

Scotland's Railway

Purpose

This addendum aims to provide further context to the main body of the report on the arrangements for managing infrastructure in Scotland's Railway. In doing so, it provides an overview of how priorities are set, how governance and accountability operate, the environmental factors and the associated challenges for managing a safe and efficient railway.

Background

Scotland has its own unique geography and climate, both of which play a significant role in how its railway is maintained and enhanced. There are also differences in how it is funded and where accountability for train performance and delivery of improvements lie. The nature of devolution in Scotland also results in differences in accountability. Transport Scotland is the Scottish Government body responsible for overseeing and funding investment in public transport and provides the Network and Infrastructure grants that are approved annually by the Scottish Parliament, as part of the Scottish Government's budget setting cycle. The Scottish Parliament prescribes environmental legislation and the Scottish Environmental Protection Agency (SEPA) is the arms-length body from Scottish Ministers that reviews organisations' compliance. SEPA also operates and maintains Scotland's flood warning system.

Scottish Ministers' High Level Output Specification (HLOS) for Control Period 6 set out specific requirements for responding to climate change and enhancing the resilience of the network, alongside a requirement for ensuring that progress can be appropriately identified and reported. Scotland's Railway therefore recognises the need to not only ensure the resilience of its assets in responding to the challenges of climate change and adverse weather events but also to take the necessary steps to ensure that it contributes to a reduction in greenhouse gas emissions in Scotland and will work closely with Transport Scotland on its recently published Rail Services Decarbonisation Action Plan.

Scotland's Geography and Railway Assets

Scotland's railway traverses some of the most challenging terrain in Great Britain, with hundreds of miles of railway throughout the Highlands alone. The West Highland line, for example, is around 200 miles long, 70 per cent of which is through mountainous topography, with 40 per cent bounded by a natural slope greater than 100 metres in elevation above the railway.

The railway is also amongst the oldest in Great Britain, with much of the civil engineering infrastructure dating from original construction. There are around 35,000 earthworks assets (an asset being defined as 100 metres in length), spread the length and breadth of Scotland, with a broadly 50:50 split between embankments and cuttings, and around 10 per cent of the latter being rock cuttings. While many of these earthworks were constructed using empirical methods or trial and error techniques, modern asset management standards are being successfully applied, with maturity of data and asset knowledge growing through use of modern technology.

Climate and Adverse Weather

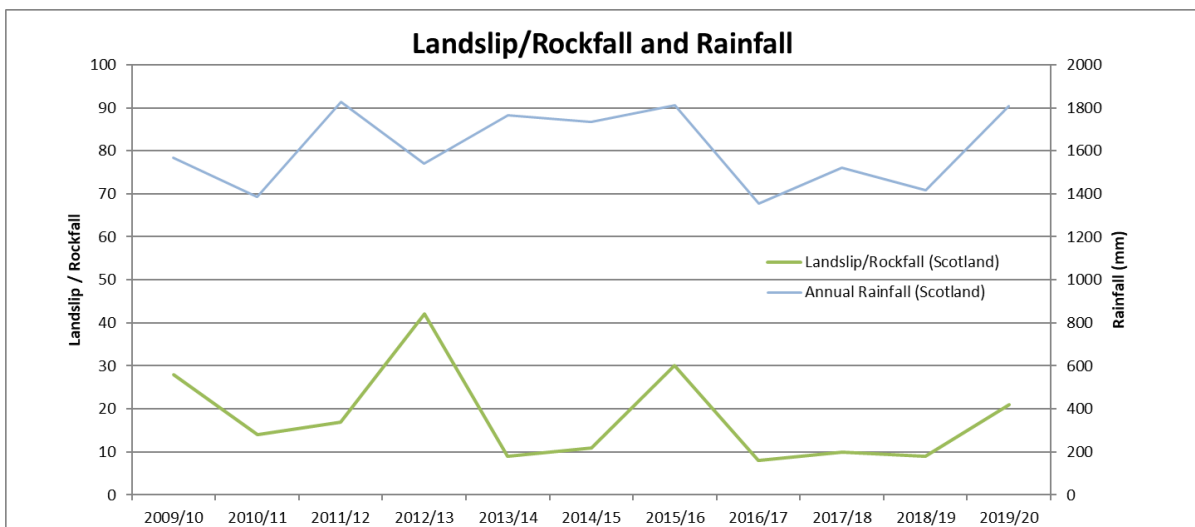
Scotland is used to experiencing frontal weather patterns and some areas, such as the Western Highlands, are amongst those in the UK that experience the highest average levels of rainfall. These weather patterns have traditionally influenced the frequency and volume of rainfall and consequently shaped the resilience arrangements that need to be built into railway assets to ensure their safe and continued operation. The last two summers have though seen significant convectional rainfall affecting railway assets.

