



Rail Accident Investigation Branch

# Rail Accident Investigation: Interim Report

**Fatal accident involving the derailment of a tram  
at Sandilands Junction, Croydon  
9 November 2016**

Report IR1/2016  
November 2016

*Note: This interim report contains information obtained from the Rail Accident Investigation Branch's (RAIB) initial examination of the available evidence. Some of the information contained in this report may be refined or changed as the investigation progresses.*

*The purpose of a RAIB investigation is to improve safety by preventing future railway and tramway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability. Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.*

# Fatal accident involving the derailment of a tram at Sandilands Junction, Croydon 9 November 2016



## Summary

- 1 At about 06:07 hrs on Wednesday 9 November 2016, a tram running between New Addington and Wimbledon derailed and overturned on a curve as it approached Sandilands Junction, in Croydon (figure 1). The tram travelled for a short distance on its side before stopping in the vicinity of the junction.
- 2 Seven people suffered fatal injuries in the accident. A further 51 people were taken to hospital, with eight of them suffering injuries described by the London Ambulance Service as “serious or life-threatening”.
- 3 The Rail Accident Investigation Branch’s (RAIB) initial review of the on-tram data recorder (OTDR) shows that the tram was travelling at a speed of approximately 70 km/h (43.5 mph) as it entered the curve, which had a maximum permitted speed of 20 km/h (12.5 mph).



Figure 1: Google image showing area where accident occurred

## The RAIB's role and the context of this interim report

- 4 The RAIB is responsible for conducting independent investigations into railway and tramway accidents in the UK. The purpose of its investigations is to improve safety by establishing the causes of accidents and making recommendations to reduce the likelihood of similar occurrences in the future or to mitigate their consequences.
- 5 The RAIB is not a prosecuting body; its investigations are focused solely on safety improvement and do not apportion blame or liability. The police and the Office of Rail and Road deal with contraventions of the law. None of their statutory duties are changed by the RAIB investigation.
- 6 The RAIB's investigation is running independently of those of the British Transport Police, the Office of Rail and Road, and the industry. However, all investigating agencies, and the industry, are co-operating fully with each other.
- 7 This interim report provides some key information including the RAIB's findings from its initial investigation. It builds upon the information already provided on the RAIB's website<sup>1</sup>. A final report will be published on completion of the investigation. All RAIB investigation reports are available on the RAIB website.
- 8 At any stage in its investigations the RAIB may also issue urgent safety advice (see paragraph 32) and make recommendations to such persons as appropriate in the circumstances.

<sup>1</sup> [www.gov.uk/raib](http://www.gov.uk/raib)

## Background information

### People

- 9 The driver was the only member of staff on the tram. The exact number of passengers is still being established, but is believed to be around 60.

### Parties involved

- 10 The tramway infrastructure is owned and managed by Transport for London through its London Trams subsidiary.
- 11 Tram Operations Ltd, a subsidiary of First Group, operates the trams.

### Key features of the route and accident location

- 12 The accident occurred at Sandilands Junction on the London Tramlink network in Croydon; the point at which the two easterly legs of the network from Beckenham Junction/Elmers End and New Addington converge (see figure 2).
- 13 The tram involved in the accident was running between Lloyd Park and Sandilands tram stops on the route from New Addington. After the Lloyd Park tram stop, the route runs in the open for about 900 metres, and then passes through Sandilands tunnels (comprised of three closely spaced tunnels with a total length of 512 metres), before emerging into a cutting approximately 100 metres before the left-hand curve on which the accident occurred. The curve has a radius of approximately 30 metres.
- 14 The tramway runs in its own dedicated corridor in this location (it does not change to street running until after Sandilands tram stop). The alignment through the tunnels on the approach to the curve is straight, and the track is on a gently falling gradient from the tunnel portal to the curve, before rising again through the junction.

