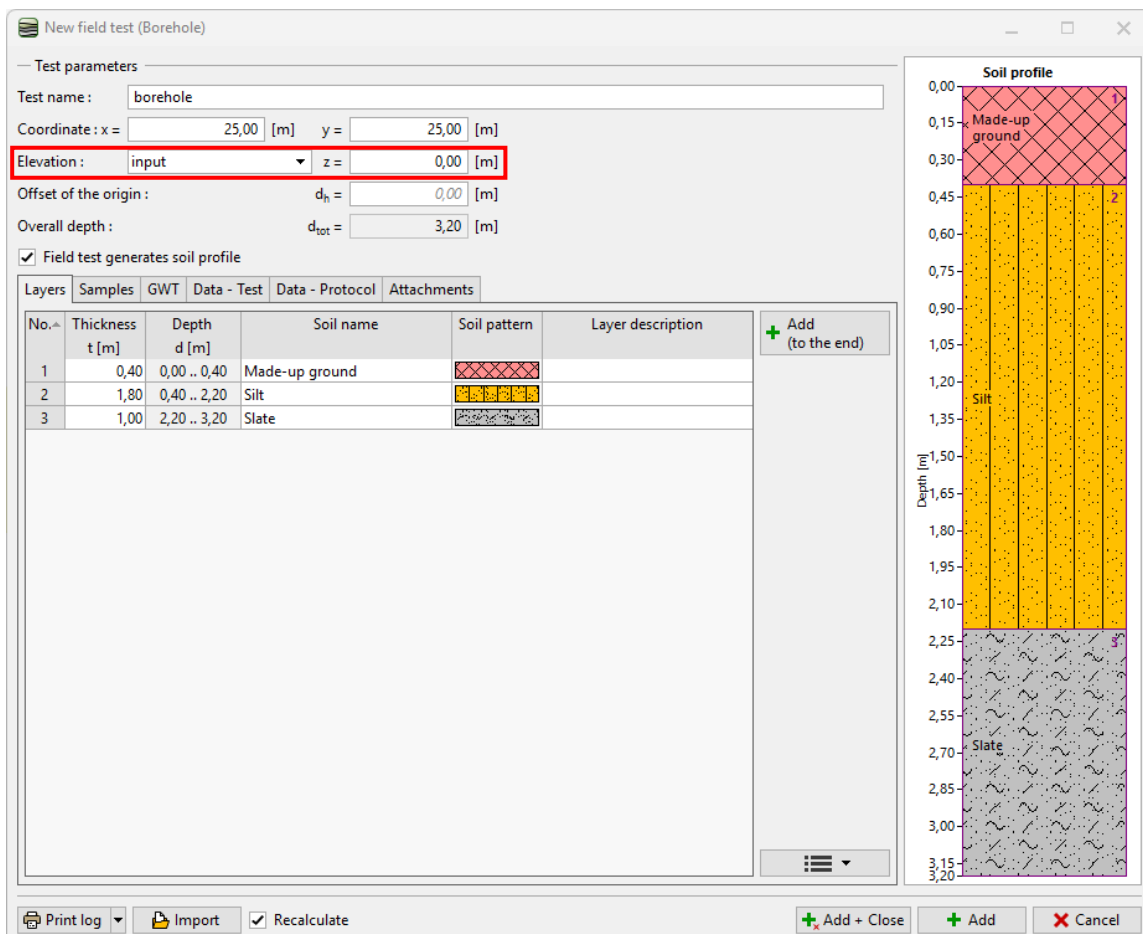
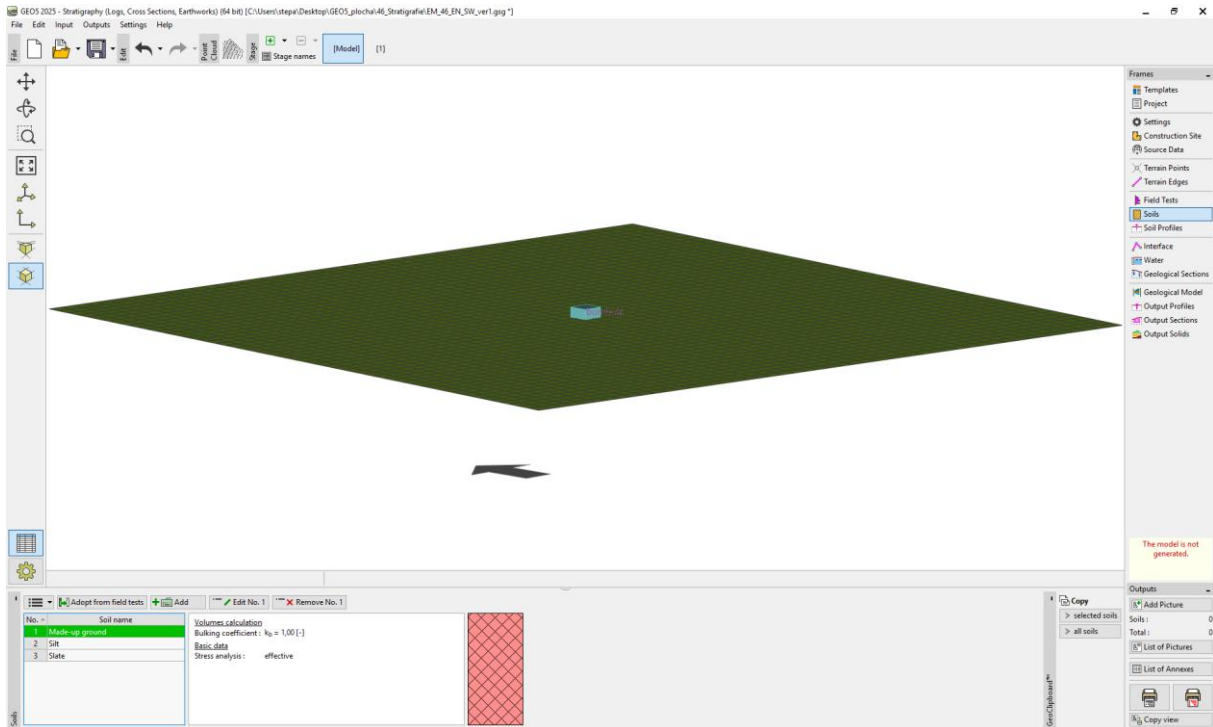The final model of the pond with viewing terrace should look like this:

In the "Construction Site" frame, we will enter the dimensions of the model. We assume a square shape with a length of 50 m. The minimal x and y coordinates will therefore be 0m and maximum 50m. The type of construction site is set as "Input rectangle".
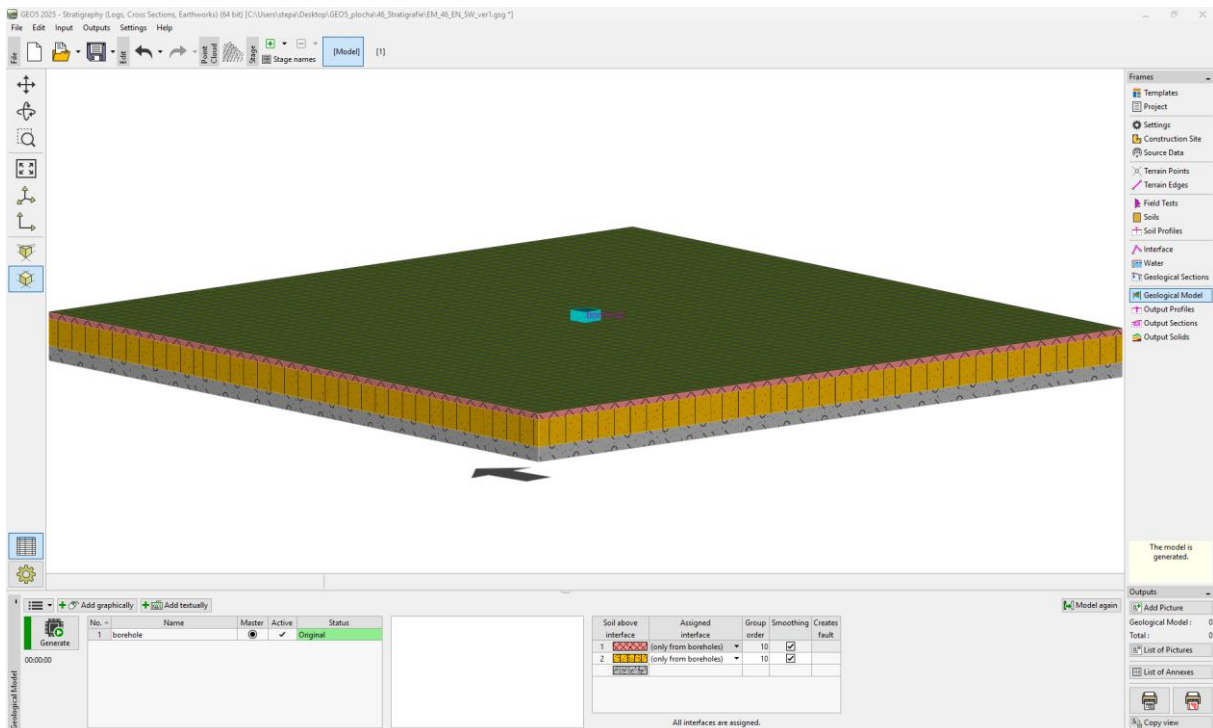

