



**Australian Government**

**Australian Transport Safety Bureau**

# Derailment of XPT ST23

Wallan, Victoria on 20 February 2020

**ATSB Transport Safety Report**  
Rail Occurrence Investigation  
RO-2020-002  
Preliminary – 3 April 2020

This investigation is being conducted under the *Transport Safety Investigation Act 2003* by the Chief Investigator, Transport Safety (Victoria) in collaboration with the Australian Transport Safety Bureau and the Office of Transport Safety Investigations (NSW).

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#### Addendum

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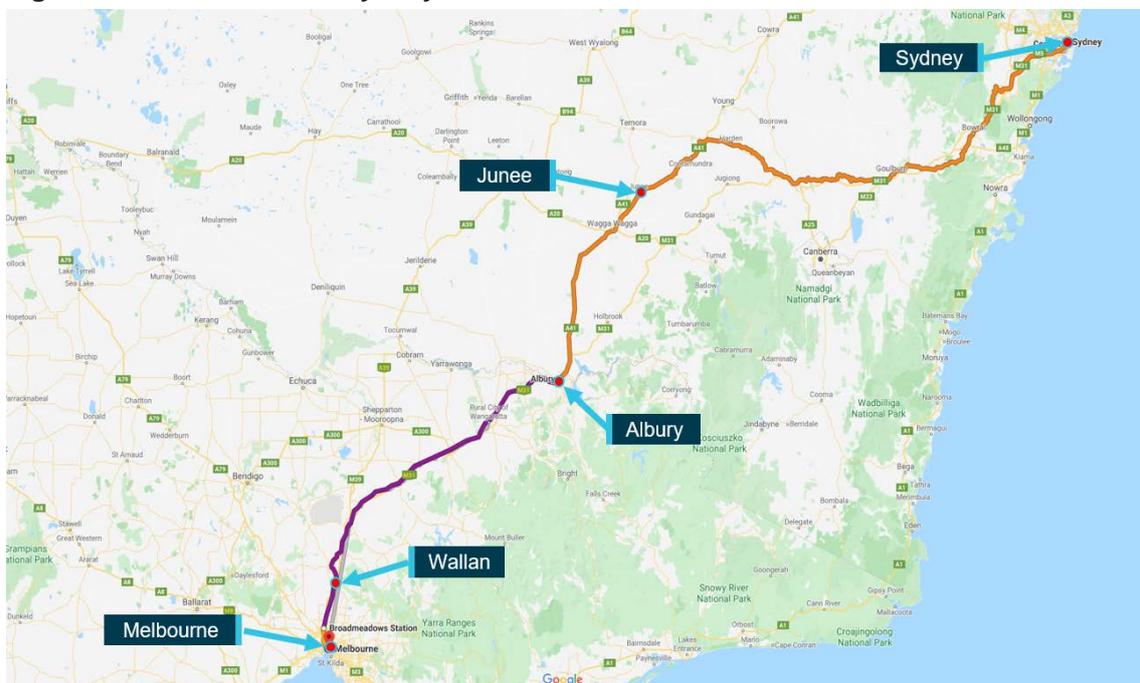
# Preliminary report

The information contained in this report is released in accordance with section 25 of the *Transport Safety Investigation Act 2003* and is derived from the initial investigation of the occurrence. Readers are cautioned that new evidence will become available as the investigation progresses that will enhance the ATSB's understanding of the accident as outlined in this update. As such, no analysis or findings are included in this report.

## The occurrence

On 20 February 2020, passenger train XPT ST23 departed Central Station in Sydney, New South Wales (NSW), at about the scheduled departure time of 0740.<sup>1</sup> The service was scheduled to stop at several stations en-route to its final destination at Southern Cross Station in Melbourne, Victoria that evening at 1830 (Figure 1).

**Figure 1: Train route from Sydney to Melbourne**



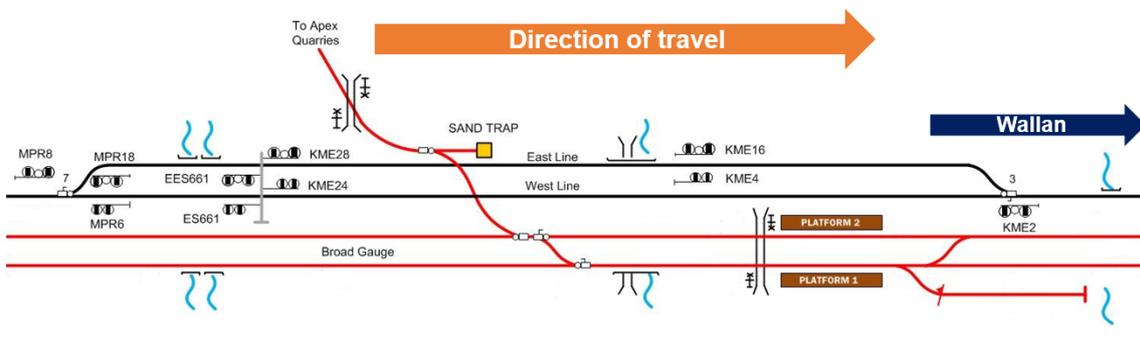
Source: Google Maps, annotated by Chief Investigator, Transport Safety