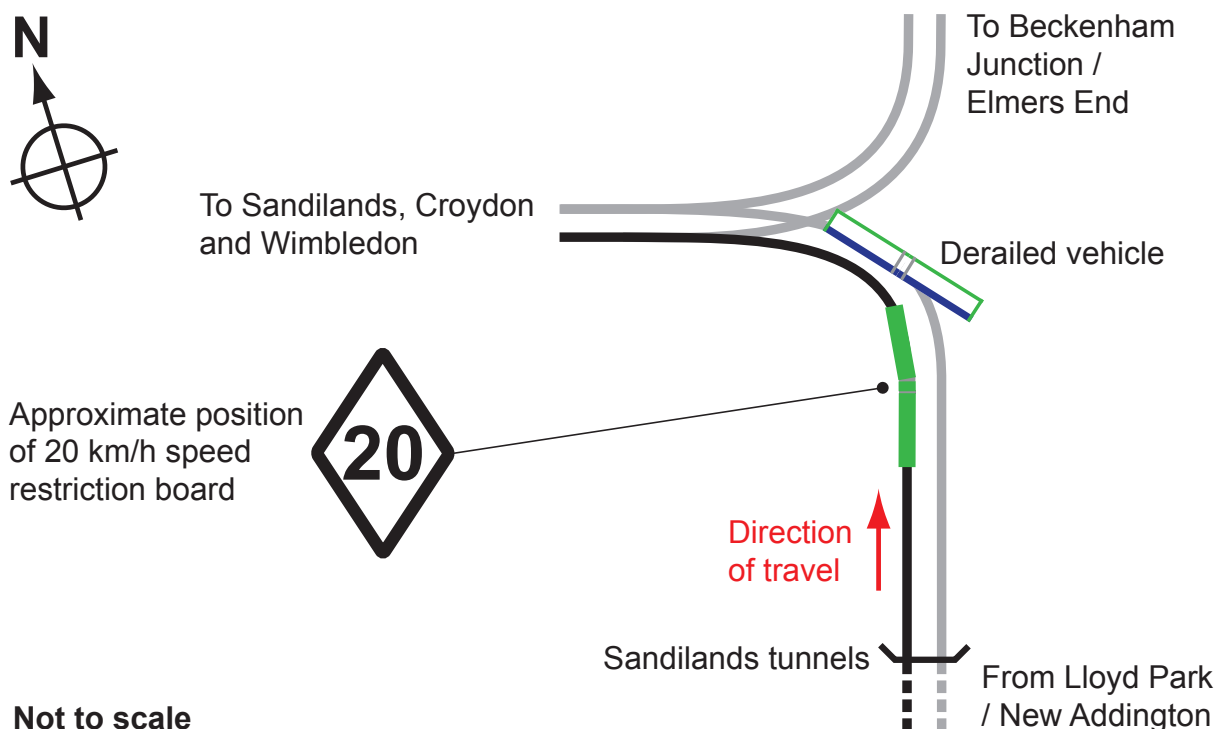


Figure 2: Diagram of accident location

- 15 The maximum permitted speed for trams approaching the area from Lloyd Park is 80 km/h (50 mph) until the curve near to Sandilands Junction, at which point it drops to 20 km/h (12.5 mph). A reflective board denotes the commencement of the 20 km/h speed restriction; it is located approximately 30 metres before the point where the derailment occurred.
- 16 Trams, including those in Croydon, generally operate on 'line-of-sight' principles, with drivers being required to check that the route ahead is clear. Indicators are provided at locations where conflict can occur, such as junctions and road crossings. There is no requirement for advance warning of speed restrictions (neither is there a requirement for speed control systems to be fitted to trams).

### External circumstances

- 17 At the time of the accident it was dark and raining heavily.

### The tram

- 18 The vehicle involved was tram 2551, one of 24 units (comprising three bogies and two cars joined by an articulation unit) that made up the initial Croydon fleet. It was built by Bombardier Transportation in Austria in 1998.
- 19 The tram was equipped with forward facing and internal closed circuit television (CCTV) cameras and an OTDR. The OTDR records key parameters such as the vehicle speed and the driver's operation of power and brake controls.
- 20 The OTDR was functioning at the time of the accident, and the evidence obtained is being used in the RAIB's investigation. However, an initial examination of the tram's CCTV equipment suggests that it was not working at the time of the accident.