In the "Field Tests" frame. We will input a borehole, where we will create three layers of soils according to the assignment. We needn't forget the height of the borehole z = 0m.
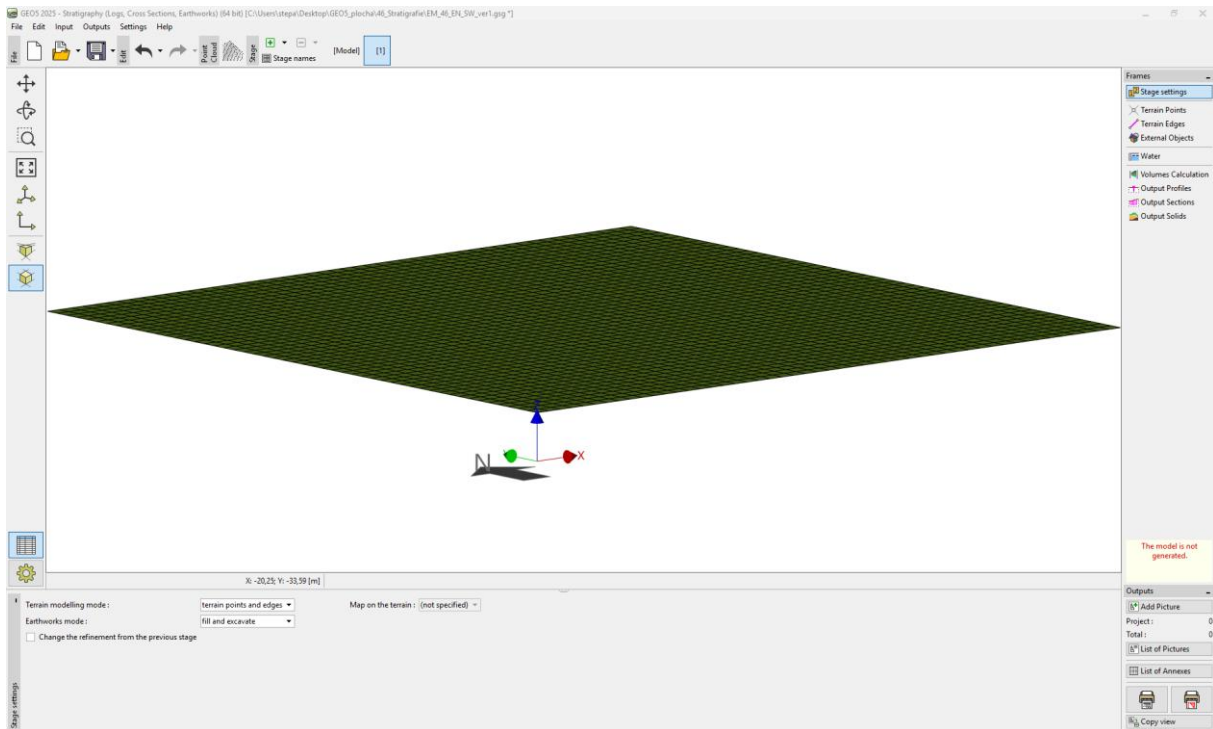
In the "Soils" frame, we will create a list, by clicking the „Adopt from field tests" button. For individual soils, we can change the bulking coefficient (important for the calculation of excavation volumes) and other soil parameters, that are needed in the calculation programs.
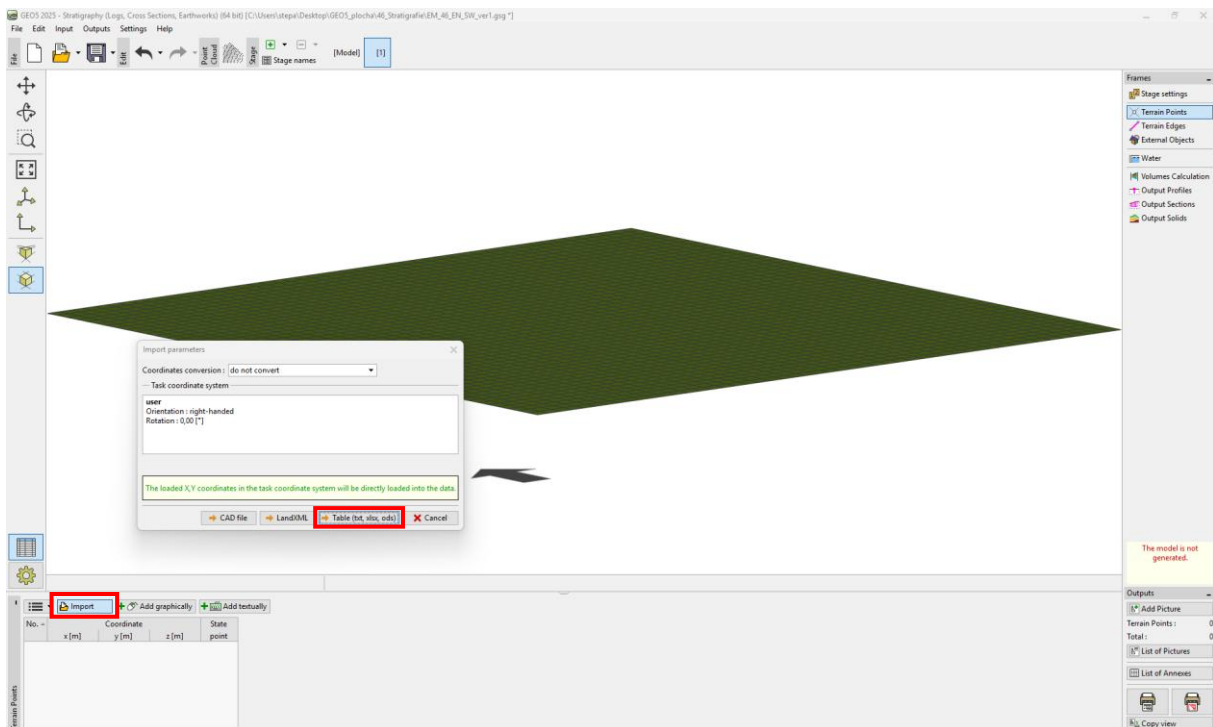

