INVESTIGATING MEANS FOR PRO-ACTIVE MANAGEMENT OF RAILWAY EARTHWORKS TO BETTER PREDICT LANDSLIPS – A WHOLE LINE APPROACH

ABSTRACT More frequent and intense rainfall events and less predictable seasonal trends in climate are impacting our ageing railway infrastructure. There is a need for greater resilience of earthworks given the safety risks, public disruption and financial consequences of landslides. A study was undertaken to better understand the failure trends and how to predict future problems on the Tonbridge to Hastings (TTH) railway line in Kent, which has had a high proportion of landslips in Wadhurst Clay Formation and Ashdown Formation earthworks.

A forensic analysis of the earthworks present along the route was undertaken capturing failure locations and historical datasets by reviewing and analysing maintenance records, ground condition data and LiDAR imagery. This data was examined by date of record, location, geology, geometry, age of construction and condition to see if there were any trends in the distribution of failures. A GIS based 'digital twin' of the route was developed using spatial geo-referencing which helped to establish causative / precursive factors that may contribute to triggering earthwork failures; thus identifying vulnerable areas for future failure. An automated slope modelling tool was developed to compare stability efficiently along the linear asset feeding into a risk categorisation of whole earthworks along the TTH line and determination 'hot-spot' priority sites for potential failure.

A geophysics, ground investigation and instrumentation monitoring trial, at a site with a similar ground model was implemented to deepen the understanding of the behaviour and identify subtle characteristics that could be transferable to future sites on the network and aid planning. Improving knowledge on the conditions preceding, and likely triggers, of earthwork failures has been a key focus of the project. The process can be fed into current practice to manage earthworks and help better prioritise and optimise the future mitigation in a more sustainable and targeted manner.