Office of Transport
Safety Investigations

Derailment of freight train 4BM4

Nana Glen, 25 February 2021

Webinar

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5 July 2023

What we'll cover today

1. About OTSI
2. Nana Glen investigation
3. Questions?
4. Connect with OTSI

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About OTSI

Our purpose

We exist to improve safety outcomes and public confidence through independent investigation, sharing safety lessons, and engagement with the transport sector.

- NSW Government statutory authority.
- Chief Investigator reports to the Minister for Transport.
- Empowered under the *Transport Administration Act 1988* (rail, bus & ferry) in accordance with the *Passenger Transport Act 1990* and *Marine Safety Act 1998.*
- Investigates rail incidents using the *Transport Investigation Act 2003 (Cth)* under a Collaboration Agreement with the Australian Transport Safety Bureau (ATSB).
- Chief Investigator initiates investigations and determines how they are conducted
- Final reports tabled in NSW Parliament.

Key functions

Undertaking ‘no-blame’ investigations into accidents and incidents involving:

Railway operations such as the construction of a railway and rolling stock; the management, commissioning and maintenance of rail infrastructure; and the operation or movement of rolling stock for the purposes of operating a railway service.

Buses seating more than 8 adults and operating a public passenger service for a fare.

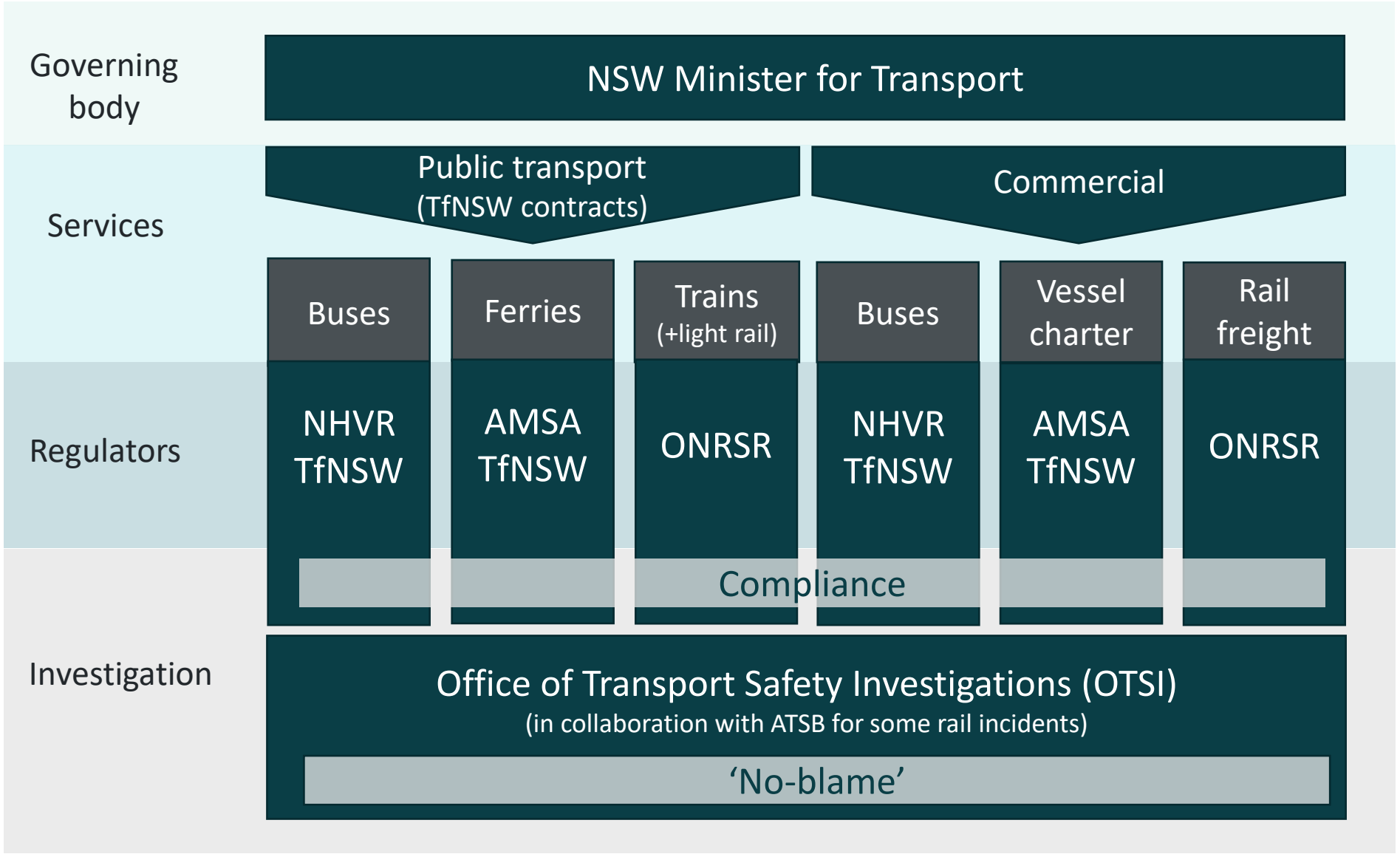
Ferries (vessels) seating more than 8 adults and operating a public passenger service for a fare.

