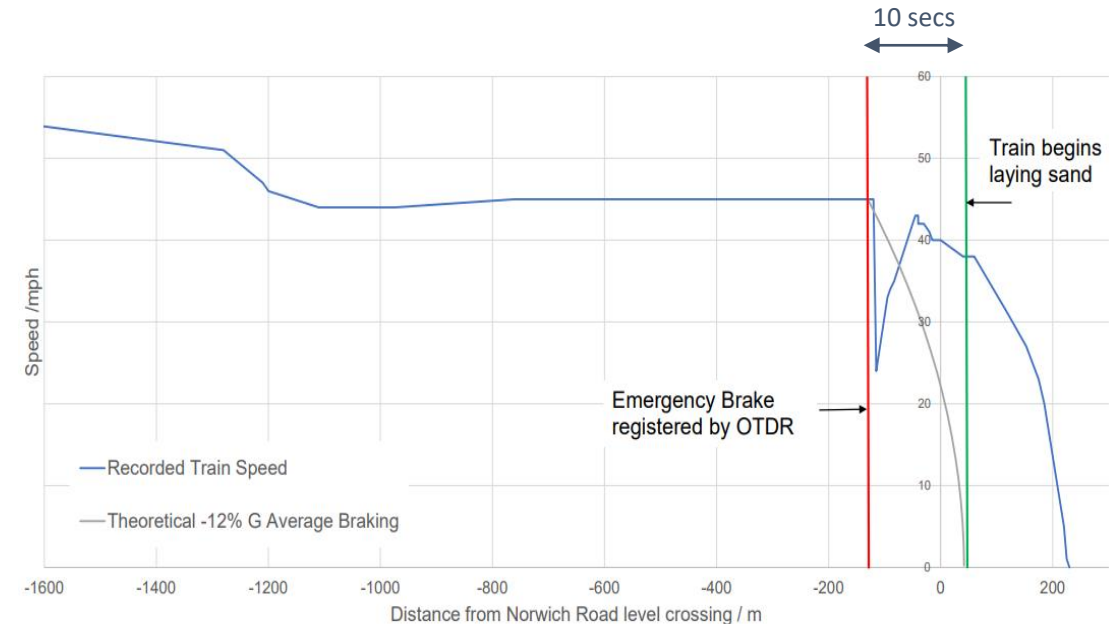


## Case Study: Class 755 wheel slide protection and sanding systems

### Situation and nature of failure mode

- During the Norwich Road level crossing incident on 24 November 2019, while not a contributory factor, it was observed that when the driver applied the emergency brake, there was a ten second delay between the wheel slide protection (WSP) system detecting axles sliding and the 'axles sliding' signal being transmitted over the Controller Area Network (CAN) bus to the Vehicle Control Unit (VCU). Once the 'axles sliding' signal is received by the VCU, sanding is deployed.
- At the design stage the train manufacturer's type testing had been undertaken to confirm that when the 'axles sliding' signal was received by the VCU that sanding was initiated. This was performed and the results deemed positive, but during the test it was missed that the signal was not immediately coming when it would be expected.



### Investigation and action taken

- The WSP system manufacturer believed that the 'axles sliding' signal was to be used exclusively for diagnostic purposes, and the delay had been included to avoid excessive wheel slide warning on the train management system, as was the case on other vehicle fleets without sanding equipment fitted.
- Type testing had been undertaken to confirm that when the 'axles sliding' signal was received by the VCU that sanding was initiated but this did not include an integrated test with the WSP system.
- The engineering change to remove the ten second delay has now been completed across the train fleet.

### Key Learning

The importance of specifying and understanding the requirements for connected systems controlling key train functions, and specifying integrated tests to be conducted against those requirements.