Australian Government
Australian Transport Safety Bureau

Derailment of freight train Y279

Traveston, Queensland, 23 February 2022

ATSB Transport Safety Report
Rail Occurrence Investigation (Defined)
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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 12 Moore Street, Canberra, ACT 2601
Telephone: 1800 020 616, from overseas +61 2 6257 2463
Accident and incident notification: 1800 011 034 (24 hours)
Email: atsbinfo@atsb.gov.au
Website: www.atsb.gov.au

Addendum

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Interim report

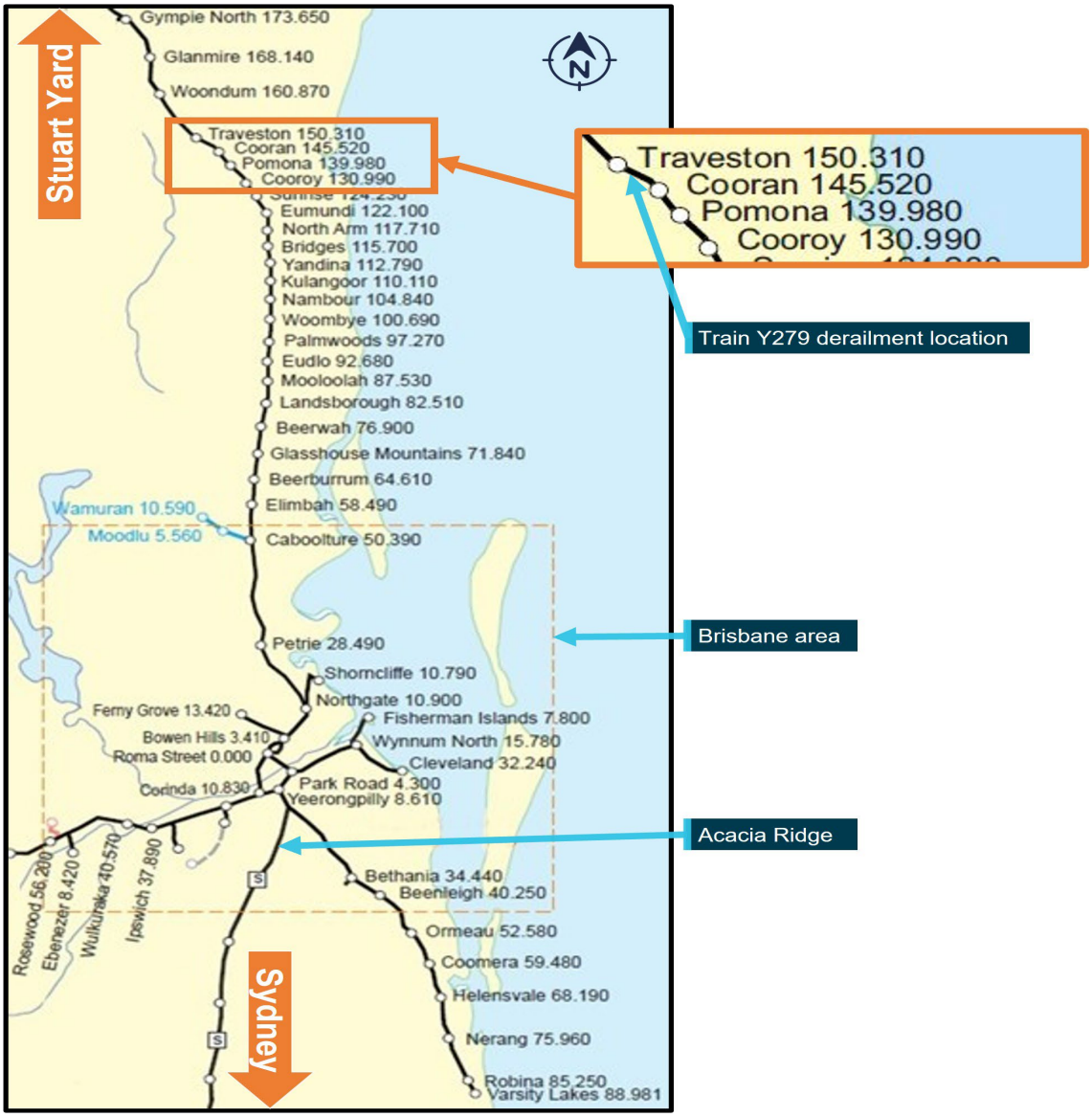
This interim report details factual information established in the investigation's early evidence collection phase, and has been prepared to provide timely information to the industry and public. The report contains no analysis or findings, which will be detailed in the investigation's final report. The information contained in this interim report is released in accordance with section 25 of the *Transport Safety Investigation Act 2003*.

