CIVIL • ENVIRONMENTAL • MANUFACTURING • MINING • OIL & GAS • POWER GENERATION

PROJECT DESCRIPTION

Nicolson Construction

Canada

FLAC3D™

Fountain Slide has a long history of stability problems. The slope is bounded downhill by the Fraser River and uphill by a highway and a railway. This project stage focused on stabilization of a section of the railway that has suffered extensive damage to its retaining system.

With regard to possible solutions, several technical limiting factors had to be taken into account, the most important being the remote location and significant inclination of the slope. These constraints favored a solution that involves small equipment. Limit equilibrium is not suitable for this type of problem mainly because the reaction of the structural elements is a function of the displacements. Consequently, "wishing-in-place" a reaction is highly misleading and in many circumstances may over-estimate the safety factor.
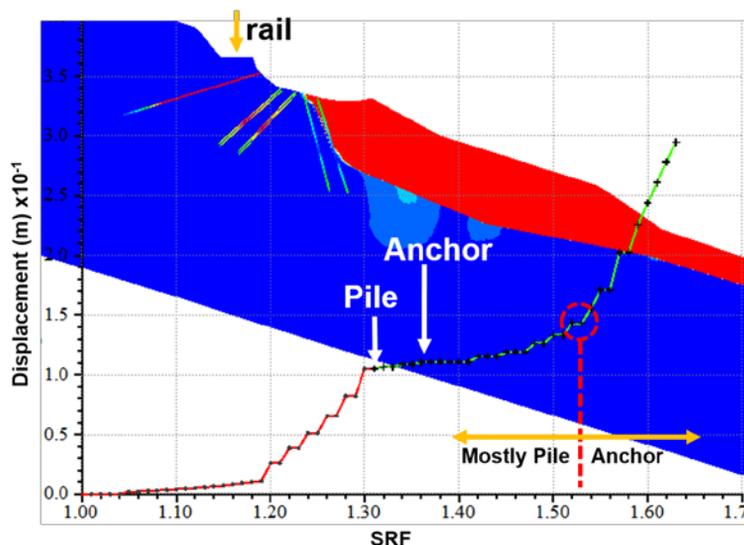
ITASCA'S ROLE

Itasca analyzed the complex structure interaction using several *FLAC3D* models, applying a Strength Reduction Method (SRM) approach. This method allowed development of performance charts for different levels of displacements and also provided important insight on the distribution of load between anchors and micropiles.

With Itasca's support design, micropiles have been placed downhill from the railway. Pile inclination was observed to be an important variable of the optimization. The micropiles behave similarly to a rebar system, reinforcing a significant volume of soil that behaves like a gravity wall. The anchors have been placed just at the toe of the existing retaining wall of the railway using a low pre-stress value in order to accommodate future movements of the slope without yielding the tendons.

PROJECT RESULTS

A combination of micropiles and anchors creates an efficient system to reinforce and support part of the sliding soil. Moreover, each component mobilizes its reaction for a different level of displacements, creating a hierarchical support system.

Displacement versus SRF with structural elements in place.

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