The train proceeded south and arrived at Junee in southern NSW at 1452,<sup>2</sup> about 85 minutes behind schedule. At Junee there was a change of driver before the train continued south, arriving in Albury on the NSW-Victorian border at 1637, still about 85 minutes behind schedule. There was a change in passenger car crew at Albury.

The train departed Albury at 1644 and entered the Victorian section of its journey. The service continued south, stopping at several stations before coming to a stand at Intermediate Home<sup>3</sup> signal KME28 at Kilmore East, at about 1856. Signal KME28 was at Stop, and the driver contacted Network Control at about 1904 to inquire when he might receive permission to proceed. There was a standard-gauge passing lane at Kilmore East, with East and West Lines (Figure 2).<sup>4</sup>

<sup>1</sup> All times are Australian Eastern Daylight Time (AEDT).  
<sup>2</sup> Stopping times at stations are as recorded by NSW TrainLink.  
<sup>3</sup> This signal protected the broad-gauge crossover going into the Apex ballast quarry. It is called an 'Intermediate Home' because it is in an intermediate location along the passing lane.  
<sup>4</sup> The passing lane was about 7 km in length.

Figure 2: Kilmore East passing lane (standard-gauge track shown in black, with signals)



Source: ARTC, modified and annotated by Chief Investigator, Transport Safety

The XPT waited at signal KME28 on the East Line until the north-bound V/line passenger train 8625 had transited the Donnybrook to Kilmore East single-line section, passed signal KME2 and was travelling along the West Line through Kilmore East. The V/Line train was clear of the single-line by about 1925 and, soon after, the XPT was given permission by Network Control<sup>5</sup> to proceed to Home Departure signal KME16,<sup>6</sup> still on the East Line within the Kilmore East location.

As a result of damage to signalling equipment, a 24 km section from Kilmore East signal KME16 (at about the 63.8 km mark)<sup>7</sup> to Donnybrook (at about the 40.2 km mark) was being managed using an alternative safeworking system.<sup>8</sup> Wallan was located in this section, about 48 rail-km from Melbourne.

At signal KME16, XPT ST23 was met by several rail workers, including a Signaller and an Accompanying Qualified Worker (AQW).<sup>9</sup> The AQW boarded the lead power car and joined the driver at the head of the train as part of the alternative safeworking system in place for the 24 km section to Donnybrook.

At about 1932 while the train was still stopped at signal KME16, the driver and the Network Control Officer communicated over the radio about the Train Authority<sup>10</sup> for the section through to Donnybrook. The train then departed signal KME16 and entered the single-line towards Wallan. The line speed for the XPT in this section was 130 km/h and after departing, the speed of the train was increased towards this line speed.

One function of the AQW was to ensure that the level crossing protection<sup>11</sup> at Wallan–Whittlesea Road in Wallan was in place for the passage of the train.<sup>12</sup> The Level Crossing Keeper<sup>13</sup> positioned at this level crossing reported receiving a call from the AQW and activating the crossing protection.

<sup>5</sup> ARTC network control for this section of track is located at Junee, NSW.

<sup>6</sup> This Home Departure signal was protecting the turnout at the end of the passing lane.

<sup>7</sup> Rail-km from Melbourne.

<sup>8</sup> Safeworking is described in this report at section, *Management of rail traffic (safeworking)*.

<sup>9</sup> The term used in Train Notices for the worker that would accompany the driver between Kilmore East and Donnybrook.

<sup>10</sup> An instruction in the prescribed format issued by the Network Control Officer in connection with the movement of a train. RISSB Glossary of Terms, viewed 30 March 2020, <www.rissb.com.au/glossary>.

<sup>11</sup> Boom barriers and flashing lights at this location.

<sup>12</sup> Active protection on the other level crossings on the Kilmore East-to-Donnybrook section were working normally and it was only the Wallan-Whittlesea Road level crossing that required local operation.