The occurrence

Overview

At 2332 local time on 22 February 2022, freight train Y279, operated by Aurizon, departed Acacia Ridge, Queensland, for a journey to Stuart Yard, Queensland (Figure 1).

Figure 1: Station locations Acacia Ridge to Gympie North



The image shows stations and their distance (in track km) from Roma Street Station in Brisbane.
Source: Queensland Rail, modified by the ATSB

At about 0200 on 23 February 2022, the Queensland Rail (QR) Traveston wayside remote monitoring system, located at the 149.280 km point between Cooran and Traveston, detected rising flood waters and, later, the overtopping of the rails by the floodwaters at that location. The

weather station transmitted data via the QR integrated asset management protection system to the rail management centre, located at Bowen Hills. The system did not, however, broadcast any of the automatically generated warnings or critical alarm messages to the network control officer (NCO) or other relevant staff managing the rail operations through the Traveston area. The NCO, and subsequently the driver of train Y279, were not alerted that the floodwaters had overtopped the rails at the 149.280 km point.

At about 0318 on 23 February 2022, train Y279 derailed at the 149.076 km point after traversing a section of track affected by the floodwater run-off. Both locomotives and 4 rail vehicles of train Y279 derailed. The driver sustained minor injuries during the derailment.

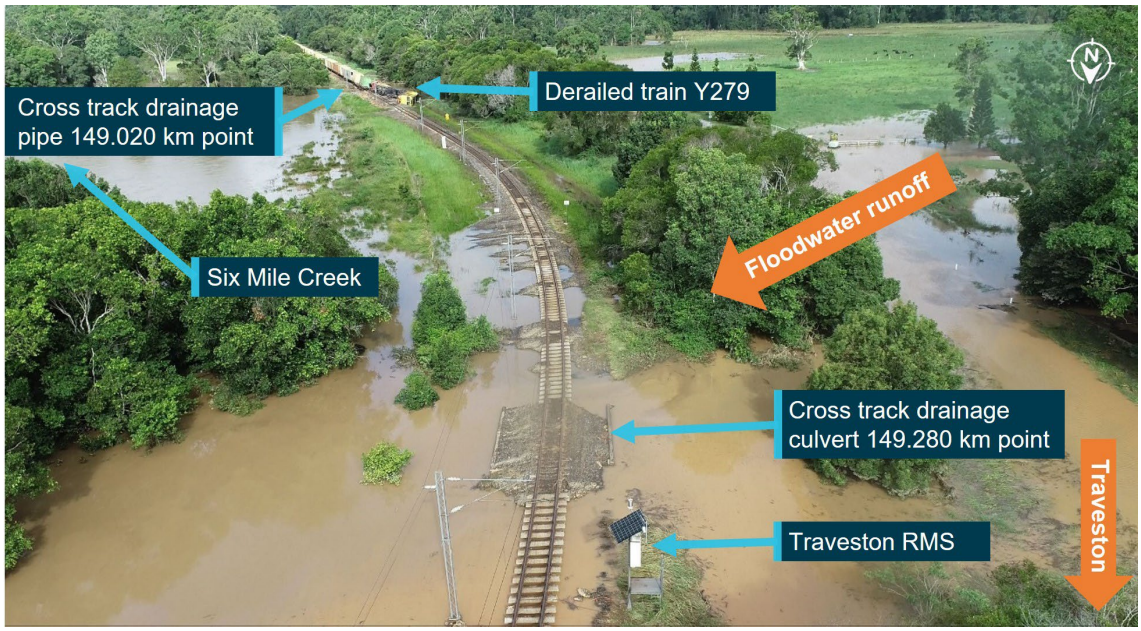
Acacia Ridge to Pomona

At 2332 on 22 February 2022, train Y279 departed Acacia Ridge to travel north towards Stuart Yard (in Townsville). The driver recalled their journey from Acacia Ridge through the Brisbane area to their arrival at Glass House Mountains was routine, with light rain falling at several locations during that part of the journey.