We will go to the "Geological Model" frame and generate the model.
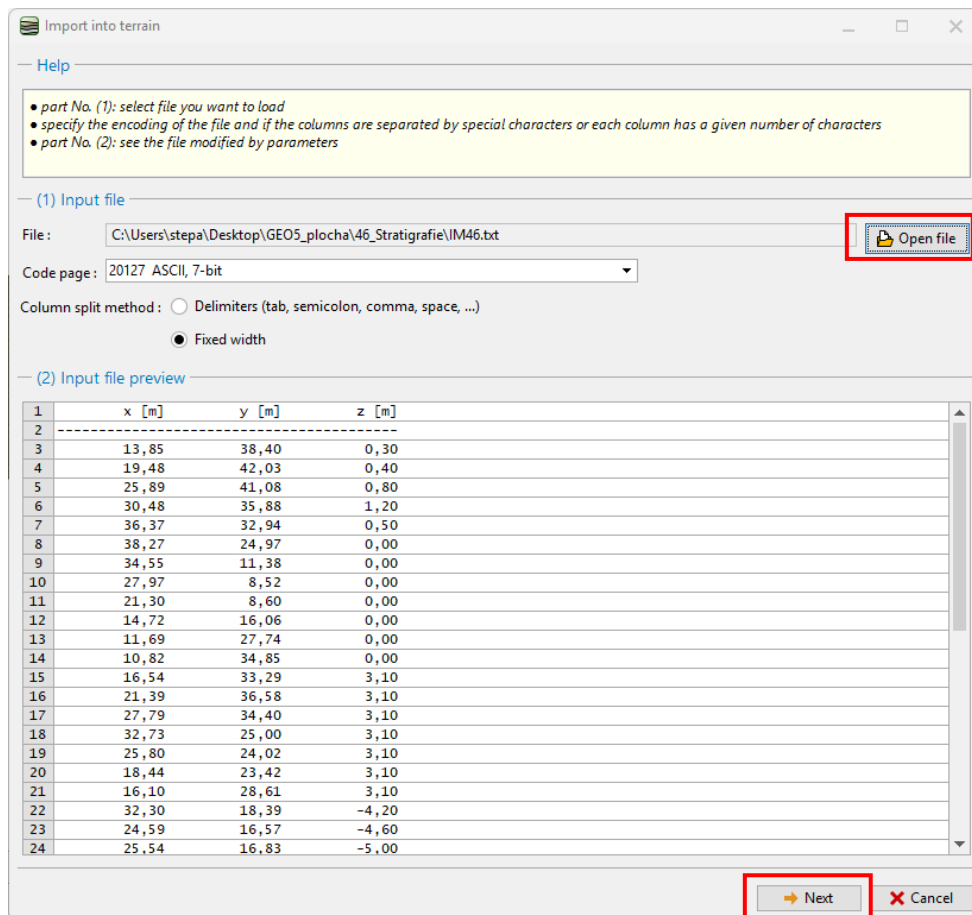
We will switch to the first construction stage. In the "Stage Settings" frame, input the terrain modelling mode in the given stage. We will choose the "terrain points and edges" because we already have the points focused.
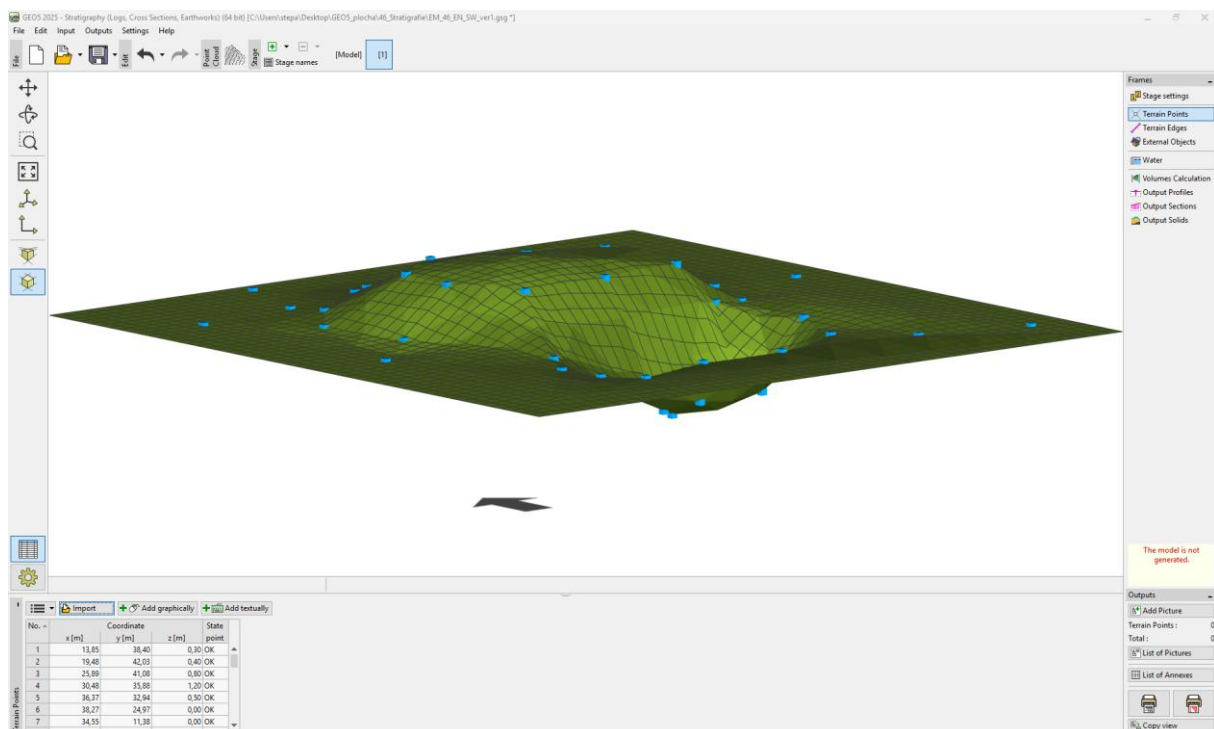