### **The accident**

- 21 Tram 2551 departed from New Addington at 05:55 hrs, calling at six stops including Lloyd Park. After leaving Lloyd Park it travelled at up to 80 km/h (50 mph)(in accordance with prevailing speed restrictions), as it ran towards its next stop at Sandilands.
- 22 The tram entered the curve on the approach to Sandilands Junction at a speed of approximately 70 km/h (43.5 mph). As it encountered the curve, it derailed and turned over onto its right side, travelling for approximately 25 metres before it stopped.

### **Consequences**

- 23 Seven people lost their lives in the accident and 51 were taken to hospital, eight of them suffering from serious injuries.
- 24 The right side of the tram, which made contact with the ground, was severely damaged.
- 25 There was some damage to the track and lineside equipment in the vicinity of the accident.

## The investigation

- 26 The RAIB was notified via its telephone incident line at 06:42 hrs, and deployed five inspectors and two support staff to the site of the accident. The first three inspectors arrived on site at 10:02 hrs. The RAIB completed work on site at 09:20 hrs on 12 November 2016.
- 27 The RAIB has:
- secured relevant physical evidence including the tram;
  - moved the tram to a secure location;
  - obtained details from the tram's OTDR;
  - carried out a detailed survey of the track and other infrastructure in the area of the accident;
  - started gathering evidence from the tram operator;
  - started gathering evidence from witnesses; and
  - launched an appeal for other witnesses to come forward ([www.gov.uk/government/news/raib-witness-appeal](http://www.gov.uk/government/news/raib-witness-appeal)).

## Initial findings

### Track

- 28 The RAIB has undertaken a survey of the track in the vicinity of the derailment and will be reviewing the findings from the survey in due course. At this stage, no evidence has been found of any track defects, or obstructions on the track, that could have contributed to the derailment.

### The tram and its operation

- 29 Detailed examination of the tram has not yet been possible. However, the RAIB's initial investigation has not indicated any malfunction of the tram's braking system.
- 30 A tram approaching the Sandilands Junction area from Lloyd Park at 80 km/h (50 mph) would need to brake at its full service rate of 1.3 m/s<sup>2</sup> approximately 180 metres before the speed restriction board in order to be travelling at 20 km/h (12.5 mph) when the board was reached.
- 31 Initial analysis of the tram's OTDR indicates that some braking was applied in the 180 metres before the 20 km/h (12.5 mph) speed restriction board, but this was only sufficient to reduce the tram's speed from 80 km/h (50 mph) to approximately 70 km/h (43.5 mph) by the time the tram passed the board and entered the curve on which the accident occurred.

## Urgent Safety Advice

32 In the light of this accident, the RAIB has issued the following urgent safety advice to Tram Operations Ltd and London Trams:

‘The factors that led to the over-speeding are still under investigation. Until these factors are better understood, and before the junction re-opens to passenger operation, the RAIB advises London Trams and Tram Operations Ltd to jointly take measures to reduce the risk of trams approaching Sandilands Junction from the direction of New Addington at an excessive speed. Options for consideration should include the imposition of a further speed restriction before the start of the existing 20 km/h speed restriction around the curve and/or additional operational signs.’

## RAIB’s future action in the investigation

33 During its investigation the RAIB will work in conjunction with other agencies to contact the families of those who lost their lives and those who were injured in the accident. The RAIB will also be contacting any passengers who were on-board the tram when the accident occurred, but who were not injured.

34 The RAIB’s ongoing investigation will include consideration of:

- the sequence of events before and during the accident;
- events following the accident, including the emergency response and how passengers evacuated from the tram;
- the way in which the tram was being driven and any influencing factors;
- the design, configuration and condition of the infrastructure on this section of the route, including signage;
- the tram’s behaviour during the derailment and how people sustained their injuries;
- any previous over-speeding incidents at Sandilands Junction; and
- any relevant underlying management factors.

35 The RAIB’s investigation report will include recommendations to reduce the likelihood and/or consequence of similar events occurring in the future.

## Rail Accident Investigation Branch

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