At 0124 on 23 February 2022, Y279 departed Glass House Mountains (71.840 km point). The driver recalled that, after departing Glass House Mountains, there was an increase in the intensity of the rain as they travelled further north.

At about 0200, Y279 approached Eudlo (92.680 km point). At this time, the Traveston wayside remote monitoring system (Traveston RMS), located adjacent to a cross track concrete box type drainage culvert at the 149.280 km point (Figure 2), recorded the water level in the culvert had risen to 945 mm below rail height.

Figure 2: Location of Traveston wayside remote monitoring station and cross track drains



The image taken later the day of the derailment shows the relative locations of the derailed train Y279, cross track drains and the Traveston RMS.
Source: ATSB

At about 0230, Y279 departed North Arm (117.170 km point). At this time, the Traveston RMS recorded the water level had risen to 321 mm below rail height. About 0236, the Traveston RMS recorded the water level had risen further to 12 mm below rail height. At about 0238, the water level was recorded to have overtopped the rail by 90 mm.

The Traveston RMS transmitted the recorded floodwater levels to the QR integrated asset management protection system (IAMPS) located at the rail management centre (RMC) at Bowen

Hills. The IAMPS generated several warnings and critical alarm messages in response to the rising floodwater level and the overtopping of the rails at the Traveston RMS location. The IAMPS set-up did not enable the alarm messages generated from the Traveston or Pomona wayside remote monitoring stations to display at the Mayne network control centre's universal traffic control (UTC) 7 workstation or broadcast to other key staff for response.

The NCO managing train movements through the Traveston area via the UTC 7 workstation was not aware that floodwaters had overtopped the rails at Traveston. The driver of Y270 recalled that, as they continued toward Cooroy (130.990 km point), they encountered 'very heavy' rain through that area.

At about 0242, as the driver approached Cooroy, the NCO radioed the driver to notify of a track fault that had affected the signalling system from Cooran toward Traveston and to prepare to stop Y279 at Cooran, signal CR25, to receive an SW50 form[1] to authorise them to continue toward Traveston. The driver acknowledged receipt of the message and continued their journey through Cooroy toward Pomona.

At about 0244, the Traveston RMS recorded floodwaters peaked at 193 mm above rail height before then starting to recede.

Pomona to Cooran

As Y279 approached Pomona (139.980 km point), the driver recalled that the rain was still heavy, and that there was floodwater pooled adjacent the track, with the level nearly to the top of the ballast in places.[2] The driver reduced train speed and continued toward the Pomona yard, where they recalled observing the floodwaters were lapping the underside of a rail bridge over a small creek at the entry to the yard.

The driver continued through Pomona toward Cooran (145.520 km point). They recalled that, as the train approached the Jampot Creek rail bridge, the floodwaters were pooled against the track formation and water was lapping the underside of the rail bridge. After crossing Jampot Creek, the driver continued toward Cooran where they stopped Y279 at signal CR25, as previously requested by the NCO.

At about 0308, the driver radioed the NCO in preparation to receive the SW50 form. The driver reported their observations of floodwaters through Pomona to the NCO, who advised they would follow up on the driver's report.

During the conversation between the driver and the NCO, the signalling system recovered and signal CR25 displayed a proceed indication. The NCO advised the driver that they could now proceed under signal indication toward Woondum, the next station after Traveston. The NCO asked the driver to observe the signal indications as they went. The driver acknowledged and advised the NCO that they expected to encounter a lot of floodwater through the area ahead as well. The NCO requested the driver kept them updated on the situation along the way.