We will load the points from the IM46.txt file in the "Terrain Points" frame. We will choose the according file, and then click next.
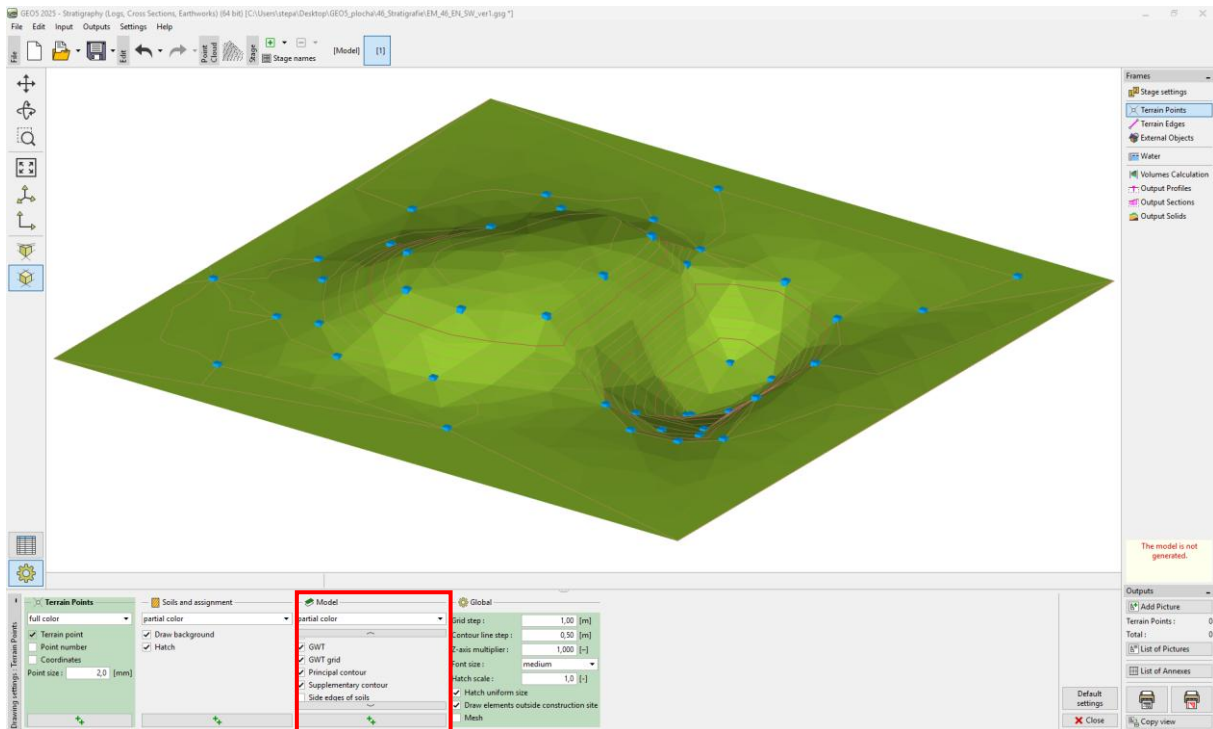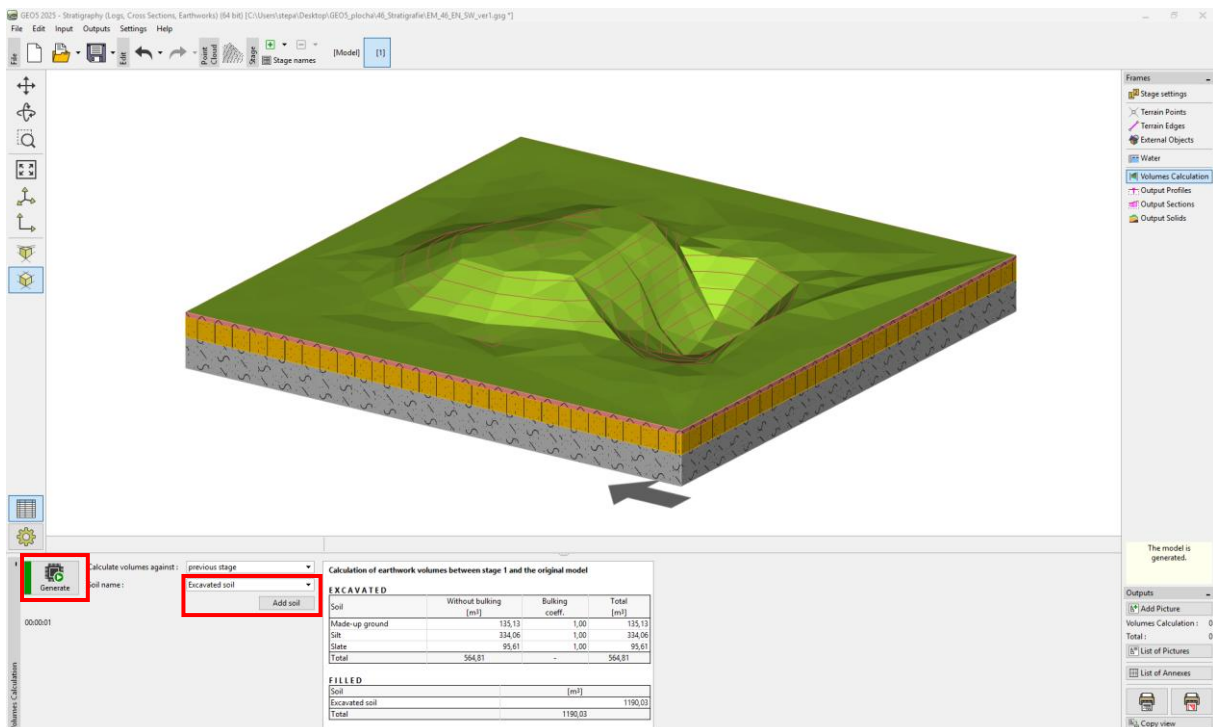
GEO5

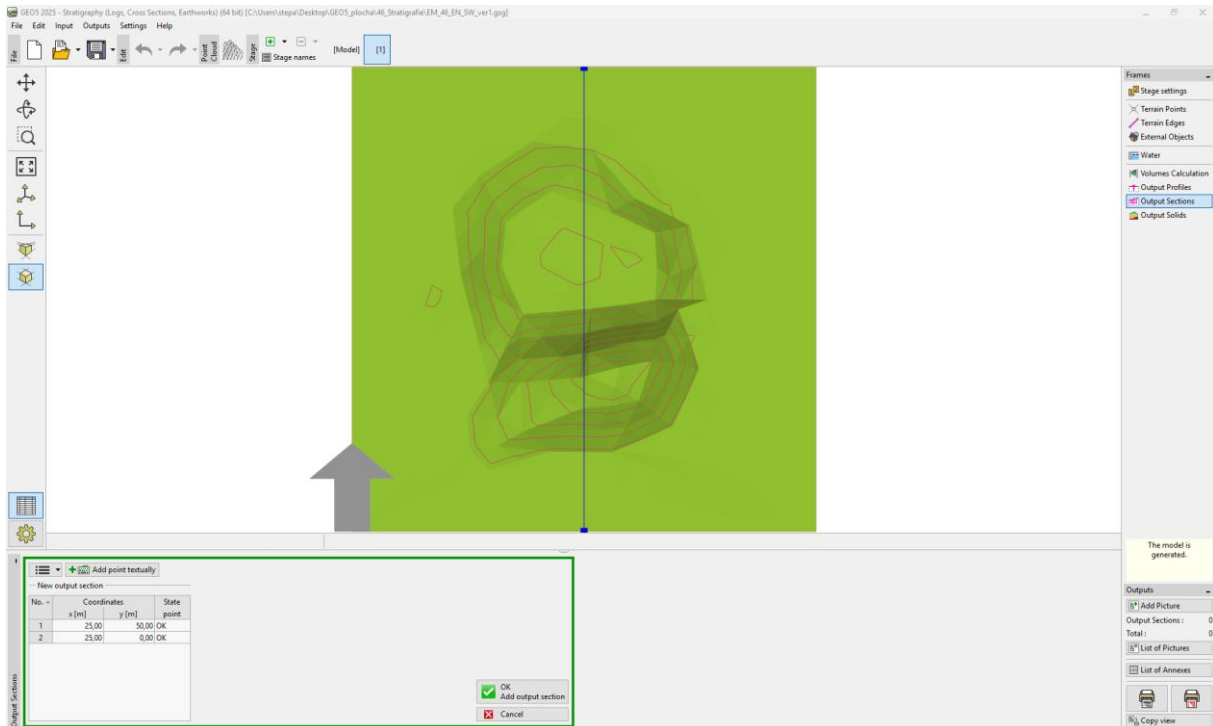Once loaded, a new terrain shape will automatically generate.

We will adjust the visualization of the project – for clarity, we will turn on the drawing contour lines and turn off the grid. If we want to have this setting the same for all frames, then click the "++ Use everywhere" button.
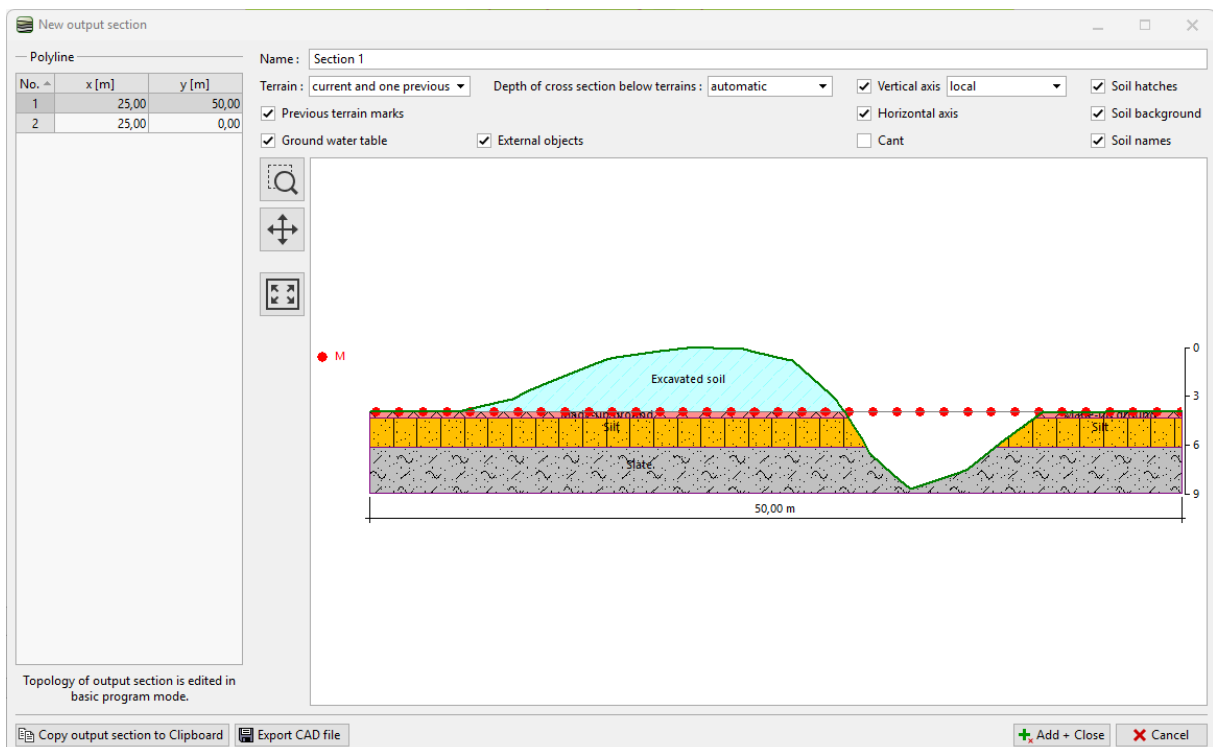

