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10 October 2019



Mr Andrew Hall  
Deputy Chief Inspector of Rail Accidents  
Cullen House  
Berkshire Copse Rd  
Aldershot  
Hampshire GU11 2HP

Dear Andrew,

**RAIB Report: Landslips affecting Network Rail infrastructure between June 2012 and February 2013**

I write to provide an update<sup>1</sup> on the action taken in respect of recommendations 1 & 2 addressed to ORR in the above report, published on 2 April 2014.

The annex to this letter provides details of the action taken regarding the recommendations. The status of recommendations 1 & 2 is '**implemented**'.

We do not propose to take any further action in respect of these recommendations, unless we become aware that any of the information provided has become inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 11 October 2019.

Yours sincerely,

Oliver Stewart

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<sup>1</sup> In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

## Recommendation 1

*The intent of this recommendation is that Network Rail revises its processes for managing earthwork and drainage risk associated with neighbouring land so that the processes are accurately documented, proportionate, reflect practical limitations and take account of benefits offered by new technology such as aerial sensing and the use of computers to process large amounts of data.*

Network Rail should review and improve its processes for managing earthworks related risk arising from neighbouring land, including associated drainage issues. This should provide a documented process which takes account of the extent to which it is practical and proportionate for Network Rail to review and/or rely on land management activities undertaken by neighbours.

The new process should, where reasonably practicable:

- obtain relevant information from other sources where it cannot be collected by earthwork examiners (e.g. where examiners are unable to view areas due to access constraints, fences, etc.);
- take advantage of opportunities offered by current technology to assess areas at risk from ground movement and areas where ground movements are occurring;
- provide a robust process for identifying, and responding appropriately, to activities on neighbouring land which have the potential to significantly increase risk to the railway between routine earthwork examinations; and
- take advantage of opportunities offered by real-time rainfall monitoring to issue alerts identifying heavy rainfall when this has not been forecast.

## ORR decision

1. In lieu of the full introduction of CSAMS, we are satisfied that Network Rail have improved their management of earthworks related risk arising from neighbouring land by developing the Geohazard Assessment Module (NR/L2/CIV/086/mod03), as described in the closure statement.

2. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- has taken action to implement it

**Status: Implemented.**

## Previously reported to RAIB

3. On 31 March 2015 ORR reported that Network Rail had yet to complete its review of its processes for managing third party risks associated with earthworks.

ORR would advise RAIB when all actions to address this recommendation had been completed.

## Update

4. On 16 May 2019 Network Rail provided a closure statement that included the following summary:

*This recommendation has been extended several times owing to a dependence on CSAMS to fully embed improvements. As a revised CSAMS plan is yet to be agreed, we have reconsidered our approach to embedding all work into CSAMS at this time and believe the work undertaken satisfactorily closes the original intent of the recommendation.*

*Firstly, a nationwide hazard rating system has been developed for natural slopes in collaboration with the British Geological Survey (BGS), building on earlier work commissioned by LNW route. This encompasses seven natural slope failure models/datasets, which are: Debris Flow, Earth Flow, Rock Fall, Geosure Landslides, National Landslides Database, DiGMap50 Mass Movements and NR/L3/CIV/185 reported natural slope failures.*

*Topographical catchments have been developed from digital terrain models to identify which mapped hazards may affect the railway. The Derailment Criticality Score and Band described in NR/L2/CIV/086/mod12 Definition of Earthwork Criticality (published 02/09/2017) is then combined with these results to articulate the relative consequence of natural slope failure at a particular point on the railway network.*

*The hazard and consequence assessment was briefed and made available to routes via the GeoRINM Viewer in July 2017. The work has formed the basis of a stage-gated Geohazard Assessment process set out in a new, dedicated business standard published on 02/03/2019 for the assessment of hazards arising from natural slopes and the consequences of natural slope failure.*

*NR/L2/CIV/086/mod03 Geohazard Assessment can be downloaded from the NR Standards and Controls hub. A high hazard/consequence rating or a management action arising from Earthwork Evaluation (per NR/L2/CIV/086/mod01), triggers a Desk Based Review, which in turn can lead to a Site Based Review and ultimately a full Landslide Hazard Assessment. Evidence: NR/L2/CIV/086/mod03*

## Recommendation 2

*The intent of this recommendation is to ensure that Network Rail takes account of all safety related information contained in reports for slopes that have been categorised as marginal or serviceable by the SSHI and RSHI algorithms (i.e. reports which, at present, are not necessarily reviewed by Network Rail's geotechnical staff).*

Network Rail should review and improve its processes so that due consideration is given to all safety related information provided by earthwork examiners and earthwork engineers, including safety related information associated with slopes categorised as marginal or serviceable by the SSHI and RSHI algorithms.