Analysing data, research and insights to improve safety

Managing the Confidential Safety Information Reporting Scheme (CSIRS)

Engaging with stakeholders and sharing safety issues

Operating environment



What is ‘no-blame’ investigation?

Why something happened	• Focuses on why something happened and makes recommendations to prevent it from happening again, or to improve safety management.
Identify contributing factors	• How was risk being managed? Are the identification and assessment processes effective? • Was there human error? Could systems better address it? • Were there missing or unreliable safety controls?
No-blame	• Does not attribute blame or liability (individuals are not named in investigation reports).
Evidence	• Involves the collection of evidence which cannot be used in any subsequent criminal or civil proceedings.
Change through engagement	• ‘Directly Involved Parties’ invited to make submissions on draft report • Reports, safety advisories/alerts and notifications published.

Incident investigation

Safety issues

Organisational influences (internal)
Limitations in the organisation's ability to develop, monitor and manage risk controls

Risk controls
Limitations in the controls put in place to prevent or recover from problems at the lower levels

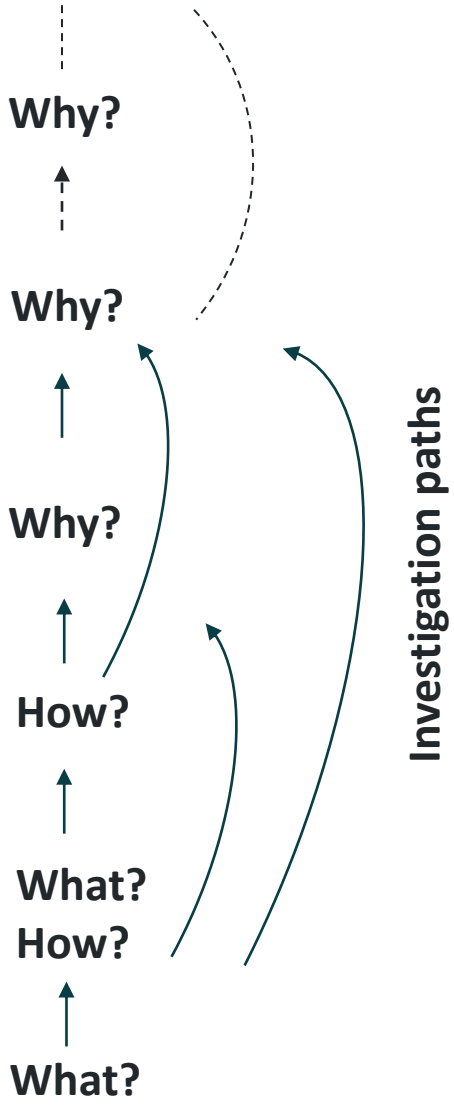
Potential indicators of safety issues

Local conditions
Personal, task, equipment or environmental conditions that affected the individual actions/occurrence events