Convectional rainfall can be harder to forecast accurately so it is more difficult to predict where and when downpours will occur and this unpredictability has an impact, on some occasions, on the ability to plan mitigation measures in advance. Convectional rainfall also results in very intense bursts of heavy rain over small localised areas, sometimes without warning, which can impact operation of the railway.

The last full business year (2019-20), for example, included the following incidents:

- The wettest August on record led to the washout of tracks near Crianlarich and scour damage to an underbridge on the West Highland Line; and
- Significant flooding on the Edinburgh – Glasgow Main Line at Winchburgh, leading to service disruption and reputational impact in August and December 2019.

There is consequently a direct relationship between adverse weather, its effects on earthworks and the challenges of maintaining a safe and efficient network for train operators.



Information plays an important role in preparing and managing the response to weather events. Scotland’s Railway utilises the same expertise as the wider Network Rail business across the UK but draws specifically from information made available from flood alerts in Scotland. There is also active engage with Transport Scotland’s wider transport adverse weather resilience arrangements, providing access to a comprehensive picture across the whole of Scotland, for all sectors.

As noted in the main report, most railway earthworks were constructed without detailed engineering design, not to modern standards and at a time when the risks associated with earthworks were not scientifically understood. This applies equally in Scotland and as only a small percentage of those assets is replaced each year, managing out through design will take a very significant period of time.

The way third party land is managed outside Scotland's Railway boundary also has an impact during adverse weather. Even small blockages upstream or downstream in otherwise innocuous ditches, burns or streams and changes in land use can alter flow paths and concentrate water in areas detrimental to railway infrastructure. Between 2012 and 2018 there were four significant landslips in the Scottish Highlands originating from natural hillsides in land outside the ownership of Scotland's Railway.

Drainage investment priorities are focused on an evidenced-based analysis of repeat flood sites and there is an emphasis on mitigating the number of earthworks assessed as being at risk during adverse weather, some by undertaking major improvement schemes and others through small changes to the way water flows are managed. Aerial survey techniques are being used to refine the way work is targeted and identify issues on third party land. In addition, new mobile technology is being used during regular inspections to improve information on drainage assets.

Following the Carmont incident, Scotland's Railway has completed 848 inspections of earthworks assets, including aerial survey by helicopter or specialist inspections on foot by trained geotechnical inspectors and engineers.

Investing to Improve Resilience

Network Rail Scotland and Transport Scotland work closely, sharing knowledge on intervention and asset management practices between engineers working on the trunk road and rail networks in Scotland. On a wider front, both organisations contribute to the Geotechnical Asset Owners Forum, hosted by CIRIA (Construction Industry Research and Information Association). This brings together a wide range of bodies with responsibility for managing earthworks and drainage assets within the UK.

Operations, Maintenance and Renewal of earthworks and drainage assets is planned in line with Network Rail asset management policy. Among other things, this aims to:

- sustain the overall portfolio condition rating of assets;
- reduce the number of geotechnical assets susceptible to heavy rainfall;
- improve the resilience of the network to adverse weather; and
- remediate assets with the highest consequence impact on the network.

Successive control periods have seen increased investment assisting in reducing the overall number of assets susceptible to heavy rainfall and incidents associated with earthworks.

Control Period	Date Range	All Earthwork Failures	Embankment Failures	Earthwork attributable derailments
CP3	2004/05 – 08/09	88	31 (35%)	2
CP4	2009/10 – 13/14	111	25 (23%)	3
CP5	2014/15 – 18/19	69	21 (30%)	1
CP6	2019/20 FY	21	9 (43%)	0

Scotland's Railway aims to sustain this investment approach whilst reducing the severity or impact of failures by targeting adverse weather-prone assets. An increased program of drainage improvements commenced in Control Period 5 on both infrastructure and the lower slopes of natural hillsides has also assisted in mitigating the susceptibility of failure in the slopes immediately adjacent to the railway.

Funding for earthworks and drainage has been increasing. In the three most recent Control Periods the following sums (expressed in 2020-21 prices) have been or are being invested:

- Control Period 4 - £152 million
- Control Period 5 - £168 million
- Control Period 6 - £221 million

This is an ongoing process and work continues in Control Period 6 where capital investment targeted at improving resilience to adverse weather increased significantly on Control Period 5, with specific priorities in the following areas:

- reduction in earthworks susceptible to adverse weather to reduce landslide risk, including development and installation of remote monitoring systems (£150 million);
- management of lineside vegetation to reduce tree failures in high winds (£20 million);
- renewal of drainage to reduce repeat flood events (£10 million); and
- renewal of track drainage, driven by asset condition (£41 million).

Scotland's Railway has also invested a further £7m (excluding the response to the recent August adverse weather incidents) as the need to respond to weather-related events has been greater than anticipated. Investments in this area for Control Period 6 will continue to be reviewed and progress provided in future reports.