



Stepwise remediation of the Macesnik landslide

M. Mikos (1), R. Fazarinc (2), F. Zigman (3), A. Petkovsek (1), B. Majes (1)

(1) University of Ljubljana, Faculty of Civil and Geodetic Engineering, Ljubljana, Slovenia,

(2) Water Engineering Ltd., Ljubljana, Slovenia, (3) IRGO Consulting, Ljubljana, Slovenia

(matjaz.mikos@fgg.uni-lj.si / Fax: +386-1251-9897)

The paper will give an overview of the collected field data, relevant to modelling and designing the proposed mitigation measures for the Macesnik landslide in northern Slovenia. The Macesnik landslide was triggered in 1992 above the Solcava village. The front of the landslide moved from the altitude of 1040 m asl to 800 m asl at a distance of 850 m in the period between 1992 and 2004. Now, the landslide threatens a few residential and farm houses, the panoramic road and is only 300 m away from Solcava village and the Savinja river. It is 2500 m long, 50 to 80 m wide and 10 to 15 m deep with an estimated volume of 2 million m³. In the area of the landslide toe, which is retained by a rock outcrop, it reaches the depth of 30 m. The unstable mass consists of water-saturated highly-weathered permo-carboniferous formations. The presently active landslide lies within the fossil landslide which is up to 350 m wide and 50 m deep with a total estimated volume of 8 to 10 million m³. The landslide was investigated by 36 boreholes, and 28 of them were equipped with inclinometer casings, which also serve as piezometers. Surface movements have been monitored geodetically in 20 cross sections. The mitigation works were made difficult in the past due to intensive landslide movements that can reach up to 50 cm/day with an average value of 25 cm/day. Local precipitations were measured in a gauging station. The analysis of the correlation of monthly rainfall amounts and the intensity of landslide movements has been performed. A surface dewatering using surface drains has mainly been completed and is regularly maintained. As a final solution, a combination of deep drains with retaining structures is foreseen. Due to the length of the landslide and its longitudinal geometry it should be first divided into several sections, and mitigation works will be executed consecutively in phases. Such approach proved effective in the 800 m long uppermost section of the landslide, where 3 parallel drain trenches (250 m long, 8 to 12 m deep) were executed in the autumn of 2003. The reduction of the

movements in 2004 enabled the construction of two 5 m wide and 20 m deep shafts (dowels) to be finished in early 2005. They will function as a permanent retaining structure above the road. The monitoring results show that the movements have been drastically reduced to 1 cm/day. Further deep shafts are planned to be constructed in the middle section of the landslide, as a part of the final remediation of the Macesnik landslide.