## ORR decision

5. Network Rail have reviewed and taken steps to improve measures for collating safety related information provided earthwork examiners and engineers. Earthworks examination system overall has been improved to the extent that the matters raised in the recommendation have been adequately addressed, and we consider that further pursuit of the recommendation would not be reasonably practicable

6. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration; and
- has taken action to implement it

**Status: Implemented.**

## Previously reported to RAIB

7. On 31 March 2015 ORR confirmed that the following Network Rail company standards were in place:

- NR/L2/CIV/086 Management of Earth Works
- NR/L3/CIV/065 Examination of Earth Works

The planned completion date (CSAMS operational) had been extended until 24 July 2016.

## Update

8. On 16 May 2019 Network Rail provided a closure statement which included the following summary:

*This recommendation has been extended several times owing to a dependence on CSAMS to fully embed improvements. As a revised CSAMS plan is yet to be agreed, we have reconsidered our approach to embedding all work into CSAMS at this time and believe the work undertaken satisfactorily closes the original intent of the recommendation.*

*Firstly, the SSHI/RSHI system has been completely revamped . A five-point A-E Earthwork Hazard Category (EHC) has superseded Serviceable/Marginal/Poor and the underlying Hazard Index algorithms have been completely redeveloped using parametric techniques.*

*The Soil Cutting and Embankment Hazard Indices (SCHI/SEHI) succeeding SSHI and covering c.90% of assets were deployed in 2014 and have been used for the whole of CPS (see NR/L3/CIV/065/mod02 and NR/L3/CIV/065/mod04). The Rock Cutting Hazard Index (RCHI) was deployed in 2018 in parallel to RSHI, which had been adapted to EHC in 2014 (see NR/L3/CIV/065/mod03).*

*At algorithm changeover in all cases parity was maintained such that similar numbers of assets exist in EHC D and E as did in SSH I/RS HI Poor. Because the successor Hazard Indices are demonstrably much better calibrated to earthwork failures, the cohorts of assets promoted for Network Rail Earthwork Evaluation now contain assets more likely to fail following deployment and operation of the new Hazard Indices.*

*The Hazard Indices incorporate data, such as rock outcrops and boulders above railway Soil Cuttings that were not previously scored in SSHI. In addition, the triggers for Earthwork Evaluation have been strengthened such that an Earthwork Manager (EM) Review is at least required if an asset's EHC improves to verify that the improvement was legitimately due to physical intervention works.*

*Where an examiner's subjective view is that risk is high (see NR/L3/CIV/065/mod01), and the examined EHC is C, Earthwork Managers now have recourse to an automated report from which they can choose to schedule Earthwork Evaluation. Both NR/L2/CIV/086, covering Earthwork Evaluation, and NR/L3/CIV/065, covering Earthwork Examination, have been updated and expanded through the referenced modules several times since this recommendation was made. Evidence:*

- NR/L3/CIV/065/mod02 Definition of soil cutting hazard index*
- NR/L3/CIV/065/mod04 Definition of soil embankment hazard index*
- NR/L3/CIV/065/mod03 Definition of rock slope hazard index*
- NR/L3/CIV/065/mod03 Definition of rock cutting hazard index [Company Standard completed and assured but not yet published whilst RCHI in trial in parallel to RSHI]*
- NR/L3/CIV/065/mod01 Definition of the risk evaluation matrix*
- NR/L2/CIV/086/mod01 Earthwork Evaluation Geotech Hub, R,D&T page (see pages for Soil Cutting and Embankment Hazard Indices (SCHI/SEHI) and Rock Cutting Hazard Index (RCHI))*

## Previously reported to RAIB

### Recommendation 1

*The intent of this recommendation is that Network Rail revises its processes for managing earthwork and drainage risk associated with neighbouring land so that the processes are accurately documented, proportionate, reflect practical limitations and take account of benefits offered by new technology such as aerial sensing and the use of computers to process large amounts of data.*

Network Rail should review and improve its processes for managing earthworks related risk arising from neighbouring land, including associated drainage issues. This should provide a documented process which takes account of the extent to which it is practical and proportionate for Network Rail to review and/or rely on land management activities undertaken by neighbours.

The new process should, where reasonably practicable:

- obtain relevant information from other sources where it cannot be collected by earthwork examiners (e.g. where examiners are unable to view areas due to access constraints, fences, etc.);
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- provide a robust process for identifying, and responding appropriately, to activities on neighbouring land which have the potential to significantly increase risk to the railway between routine earthwork examinations; and
- take advantage of opportunities offered by real-time rainfall monitoring to issue alerts identifying heavy rainfall when this has not been forecast.