We will switch to the "Volumes Calculation" frame. We will input a new soil, that forms the created embankment and generate the model. In the frame, we have the calculated volumes of embankments and excavated soils.
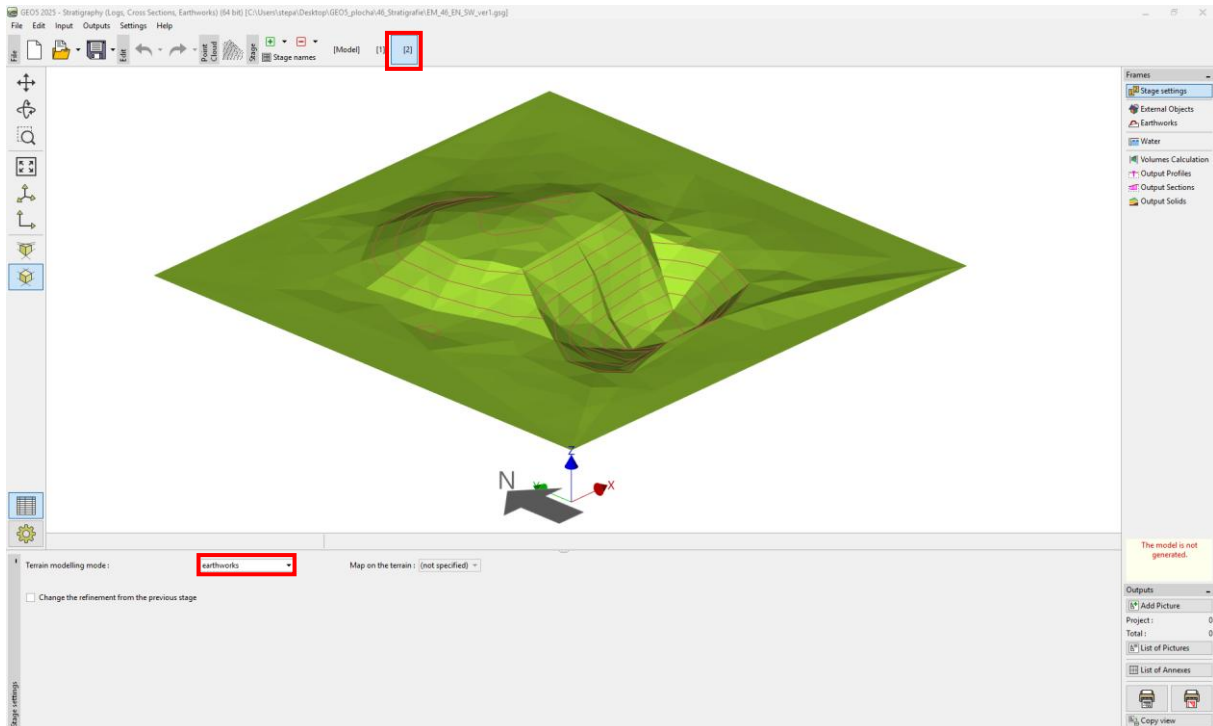
In the "Output Sections" frame, we will enter a cross-section, that passes through the pond and the embankment.
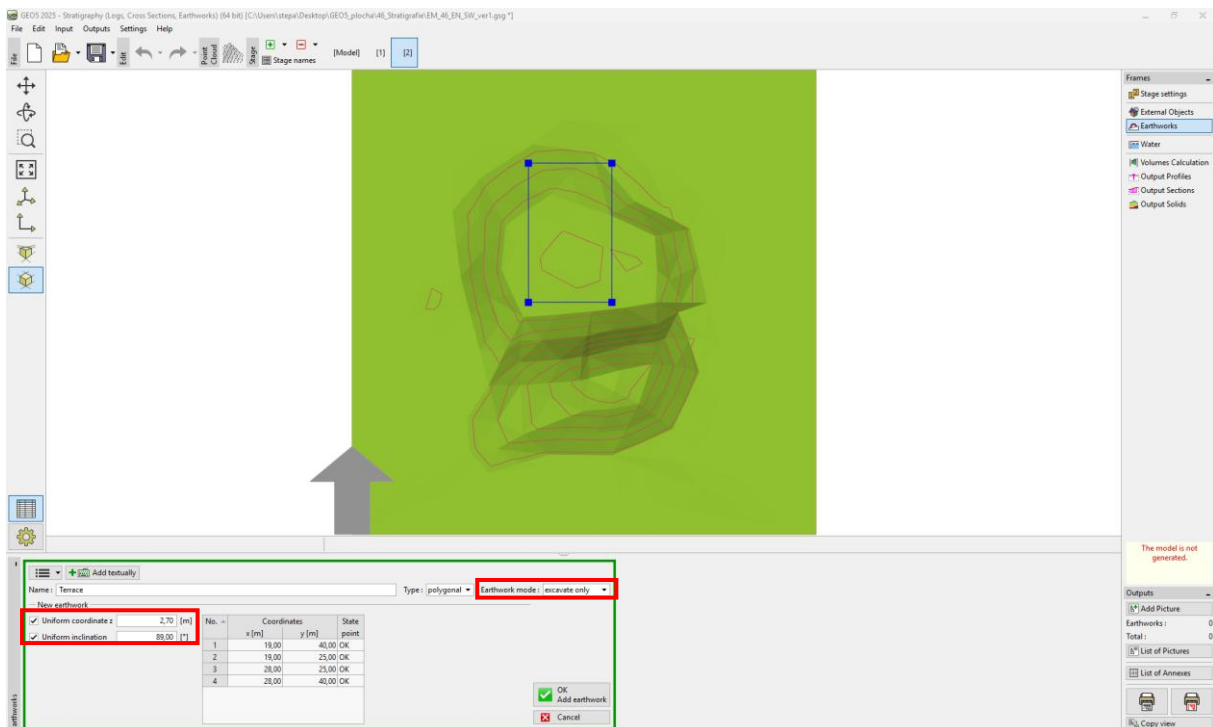