Cooran to Traveston

At about 0310, Y279 passed signal CR25 and continued toward Traveston. The driver initially increased the train speed to 27 km/h. Shortly after, the driver, expecting to encounter floodwaters, reduced the train speed to 15 km/h to travel through an area of track that was known to be prone to flooding (Figure 3). The driver recalled that, although floodwaters were present, they considered there was not enough water to be of concern.

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1 SW50 form was a written authority for rail traffic to proceed.

2 At 0150, the Pomona RMS recorded a rainfall rate of 127 mm/h. At 0220, the Pomona RMS recorded the floodwater level at 380 mm below rail height.

Figure 3: Route map extract showing features between Cooran to Traveston

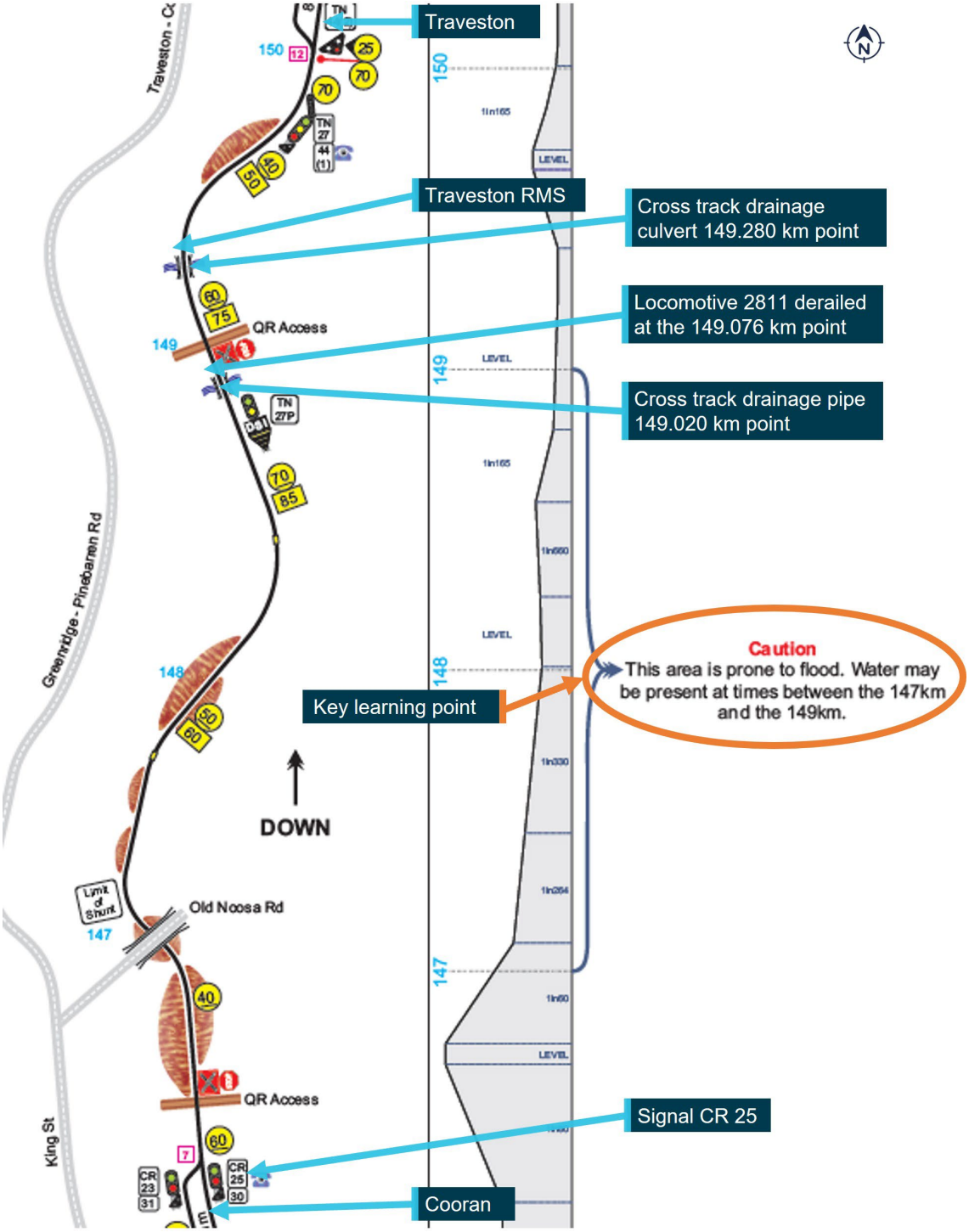

Image shows sections of driver competency-based route knowledge material highlighting key learning points. Image not drawn to scale; some discrepancy between km identifiers may present.
Source: Queensland Rail, modified by the ATSB

At about 0315, after passing through the flood-prone area, the driver began to increase the train speed. The driver recalled that it was still raining, and they were having difficulty seeing out so they opened the driver's side window to look out. Shortly after the driver sighted an anomaly in the track ahead. The train was travelling at a speed of 33 km/h.

At 0318 the driver moved the throttle to idle and the automatic brake control handle to the emergency position. The driver recounted they initially felt the locomotive dip, before commencing a pitching motion and rolling onto its side. Locomotive 2811 travelled about 56 m between the time

the driver made an emergency brake application and coming to a stop resting on its side in the floodwater (Figure 4).

At about 0319, the driver radioed the NCO to report the train had derailed and the lead locomotive 2811 had come to rest on its side in the floodwaters. The driver reported they were ‘alright’ but ‘a bit shaken up’ and that there would be a ‘fair sort of a mess’ at the site.

The driver could not see anything to identify the kilometre location of the train apart from a 60 km speed board located on the trackside ahead. Network control centre staff established, in discussion with the driver, the derailment location was ‘on the straight’ just prior to Traveston Station. The status of the overhead traction supply was unknown and network control staff instructed the driver to remain in the locomotive cab until receipt of further advice.

Figure 4: Derailed rail vehicles from train Y279