### Steps taken or being taken to address the recommendation

1. On 20 June 2014, Network Rail provided the following information:

*Network Rail's initial review has found that the formal controls for managing risks arising from neighbouring land are limited unless that risk is from built infrastructure (i.e. controls for natural hazard-posed risks are not currently considered adequate).*

*A discovery phase will facilitate a formal gap analysis, which will feed into a multifunctional workshop involving Legal Services, Liabilities, Outside Parties and the Geotechnical Community to discuss this issue and agree a clear and consistent way forward.*

*The intended outcome is a set of appropriate and proportionate controls built into a documented process, which is deliverable and can be evidenced, to enhance management of risk imported from third party land.*

*Timescale: 30 April 2015*

2. On 5 August 2014, ORR wrote to Network Rail asking it for details of its plan, including interim milestones. ORR also requested specific information on how it is to address each bullet point. On 26 August 2014, Network Rail provided the following information:

*Recommendation 1 (bullet 1) – Network Rail is carrying out a national study to understand the quantum of locations where third party land could potentially pose a hazard to the safe operation of the railway. Once defined, each location will be reviewed for the adequateness of control measures currently employed.*

*Recommendation 1 (bullet 2) – In parallel the Remote Condition Monitoring (RCM) development work into the potential uses of technology in the earthworks discipline is underway, much of which would be transferable to Outside Party Slopes.*

*Recommendation 1 (bullet 3) – Network Rail will undertake a review of the current Asset Protection process and arrangements and consider appropriate enhancements.*

*Recommendation 1 (bullet 4) – Real-time weather intelligence is covered by the response to Recommendation 3, which is being led by Network Rail's National Operations Centre (NOC), as well as Recommendation 5.*

## **ORR decision**

ORR, in reviewing the information provided by Network Rail, has concluded that in accordance with the Railway (Accident Investigation and Reporting) Regulations 2005. It has:

- taken the recommendation into consideration; and
- is taking action to implement it by 30 April 2015.

**Status: *Implementation on-going.*** *Network Rail has yet to complete its review of its processes for managing third party risks associated with earthworks. ORR will advise RAIB when all actions to address this recommendation have been completed.*

## **Recommendation 2**

*The intent of this recommendation is to ensure that Network Rail takes account of all safety related information contained in reports for slopes that have been categorised as marginal or serviceable by the SSHI and RSHI algorithms (i.e. reports which, at present, are not necessarily reviewed by Network Rail's geotechnical staff).*

Network Rail should review and improve its processes so that due consideration is given to all safety related information provided by earthwork examiners and earthwork engineers, including safety related information associated with slopes categorised as marginal or serviceable by the SSHI and RSHI algorithms.

### **Steps taken or being taken to address the recommendation**

3. On 20 June 2014, Network Rail provided the following information:

*During individual approval of examination reports the Earthwork Examining Engineer (EEE) is expected to pick up examiner comments including recommendations for repair / maintenance and communicate these to Network Rail. This has been reinforced by adding drop-downs for recommended standard maintenance items to electronic handheld examination units.*

*Redrafting of Company Standards will specify the response actions required by Route teams for slopes rated as Serviceable or Marginal by the current Soil Slope Hazard Index (SSHI) and Rock Slope Hazard Index (RSHI) algorithms or A, B or C under the new Soil Embankment Hazard Index (SEHI), Soil Cutting Hazard Index*

*(SCHI) and modified RSHI algorithms to be implemented from October 2014. It is anticipated that examiner recommended interventions will be used to populate a work-bank in future via Civils Strategic Asset Management System (CSAMS).*

*Planned completion date (Standards reissue): 31 August 2014*

*Planned completion date (CSAMS operational): 31 August 2015*

*Timescale: 31 August 2015*

4. ORR confirmed that the following Network Rail company standards are now in place:

- NR/L2/CIV/086 Management of Earth Works
- NR/L3/CIV/065 Examination of Earth Works

5. The planned completion date (CSAMS operational) has been extended until 24 July 2016.

#### **ORR decision**

ORR, in reviewing the information provided by Network Rail, has concluded that in accordance with the Railway (Accident Investigation and Reporting) Regulations 2005. It has:

- taken the recommendation into consideration; and
- is taking action to implement it by 24 July 2016.

**Status: Implementation on-going:** *ORR will advise RAIB when actions to address this recommendation have been completed.*