We will name and save the created cross-section. The original terrain can be highlighted by red dots.
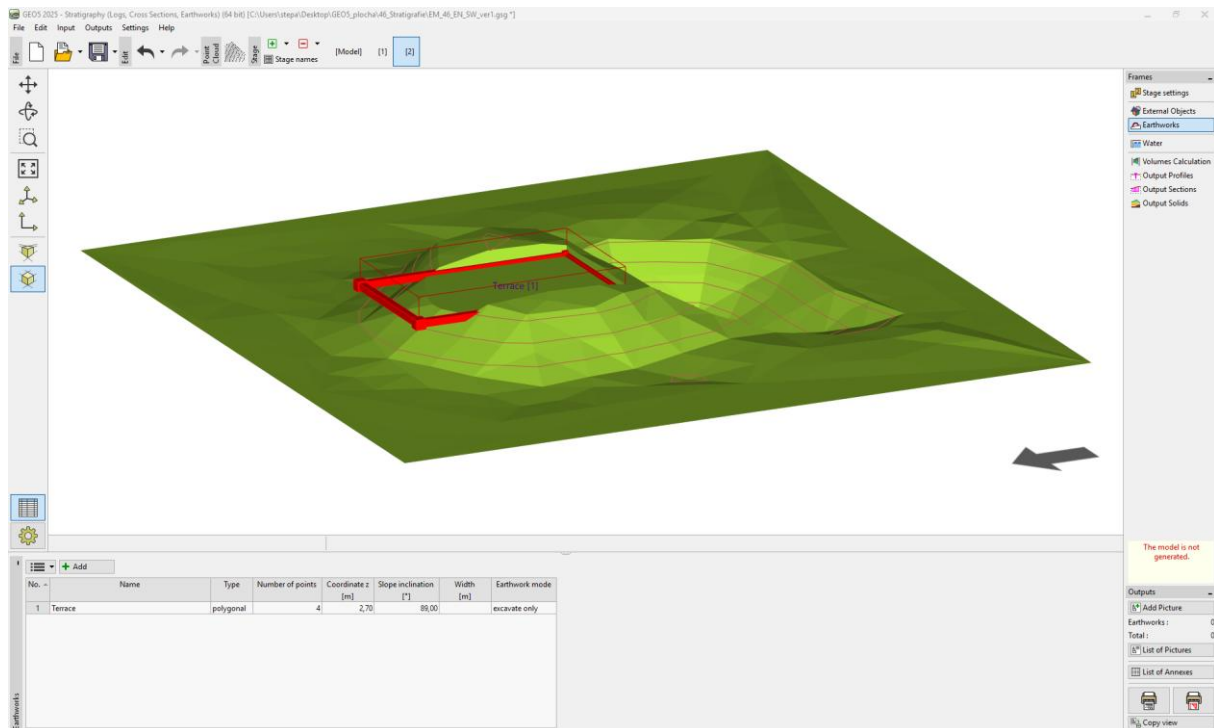
We will create a second stage. This time, in the "Stage settings" frame, we will choose the "earthworks" mode.
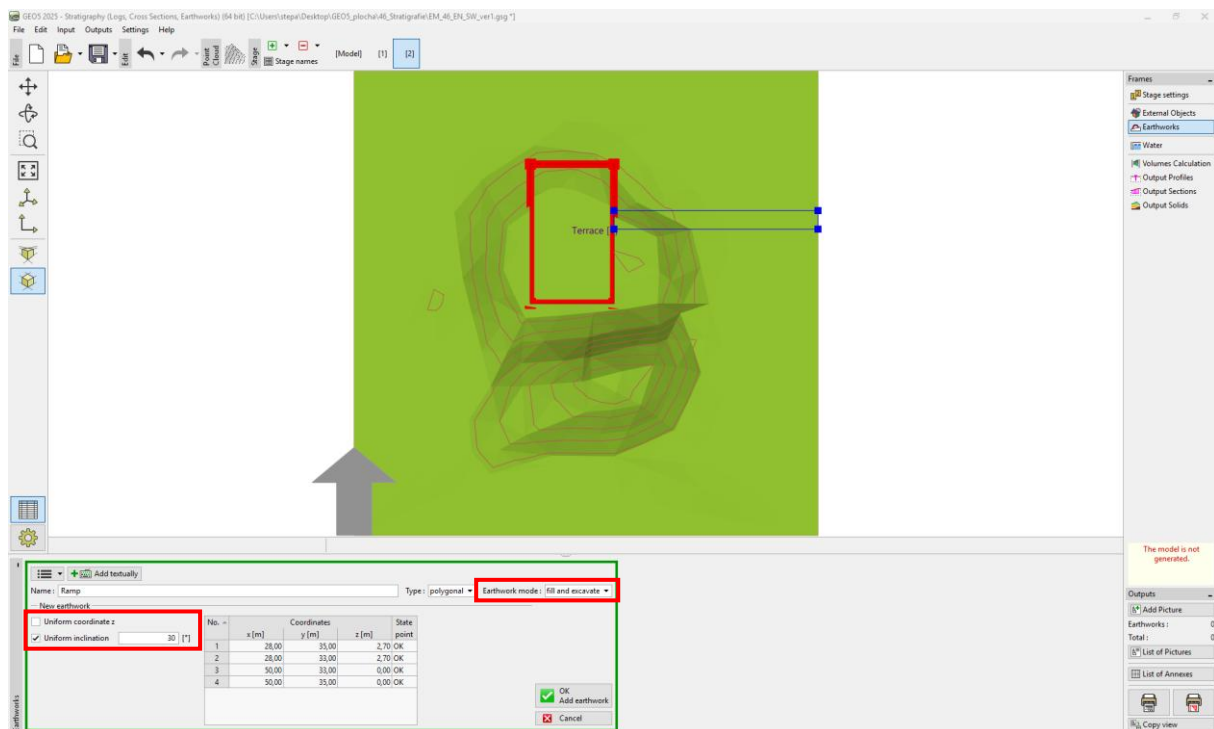