Individual actions
Actions by safety critical, frontline personnel that increased risk

Occurrence events
Events at vehicle level and/or events involving vehicle/equipment problems that increased risk

Occurrence



Source:
Australian Transport Safety Bureau

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Nana Glen investigation

The derailment

- Extreme weather event on the Mid-North Coast 24-25 February 2021 with heavy rain and flooding.
- 6-hour rainfall likely 100–200 ARI.*
- Freight train derailed when it passed over track that had washed away.
- XPT passenger train passed through section about 27 minutes prior (6 crew and 36 passengers on board.
- Weather alert communicated to ARTC but missed and not sent to network users.

* Average Recurrence Interval - The average or expected value of the periods between exceedances of a given rainfall total accumulated over a given duration

Investigation focus and safety analysis

High level scope

Response to extreme weather events	Track drainage system	Previous incidents	Network rules and procedures
• Monitoring/response to extreme weather events and flooding • Effectiveness of risk controls • Procedures, weather monitoring service/contract, weather monitoring stations, flood studies, standards, inspections	• Design and maintenance of the track drainage system • Standards and procedures • Flooding risk/flooding locations	• Responses by ARTC to previous incidents and flooding	• Information for train crew to respond and report weather events

Safety factors map

RO-2021-004 Nana Glen Derailment

Investigators can use several tools to identify contributing factors and analyse risk:

- **Safety Factors Mapping**
- Bow Tie Analysis
- ICAM (Incident Cause Analysis Method).

Link likely or better

Link possible

External org influences

Internal org influences

Risk controls

Local conditions

Individual actions

Occurrence events

ARTC and EWN weather monitoring procedure and service agreement
– Safety issue

ARTC flood risk and cross drainage systems TAR corridor
– Safety issue

ARTC Remote weather monitoring equipment/needs
– Safety issue

ARTC Extreme Weather Monitoring and Response (Amber and Red Alert)
– Safety issue

ARTC and PN Guidance for extreme wet weather and flooding
– Safety issue

ARTC Network Control Rostering Practices increases fatigue
- Not a safety issue

Culvert at 643.849km and numerous other culverts inadequate and susceptible to overtopping the embankment

Network users not aware of amber alert or extent of severe weather event

Drivers of 3MB4 and NT31 did not report a CAN or slow down

Driver of 4BM4 continued near track speed after sighting water in corridor/near ballast

Extreme wet weather event Nana Glen

Flood water rises and washes out ballast as culvert unable to drain

4BM4 derails at washaway @0137

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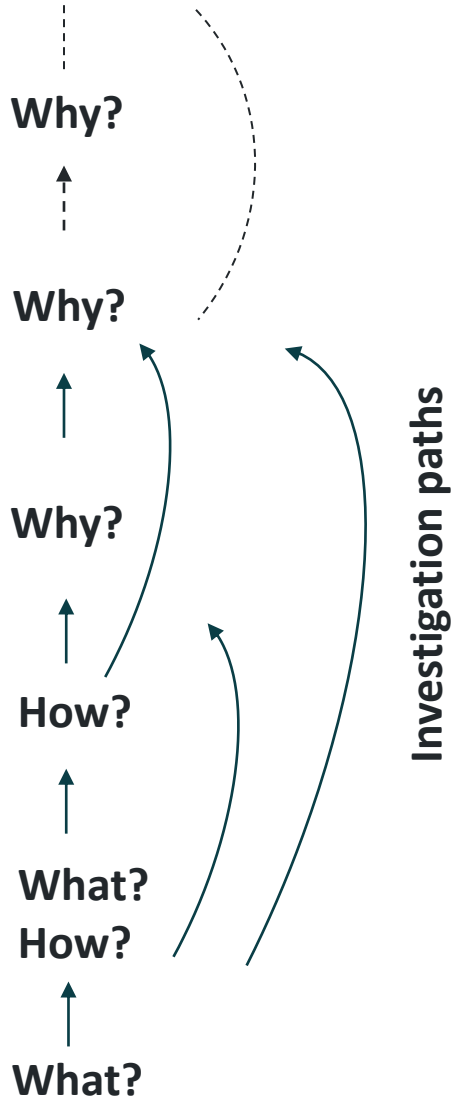