The image (taken later on the day of the derailment) shows derailed rail vehicles from train Y279, washout and other damage to the track formation.
Source: ATSB

Events post derailment of Y279

The network control centre staff initiated emergency response procedures, contacting the emergency services and QR staff. The NCO made regular radio contact with the driver, checking their welfare and updating them on the status of emergency services and the isolation of the overhead traction system.

At about 0407, the driver reported to the NCO that they had sighted flashing lights from emergency services vehicles. At about 0505, the driver reported the train radio had failed and they were now using a handheld radio. The driver also reported that floodwaters in the locomotive cab were rising slowly. At about 0552, network control radioed the driver to advise the overhead supply was isolated and they could exit the cab.

At 0618, emergency services reached the locomotive and assisted the driver to climb out of the cab onto the side of the locomotive. Floodwaters hindered arrangements for the driver to access ambulance services for a medical assessment until about 0755.

Context

Train information

Aurizon train Y279 comprised locomotives 2811 leading and 2338 trailing, hauling 27 wagons carrying containerised freight, which included dangerous goods. The containers carrying dangerous goods were positioned toward the rear of the train. Train Y279 was 562.9 m in length with a gross mass of 1,695.7 tonnes. The train was crewed in a driver only configuration.

Track information

North Coast Line system

The Queensland Rail (QR) North Coast rail system extended between Brisbane in the south and Cairns in the north. The system comprised 2 parts: the north, running from Rockhampton to Cairns; and the south, running from Roma Street Station to Rockhampton. Traveston Station was located in the south. The North Coast rail system (south) carried various containerised and bulk freight products. Long distance and high-speed passenger train services also operated on the system to service the central and North Queensland areas.

QR managed the railway where the derailment occurred, with the movement of rail traffic controlled from its QR Mayne network control centre, UTC 7 workstation, located at Bowen Hills in Queensland. The system was operated utilising remote controlled signalling, automatic train control and automatic train protection systems. The track length between Roma Street Station and Rockhampton was electrified with an 25kV 50 Hz alternating current (AC) traction system.