In the "Earthworks" frame, enter the shape of the terrace. In our case, we will choose rectangle, with the coordinates: [19;40], [19;25], [28;25], [28;40] and height of 2,7m. Because the edge will be vertical, we enter a slope of 89 degrees. (90 degrees cannot be enter, due to construction principles). Enter "Earthwork mode" as "only excavate" – the adjustment will only remove the soil.
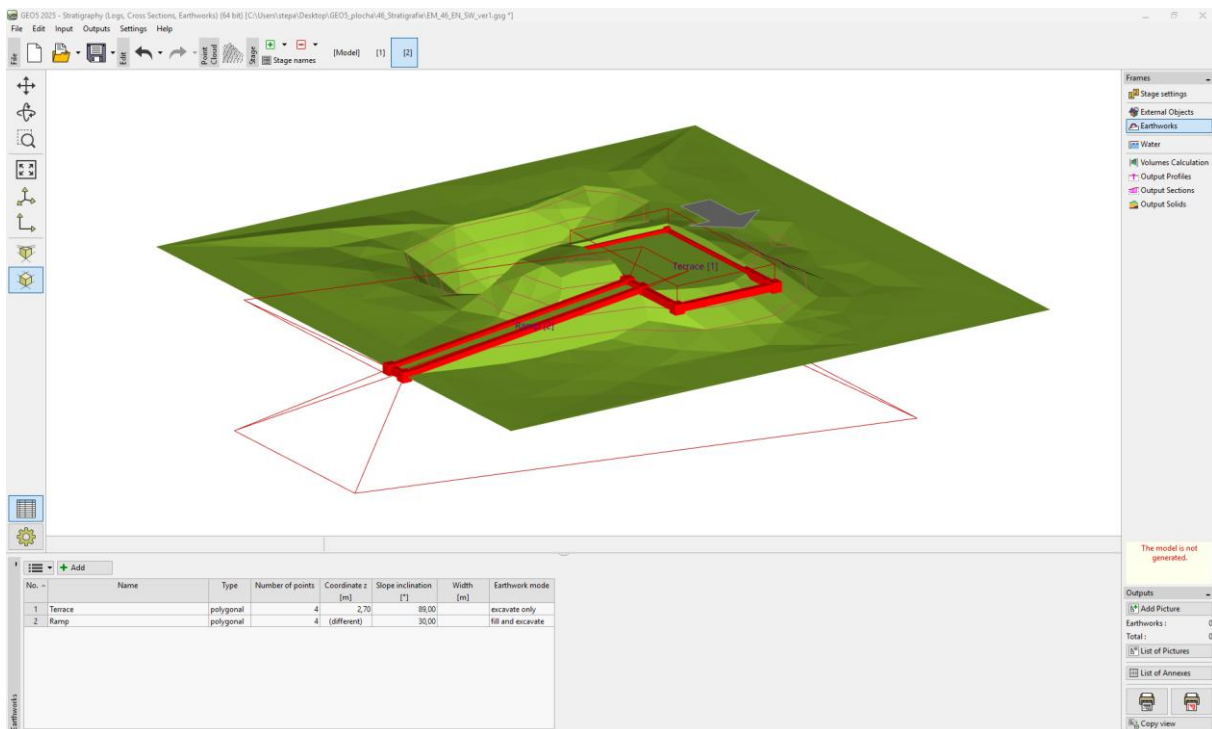
The created construction will be generated after entering. The outline of the earthwork that cut the terrain is shown in red.
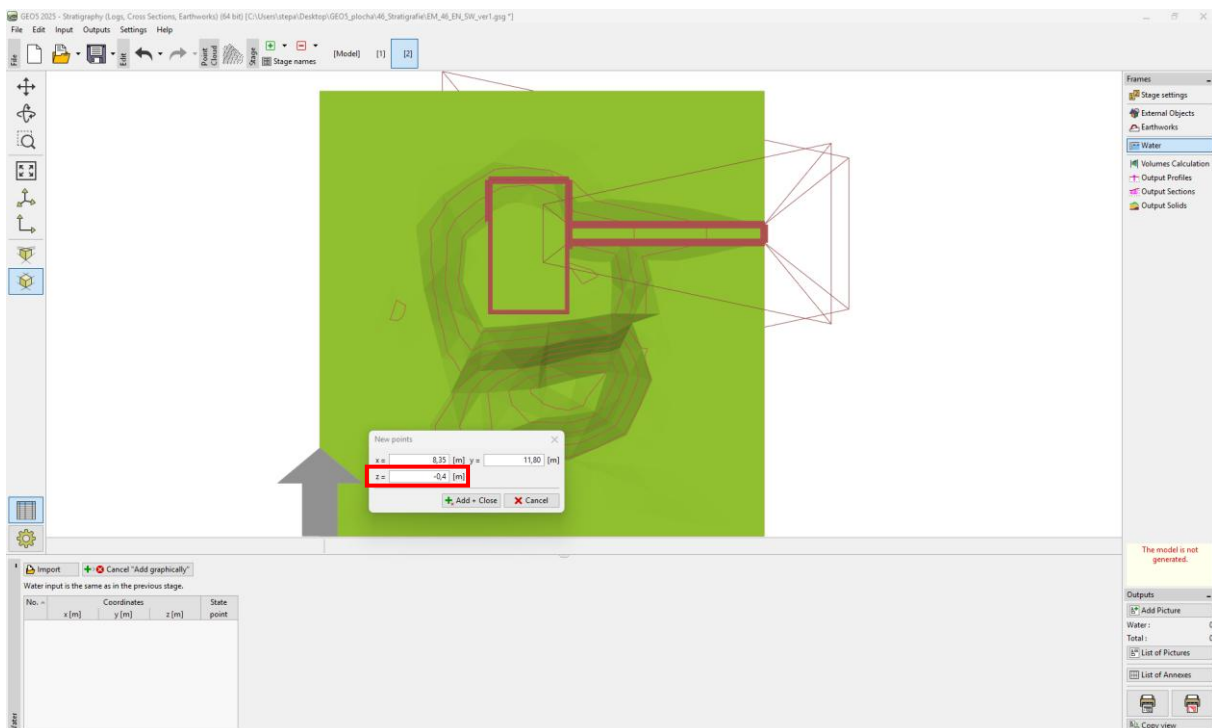

We will enter another earthwork, this time representing the access ramp. For simplicity, we will choose a rectangle with coordinates: [28;35], [50;35], [50;33], [28;33]. The height of the adjustment is a variable this time – at the top, the height is 2.7m, down it is 0.0m and a slope of 30 degrees. We will be adding and removing the soil this time – therefore, we will choose the mode: „Fill and excavate" mode.
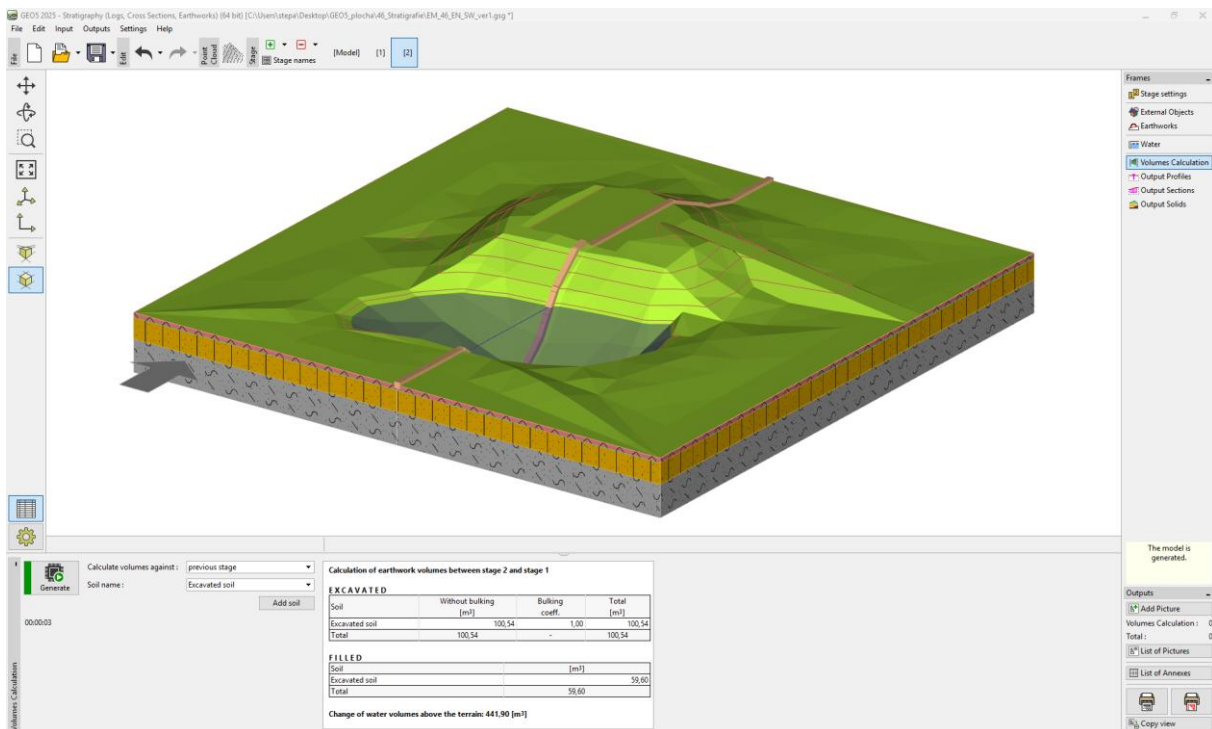
![GEO5 logo]

After confirmation, the new shape will be generated.