Source:
Australian Transport Safety Bureau

Contributing factors

Response to extreme weather events

- Network users unaware of severe weather event
- The driver of 4BM4 observed water in and around the rail corridor but had not been advised of any issues and continued
- ARTC had procedures in place for monitoring and responding to extreme weather events had significant limitations:
  - Emails used to alert/advise action in response to amber alerts could not ensure alerts were identified or actioned quickly.
  - Actions required for amber and red alerts were insufficient to respond to escalating rainfall and flooding (**Safety issue**).

Track drainage system

- Rainfall exceeded the capacity of the culvert
- Floodwater built up on the embankment before overtopping the track and washing away the ballast

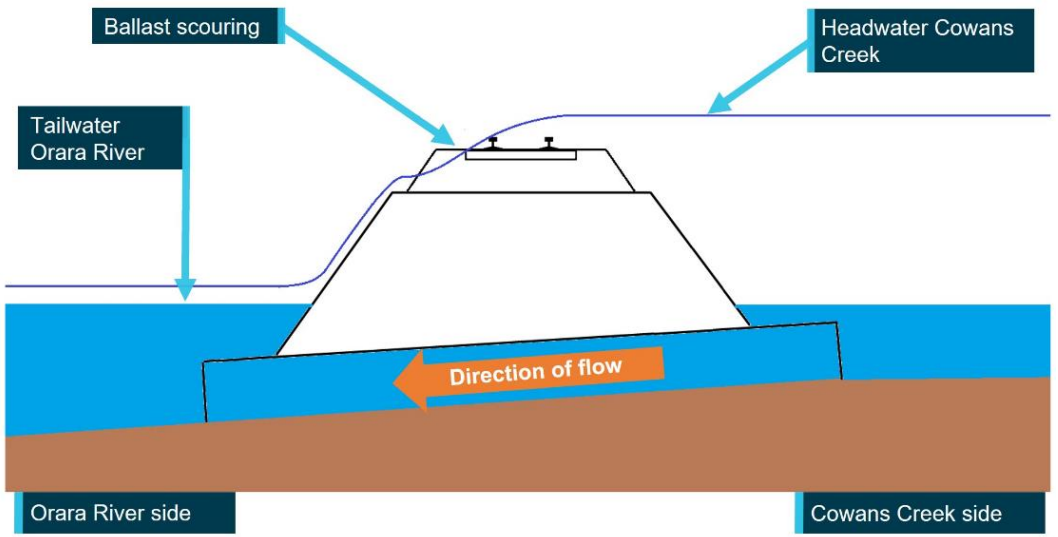


Image source: OTSI
Overtopping and washaway

Safety issues

Risk factors

Weather, flooding and drainage

- ARTC could not reliably determine the risk of flooding along the Telarah to Acacia Ridge corridor or the risks associated with inadequate capacity cross drainage systems.
- ARTC was installing remote weather monitoring stations but had not used a risk based approach to work out where to monitor.
- Weather monitoring alerts and service did not align with ARTC procedure or contract. ARTC thought they would receive flood warnings as events occurred.
- Neither ARTC or PN provided guidance to train crew on how to respond to weather (recommendation).

Impacts of the incident

140 metres

Track repaired including formation and replacement of rail, sleepers and ballast.

180 sleepers

Sleeps beyond the washaway were replaced. Embankment slip repaired using geofabric and rock fill to stabilise.