The narrow gauge (1,067 mm) track at the derailment location consisted of 47 kg/m rail fastened to concrete sleepers by resilient clips laid on a formation of crushed rock ballast. The configuration of the track from Cooran toward Traveston included a series of left and right curves of varying radius and was generally of falling grades. Approaching the derailment site in the direction of travel of train Y279, the configuration included a left curve of 239 m radius before transitioning to tangent track.

Track drainage at derailment site

Adjacent the derailment site, there was one 900 mm diameter concrete pipe installed under the track formation at the 149.020 km point. Immediately north of the site there were 2, 2700 mm concrete box culverts installed under the track formation at the 149.280 km point. Rainwater run-off flowed through the under-track drainage from the west to east into Six Mile Creek (Figure 2).

Queensland Rail weather monitoring systems

QR implemented a variety of management systems and operational procedures/protocols to assist staff to detect and respond to weather events that may affect the network. Available sources of weather information included:

- Bureau of Meteorology data
- weather briefings/3 day forecast summary
- MyGEO Emergency management and weather applications[3]
- QR integrated asset management protection system (IAMPS).

[3] MyGEO application developed by QR provided network control centres and other operational areas with a portal for single-point access to weather information, fire conditions, traffic and other relevant information for the management of major weather events or emergencies.

The IAMPS provided an interface displaying real time data derived from a variety of sources to relevant personnel at either the regional or Mayne network control centres. Wayside remote monitoring stations (RMSs) situated at selected sites throughout the rail system relayed information from a variety of installed devices, which included weighbridges, rainfall, flood and temperature monitors, hot bearing detectors, bearing acoustic monitors, wheel impact and load detectors.

The RMS sites on the North Coast rail system (south) included:

- Elimbah
- Glass House Mountains (Coonowrin Creek)
- Caboolture (King Johns Creek)
- Pomona
- Traveston.

The Pomona and Traveston RMSs recorded rainfall,[4] flood and temperature data. The IAMPS application displayed related information and generated various warning and alarm messages in response to the detection of a range of defined parameters (Table 1).

Table 1: Weather station warning and alarm parameters for rainfall and flooding

Parameter	Priority	Description	Alarm text
Water height has been detected 1 m below rail height	Warning	Flood sensor has detected water 1m below the rail height	Water level is 1m below rail height at <KM Point/Track Name or location name>.
Water height has been detected 40 cm below rail height	Warning	Flood sensor has detected water 40cm below the rail height	Water level is 40cm below rail height at <KM Point/Track Name or location name>.
Water height has been detected 10 cm below rail height	Warning	Flood sensor has detected water 10cm below the rail height	Water level is 10cm below rail height at <KM Point/Track Name or location name>
Water height has been detected at rail height	Critical	Flood sensor has detected water at rail height	Water level is at rail height at <KM Point/Track Name or location name>.
Water height has been detected 20 cm above rail height	Critical	Flood sensor has detected water 20cm above the rail height	Water level is 20cm above rail height at <KM Point/Track Name or location name>
Water height has been detected 50 cm above rail height	Critical	Flood sensor has detected water 50cm above the rail height	Water level is 50cm above rail height at <KM Point/Track Name or location name>
The 1-hour total rainfall figure has exceeded 50 mm	Warning	Heavy rainfall detected	Heavy rainfall (more than 50mm in 1 hour) at <station>.
Rainfall in excess of 100 mm/h has been detected for 10 minutes	Warning	Heavy rainfall detected	Heavy rainfall (more than 100mm/hr in 10 minutes) at <KM Point/Track Name or location name>.

[1] Warning and alarm messages trigger for both the exceedance and recovery of a listed parameter. Recovery messages not included in the table above.

[4] At the time of the occurrence, no rainfall rate data was available from the Traveston RFS.

The data and alarms were available at workstations at the fault centre coordinator (FCC) and network shift asset manager (NSAM), located respectively at the Mayne fault coordination centre and the Mayne network control centre at Bowen Hills. The staff attending the respective workstations had to open the application to view readings and the warning and critical alarm messages.