We will go to the "Water" frame and input the height of the water level in the pond (z = -0.4m). The water level is represented only by one point anywhere in the model. The created water level is then horizontal.
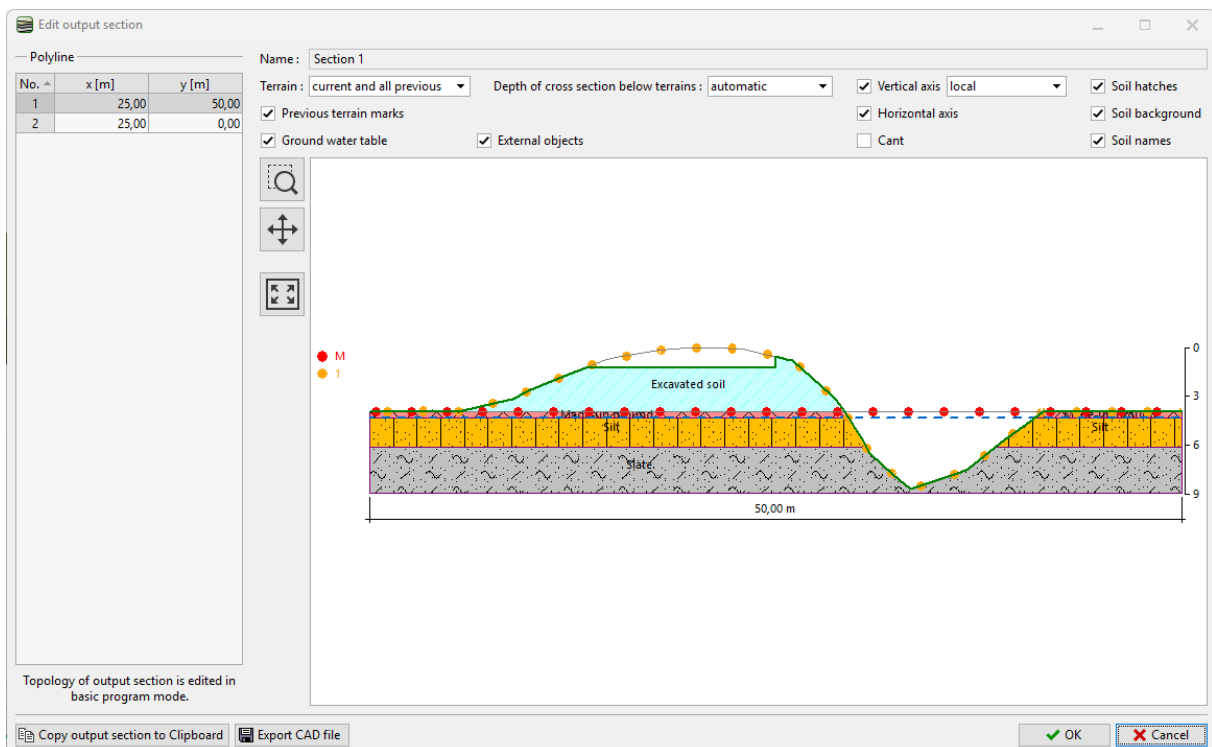
In the "Volumes Calculation" frame, we will calculate the volume of the excavated and filled soil.
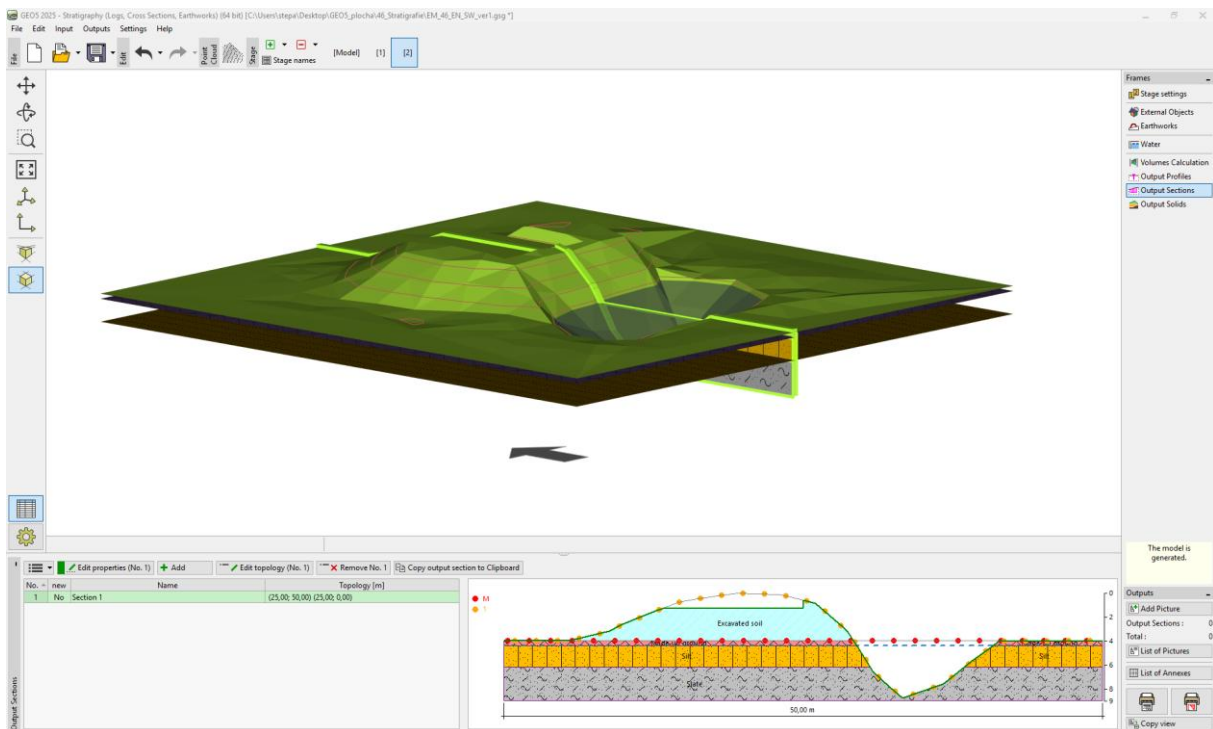

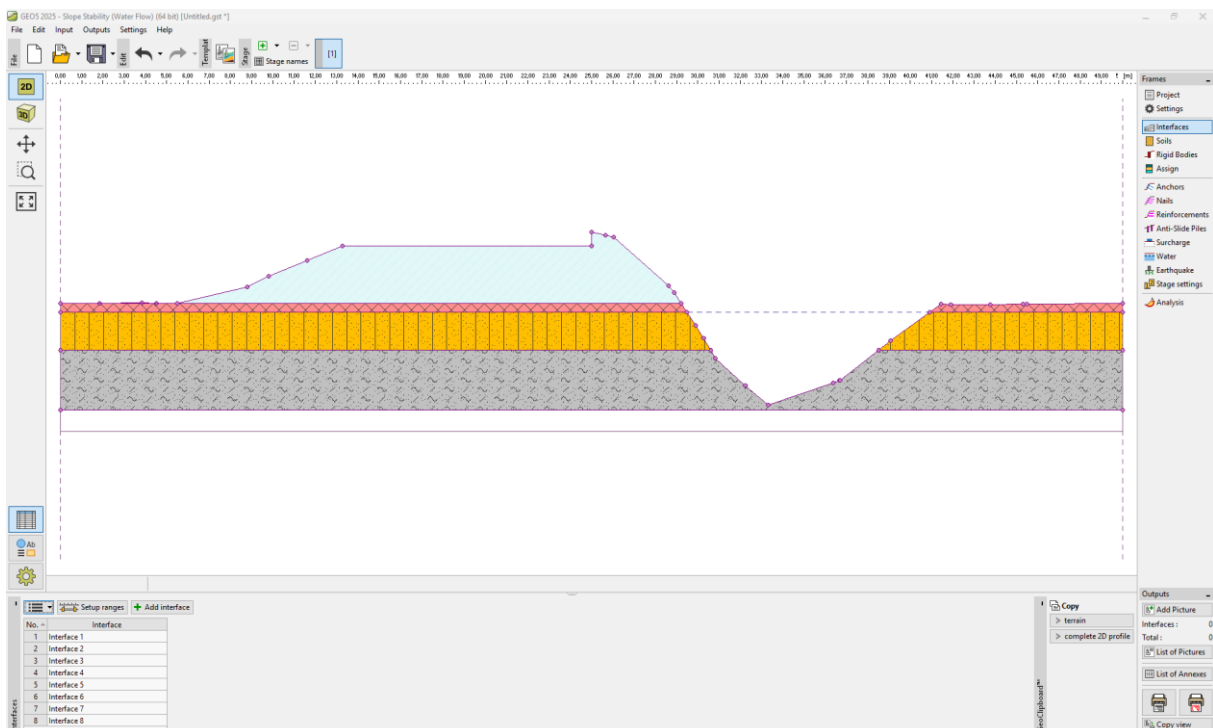We will switch to the "Output Sections" frame.

It is possible to choose from three options of the "Terrain" in the section setting: "current"; "current and previous"; "current and all previous". If we choose "current and all previous" then we can highlight terrain from the previous stages by dots (red – stage Model; orange – stage 1).

Also, it is possible to copy the section by clicking the "Copy output section to Clipboard" button.

Then, we will go to the "Slope Stability" program (menu item „Edit" „Paste data"), where we will insert the cross-section. After entering the soil parameters, surcharge, and calculation parameters, we can then analyse the construction.

Note: An example with this task (Demo_manual_46.gsg) can be found in [*Online examples*](*)*.*