9 days

The incident occurred on 24/25 February and the rail line opened on 6 March 2021 – closing the track for 9 days.

Injury

Minor injury to one of the drivers

$1.07M

Repairs to the site

$4.05M

Damage to rolling stock and recovery of wagons

$significant

Rail line closure, damaged freight, emergency services response, and environmental impact not assessed but likely to be significant.

Recommendations are issued where the response from the operator does not address the safety issue or there is no committed timeframe

Recommendations

Recommendations to improve safety

- ARTC to develop guidance for train crew to respond to and report extreme wet weather events or flooding in the rail corridor – recommendation number RO-2021-004-SR-20
- Pacific National to develop guidance for train crew to respond to and report extreme wet weather events or flooding in the rail corridor – recommendation number RO-2021-004-SR-19

Early identification of safety issues to improve safety since the incident

Safety actions

Proactive safety actions by ARTC (completed, in progress or planned):

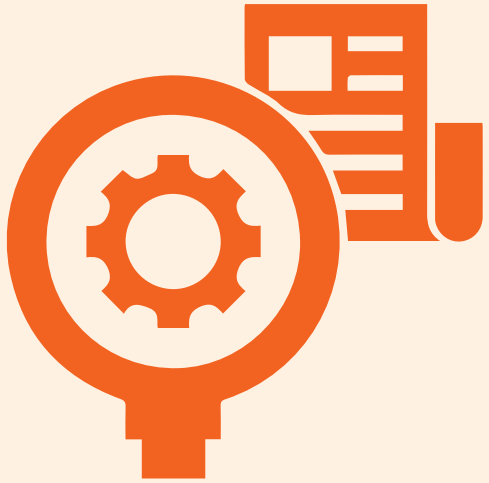
- 20 remote weather stations along the Telarah to Acacia Ridge corridor. Planned additional through their asset management system.
- 50 remote weather stations and 500 stream flow monitors over the next two years.
- Work instruction for the management of flooding and special locations. Introduced an enterprise-wide special locations register (to capture infrastructure such as non-standard culverts) which is maintained in (December 2022) communicating rainfall and flooding alerts increasing by one category (i.e. red alerts treated as black alerts).
- Revised contract with the Early Warning Network (EWN) to address extreme weather monitoring procedure (OPE-PR-014).

Risk analysis, and focus on the effects of climate change to address monitoring extreme wet weather events

Safety actions

What's been done as a result (completed, in progress or planned)

- New weather monitoring contract to a different provider (December 2022) – additional requirements for monitoring rainfall near flooding locations, and flood warnings for specific locations. Service agreement aligned with the requirements of ARTC procedure OPE-PR-014.
- Hydrology review of ARTC network - identify culverts' handling capacity. Risk analysis to prioritise locations for installation of monitors and identify upgrades. Focus on the effects of climate change along the Brisbane to Albury corridor.
- Formal review of extreme weather monitoring procedure in progress. Developing a risk model to support real-time decision-making on operational responses to extreme wet weather events over two stages.



Considering future risk

Operators should consider future risk instead of treating incidents as one-off events that exceed the design of their network.

- *How is your organisation managing the risk both short and long term?*

Extreme weather and climate change will likely have significant impact on rail infrastructure into the future with potential for loss of life and economic costs.

Implications for RIMs & Rolling stock operators

Rail infrastructure managers must ensure:

- they have sufficient processes in place to actively identify, monitor and manage foreseeable risks relating to extreme weather
- processes should be frequently reviewed to ensure that they remain adequate and appropriate.

Rolling stock operators and RIMs must ensure:

- they provide guidance and operational procedures to enable consistent responses to conditions that may adversely affect the integrity of rail infrastructure and operational safety.

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Confidential Safety Information Reporting Scheme (CSIRS) for transport employees

1800 180 828 (M-F 8:30am - 5:00pm) or use the online form on the OTSI website