Automated messaging via text and e-mail alerts to specified recipients was also available if a warning or critical alarm occurred. In response to the warnings and alarms generated from the Traveston and Pomona RMS data, the automated messages were not broadcast, as no recipients were defined within the IAMPS database.

The IAMPS also displayed messages of new alarms generated in a text format on the display of the train control workstations located in the regional network control centres. No messaging of alarms generated by the IAMPS was displayed to the UTC train control workstations located at the Mayne network control centre.

Safety action

Following the derailment of train Y279, Queensland Rail undertook actions to:

- Review the regional operations status document, MD-20-53 to consider the effectiveness/appropriateness of the risk management for network conditions
- Review/implement local business procedures for compliance with the minimum requirements of MD-20-53 and ensure that relevant staff receive related training and/or instructions
- Review the asset protection systems delivery specification, MD-21-306 to include the principles for alarm management and to clarity response actions to ensure consistency across QR operations as the rail infrastructure manager
- Review the amendments to MD-21-306 and (if required) develop an action plan to review and update associated documents:
    - MD-11-1955, RMS alarm response for fault coordination centres procedure
    - UTC SR200, wayside alarms to train control
    - RMS V2 VIEWX and VVIEWX user guide
- Ensure consistency between the above amendments and documents:
    - MD-14-37, network control manual
    - MD-14-36, general appendix
- Review whether training and/or instruction to affected rail safety workers is required following an amendment to the above documents
- Conduct a risk-based review to determine the feasibility of implementing environmental management system (EMS) alarms at the South-East Queensland (SEQ) rail management centre universal traffic control boards to provide relevant alarm notification to the network control officer (NCO). Pending the outcome of the review, develop an implementation plan for the training of affected NCOs and other stakeholders
- Review current EMS alarm notifications provided at regional control centres to ensure effectiveness/appropriateness of the alarms displayed at the NCO workstations
- Review SEQ control centre EMS CCTV availability and consider access arrangements for network control centre personnel to monitor as required including the:
    - appropriate roles to have access
    - appropriate response actions to be taken upon identification of possible conditions
    - training and/or instruction requirements for the affected rail safety workers
- Review available EMS CCTV availability at regional control centres to ensure NCOs have sufficient access and instruction to monitor the CCTV information

- Develop maintenance bulletin/alert in relation to the requirements for raising corrective maintenance work orders when conducting preventative maintenance on the weather monitoring system (WMS)/EMS equipment, as per the asset protection preventative maintenance check sheet MD-16-442
- Review sampled work orders that fall outside of the scheduled response timeframes to determine causality. Pending causality, review findings and present to the relevant general managers of the business line for corrective action development.

Further investigation

To date, the ATSB has obtained relevant material and conducted interviews with a number of Aurizon and Queensland Rail staff.

The investigation is continuing and will include review and examination of:

- the integrated asset management protection system (IAMPS) and arrangements for the distribution of weather-related warning and alarm messages generated by the system
- procedures for response to weather related warning and alarm messages
- procedures for the identification and management of a potential hazard from a weather event
- training provided to network control operations staff in the management of weather events
- maintenance inspections of the serviceability of cross track drainage systems at Traveston
- training provided to drivers in the identification and management of weather events
- procedures and training provided to drivers in the emergency egress arrangements from a locomotive cab.

Should a critical safety issue be identified during the course of the investigation, the ATSB will immediately notify relevant parties so appropriate and timely safety action can be taken.

A final report will be released at the conclusion of the investigation.

General details

Occurrence details

Date and time:	23 February 2022 – 0319 EST	
Occurrence class:	Accident	
Occurrence categories:	Derailment	
Location:	149.076 km point, Elimbah to Gympie North corridor	
	Latitude: 26º 19.579' S	Longitude: 152º 47.542' E

Train details

Track operator:	Queensland Rail	
Train operator:	Aurizon	
Train number:	Y279	
Type of operation:	Containerised freight	
Departure:	Acacia Ridge (Brisbane)	
Destination:	Stuart Yard (Townsville)	
Persons on board:	Crew – 1	
Injuries:	Crew – 1	Passengers – 0
Damage:	Substantial	Passengers – 0