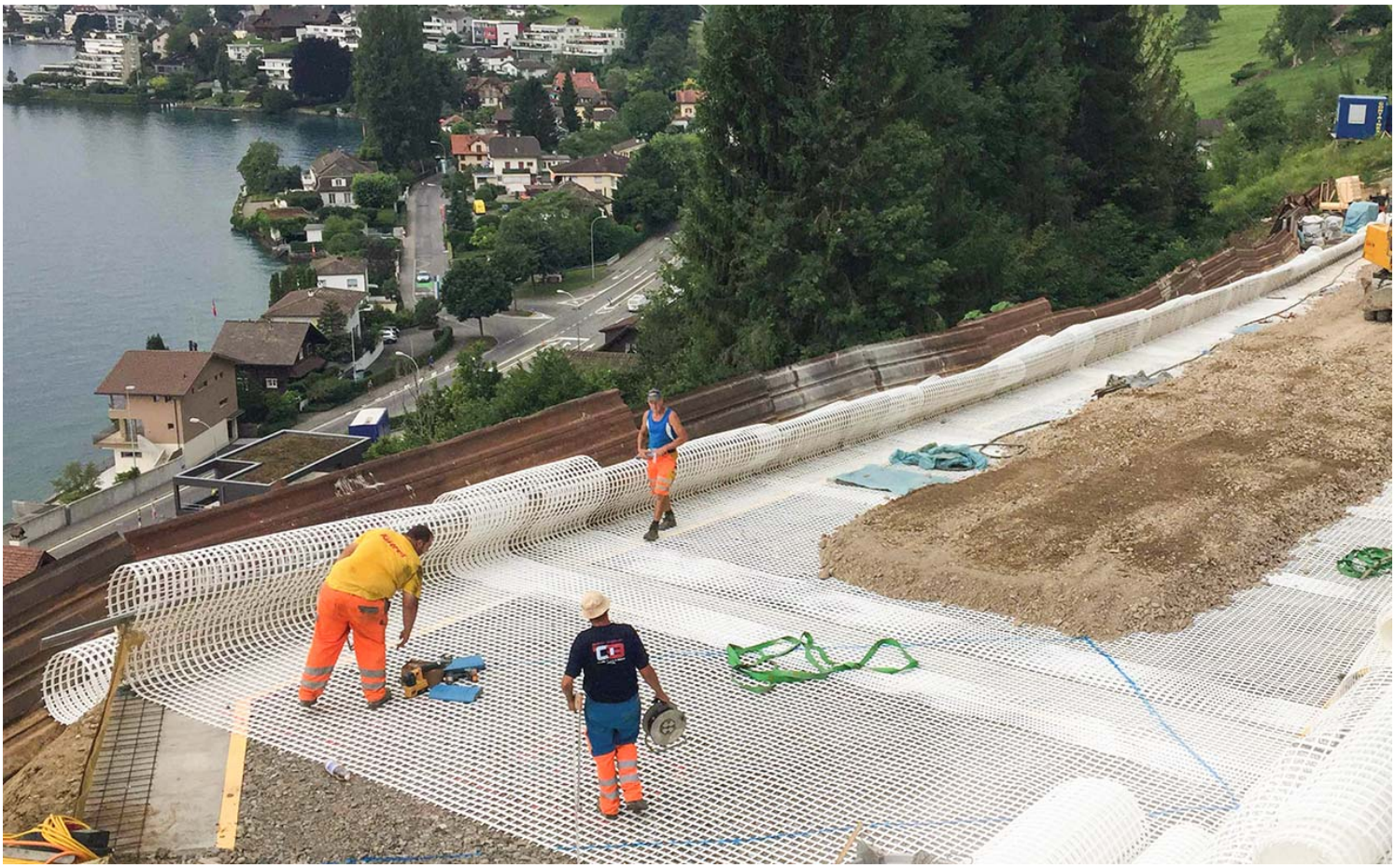
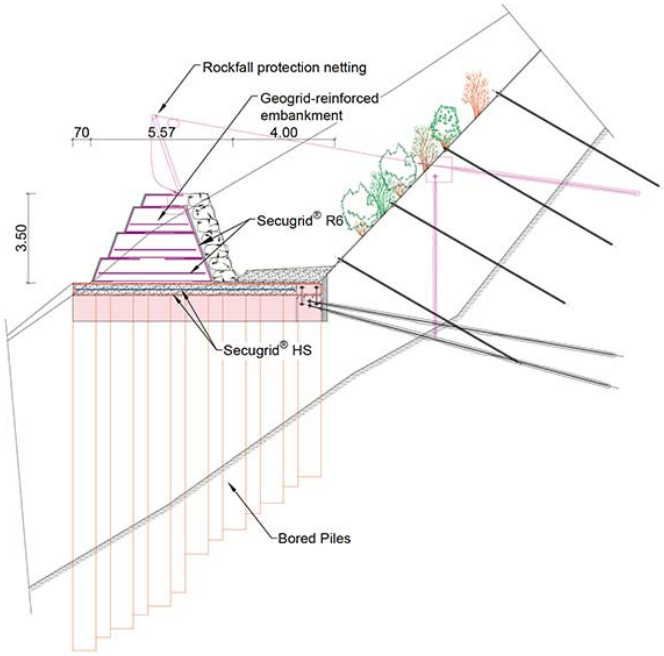
Secugrid® HS - Protective measures Laugneri II (Ost)