<sup>13</sup> The person who activated the level crossing protection locally at the crossing, colloquially referred to as the bellhop.

The train was now approaching Wallan. Earlier that afternoon, the points at either end of Wallan Loop had been changed from their Normal position to their Reverse position.<sup>14</sup> This change meant that rail traffic, in both directions, would be diverted from the Main Line (straight) into the loop track (No.2 Road). A Train Notice<sup>15</sup> reflected this change and also specified a 15 km/h speed limit for entry into the loop, and a limit of 35 km/h for exiting the loop.

At about 1943, XPT ST23 was approaching the northern end of Wallan Loop at about the track's line speed. Recordings from the train indicate an Emergency brake application a short distance before the points. This slowed the train a small amount before it entered the turnout travelling at a speed in excess of 100 km/h. The train was not able to negotiate the turnout to the loop track at this speed and derailed. All vehicles derailed excepting the rear power car (Figure 3).

**Figure 3: Aerial photograph of derailment site**



Source: ATSB

During the derailment sequence, the leading power car rolled onto its left side and the XPT driver and the AQW sustained fatal injuries. Three passengers were seriously injured and 36 received minor injuries.<sup>16</sup> Five train crew that were in the passenger cars also sustained injuries.

<sup>14</sup> The Normal position of the turnouts was for 'straight-through' traffic, and the Reverse position was for the loop.

<sup>15</sup> Operational information issued by or on behalf of the Rail Infrastructure Manager. RISSB Glossary of Terms, viewed 30 March 2020, <[www.rissb.com.au/glossary](http://www.rissb.com.au/glossary)>

<sup>16</sup> Injury information accounts for physical injuries and does not include non-physical injury or distress.

## Context

### Track information

The XPT service was running on the national standard-gauge track that connects Sydney and Melbourne. The track is part of the Defined Interstate Rail Network (DIRN) and is managed by the Australian Rail Track Corporation (ARTC).<sup>17</sup>

The standard-gauge track between Kilmore East and Donnybrook was a single, bi-directional line that serviced the XPT, V/Line passenger services and rail freight. There were passing lanes at Kilmore East and Donnybrook and a 1,550 m crossing loop at Wallan. The northern entry to this loop was located about 1.8 km north of Wallan–Whittlesea Road (Figure 4).

**Figure 4: Wallan Loop (standard-gauge track shown in black, with signals)**



Source: ARTC, modified and annotated by Chief Investigator, Transport Safety

### Train information

The first XPT (Express Passenger Train) commenced service in 1982. The XPT fleet is operated by NSW TrainLink<sup>18</sup> and provides passenger services in regional NSW and between the east coast capital cities of Melbourne, Sydney and Brisbane. XPT vehicles are maintained by Sydney Trains<sup>19</sup>.

The XPT ST23 running on 20 February 2020 included five passenger cars (Figure 5). The leading three vehicles were manufactured by ABB Transportation in Dandenong, Victoria and commissioned in 1993. The trailing four vehicles were manufactured by Comeng in Granville, NSW and commissioned between 1981 and 1984.

**Figure 5: Train configuration**



Source: ATSB, vehicle images supplied by Sydney Trains

<sup>17</sup> ARTC is a statutory corporation fully owned by the Government of Australia.

<sup>18</sup> The brand name of NSW Trains, an agency of Transport for NSW.

<sup>19</sup> Sydney Trains maintains trains on behalf of NSW Trains through a service agreement. Sydney Trains is an agency of Transport for NSW.

### ***Train data logger***

Both power cars were fitted with a Hasler RT data logger. The data logger is an electro-mechanical device that records speed, distance, time, a combined power-vigilance parameter, and brake cylinder pressure parameters. These parameters are recorded on a waxed paper tape (roll). The Hasler system also included an analogue speedometer located on the driver's console.

The train's speed is derived from the measurement of the rotation of the left hand wheel on the second axle of the power car. In order for this rotation to be translated into distance (and speed), an average wheel diameter is assumed. Actual speed may deviate from that recorded (and displayed) due to differences between this assumed diameter and the diameter of the actual wheel providing the feed to the Hasler system.

The Hasler tapes from the two power cars were recovered at the accident scene and examined by the ATSB. Corrections to the recorded speed were made to account for the differences between the assumed wheel diameter and the actual wheel diameter on each power car. The results from both recorders indicated a speed of about 130 km/h approaching Wallan Loop.<sup>20</sup> The Hasler analogue speedometer would have read less than this, probably between the 125 km/h and 130 km/h marks.<sup>21</sup>

The data from both recorders indicate that there was an Emergency brake application nearing the turnout to the loop, and an associated small reduction in speed prior to the train entering the loop. The Hasler recordings will be the subject of further detailed analysis and review against other evidence.

### ***Train crew and passengers***

The XPT is a single-driver operation. The driver of the XPT was designated as a Regional Driver, and at the time of the derailment, an AQW was also in the driver's cab. Both the driver and AQW suffered fatal injuries in the derailment.

Within the passenger vehicles, there were five further crew members including a Passenger Service Supervisor, Senior Passenger Attendant and three Passenger Attendants. All five have reported injuries.

There were 153 passengers recorded as being on the train at the time of the derailment, of which 39<sup>22</sup> have reported injuries.

### ***Management of rail traffic (safeworking)***

Safeworking is an integrated system of operating rules and procedures that defines the interaction between workers and engineered systems for the safe operation of a railway.<sup>23</sup> Of primary concern is safe operations including train separation and speed management according to infrastructure.

Relevant to this occurrence, the signalling infrastructure used for standard-gauge traffic through Wallan was damaged as a result of a fire in a track-side equipment hut on 3 February 2020. From 6 February, Train Authority Working was established to manage traffic between Home Departure signals DBK6 and DBK18 at Donnybrook<sup>24</sup> and KME4 and KME16 at Kilmore East.<sup>25</sup> The alternative safeworking arrangements permitted only one train in the section between Donnybrook and Kilmore East at any one time, and Wallan Loop was not being used for trains to cross or pass.

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<sup>20</sup> The results of the interim analysis. Further analysis will be undertaken and reviewed against other evidence sources.

<sup>21</sup> This difference is because the actual wheel diameter was greater than that used as input to the Hasler system.

<sup>22</sup> This figure may be updated during the investigation.

<sup>23</sup> RISSB Glossary of Terms, viewed 30 March 2020 <[www.rissb.com.au/glossary](http://www.rissb.com.au/glossary)>

<sup>24</sup> DBK6 and DBK18 were at a similar km location at Donnybrook, servicing the West Line and East Line respectively.

<sup>25</sup> KME4 and KME16 were at the same km location at Kilmore East, servicing the West Line and East Line respectively.

From the commencement of Train Authority Working on 6 February, Wallan Loop was configured for trains to travel along No.1 Road.<sup>26</sup> This changed to the No.2 Road on 20 February.

## Further investigation

The areas explored and requiring further investigation include:

- Derailment sequence: Further investigation will include a detailed examination and review of available evidence to refine the derailment sequence.
- Track condition: To date, site observations and preliminary review of track data have not identified adverse conditions directly contributing to the derailment. Further investigation will include the detailed examination of post- and pre-occurrence track geometry and maintenance information.
- Rolling Stock condition: To date, site observations and vehicle workshop inspections (that commenced 6 March) have not identified adverse conditions directly contributing to the derailment. Inspections are ongoing and include detailed inspection of vehicles and testing of braking and driver safety systems.
- Crew and passenger survivability: Detailed survivability inspection of the leading power car XP2018 and all passenger vehicles is complete. A passenger survey is being conducted researching passenger experiences of the derailment and subsequent evacuation and emergency response.
- Train operation: Further investigation will include a detailed examination of the operation of the train drawing on a wide range of evidence sources.
- Management of train operations: Further investigation will include a detailed examination of the alternative safeworking systems used to manage rail traffic at this location from 6 to 20 February 2020.
- Other areas of investigation: Further areas of investigation may be identified as the investigation progresses.

## Acknowledgements

The ATSB would like to acknowledge the significant assistance provided by all involved parties during the initial investigation, particularly in the context of the impact of COVID-19 on business operations and the community.

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<sup>26</sup> Utilising manual operation and clipping of the points.

# General details

## Occurrence details

Date and time:	20 February 2020 – 1943 AEST	
Occurrence category:	Accident	
Primary occurrence type:	Derailment	
Location:	Wallan, Victoria	
	Latitude: 37° 24.500' S	Longitude: 145° 0.823' E

## Train details

Train operator:	NSW TrainLink	
Registration:	ST23	
Type of operation:	Passenger	
Departure:	Sydney	
Destination:	Melbourne	
Persons on board:	Crew: 6 +1	Passengers: 153 <sup>27</sup>
Fatalities:	Crew: 1+1	Passengers: 0
Other Injuries: <sup>28</sup>	Crew: 5	Passengers: 39
Damage:	Substantial, to train and track	

<sup>27</sup> The number of passengers on board at the time of the derailment may be updated during the investigation.

<sup>28</sup> Injury data may be updated during the investigation.