Reinforced load transfer platform

- **Project Name**
  Protective measures Laugneri II (Ost)
- **Engineer**
  Schubiger AG Bauingenieure
- **Installation contractor**
  ARGE Gasser Felstechnik AG, Lungern Josef Küttel AG, Weggis
  Brun AG, Emmenbrücke
- **Product**
  Secugrid® HS 500/100 R6 LA
  Secugrid® HS 1000/100 R6
  Secugrid® 80/20 R6
  Secugrid® 200/40 R6





Between the Lake Zug, Lake Lauerz and Lake Lucerne in Switzerland rises a 1798m high mountain mass – the Rigi. The community Weggis is located between the lakefront and the steep south-western slope of the Rigi. Due to the morphological and geological conditions, various residential areas near the lake are seriously endangered by rockfall or landslides.

In many cases, origin of this hazard are alternating sequences of sandstone and weathered marlstone. In a late phase of the formation of the Alps, these sediment seams were pushed onto younger deposits and tilted out of the original horizontal position. This process favours landslides and rockfall.

For the residential area of Laugneri the risk of damage due to rockfall and potential landslides became too big. A sustainable and cost-efficient solution for this area was realised with a geogrid-reinforced soil structure in combination with a rockfall protection netting system.

Foundation over loose rock requires special solution

The planned rockfall protection embankment had to be integrated into an existing slope (inclination 35° - 40°). A conventionally built embankment together with the required space for collection of debris would not have been able to be realised under the cramped conditions of the site. The construction of a slim geogrid-reinforced earth structure made it possible to reduce complex cutting operations into the existing terrain.

The foundation of the rockfall protection embankment posed a real challenge to the project. The problem was loose rock on a steep hillside directly under the new foundation. A load transfer platform (LTP) in combination with a piled foundation was proposed. This solution will safely transfer the vertical stresses from the geogrid-reinforced earth structure into the deeper solid rock layers. The LTP consists of gravelly sand layers and longitudinally and transversely placed Secugrid® HS 1000/100 R6 high-strength geogrids. The LTP design was carried out in accordance with the „Recommendations for the design and calculation of soil structures with geosynthetic reinforcements – EBGEO, April 2010“.

Horizontal impact loads resulting from rock impacts or landslides can also be absorbed by the LTP. For this purpose, the transverse Secugrid® HS geogrid reinforcement was permanently tied back into the rock via a concrete beam and rock anchors. The 3.0m high rockfall protection embankment was built directly on top of the Secugrid® HS geogrid-reinforced LTP. On top of the finished embankment a rockfall protection netting system was installed. This is anchored into the geogrid-reinforced soil structure via micropiles. Construction works for the rockfall protection embankment were completed on time at the estimated project cost. Due to the durable and robust system as well as the comparatively simple maintenance of the reinforced embank-ment, this unique structure proved to be an efficient and economical solution. The innovative protection system optimally met the technical and landscape requirements of the client.