Office of the Chief Investigator
Transport Safety

Rail Safety Investigation
Report No 2011/12

Signal Passed At Danger
V/Line Empty Car Movement
Southern Cross Station
23 December 2011

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THE CHIEF INVESTIGATOR

The Chief Investigator, Transport Safety is a statutory position under Part 7 of the *Transport Integration Act 2010*. The objective of the position is to seek to improve transport safety by providing for the independent no-blame investigation of transport safety matters consistent with the vision statement and the transport system objectives.

The primary focus of an investigation is to determine what factors caused the incident, rather than apportion blame for the incident, and to identify issues that may require review, monitoring or further consideration.

The Chief Investigator is required to report the results of an investigation to the Minister for Public Transport or the Minister for Ports. However, before submitting the results of an investigation to the Minister, the Chief Investigator must consult in accordance with section 85A of the *Transport (Compliance and Miscellaneous) Act 1983*.

The Chief Investigator is not subject to the direction or control of the Minister in performing or exercising his or her functions or powers, but the Minister may direct the Chief Investigator to investigate a transport safety matter.

EXECUTIVE SUMMARY

An empty V/Line two-car VLocity was being transferred from Southern Cross station to a maintenance facility when it was started against the Stop indication displayed on Home signal 509. The unauthorised movement continued for about 800 metres on the Metro Trains Melbourne network towards North Melbourne Station and an opposing train. At no time was the driver aware of the error and only stopped the train in anticipation of a move back towards the maintenance facility. In this section of track, there were no signals facing the train that would have prevented its continued travel towards the opposing train.

The investigation concluded that signal 509 was passed at Stop due to the driver's diminished cognitive performance and loss of situational awareness. The investigation did not identify the reason(s) for this reduced level of performance. There were no sighting issues with signals and all infrastructure operated as designed.

The investigation found that the absence of a signal enforcement interface with V/Line trains at this signal allowed the movement to proceed unchecked. The investigation also found that V/Line communication practices for trains operating on the Metro Trains Melbourne network within the Southern Cross Station precinct removes the ability for Metrol, the control centre for the metropolitan network, to communicate on the local radio system with these trains.

The investigation makes recommendations to Metro Trains Melbourne regarding the network management of Signal Passed at Danger (SPAD) risks associated with V/Line rolling stock and to Metro Trains Melbourne and V/Line with regard to communication protocols within the Southern Cross Station precinct.

1. CIRCUMSTANCES

On 23 December 2011 at about 0855, V/Line car set VL05—a two-car VLocity Diesel Multiple Unit (DMU)—was required to move from Southern Cross Station Platform 8 South to the carriage maintenance depot at Bank sidings for maintenance. To achieve access to the maintenance depot, VL05 was required to be routed towards North Melbourne Station via Franklin Street[1] and then back towards Southern Cross Station.

VL05 departed Platform 8 South and travelled in accordance with signal indications from the platform along track 8a before stopping at Down[2] Home signal 509. After remaining stationary for 51 seconds VL05 then proceeded against the Stop indication displayed. The movement continued on an unauthorised route against the flow of traffic for about 800 metres before coming to a stand about 60 metres beyond signal 556 on the Up Main Suburban line near Franklin Street. During this move one set of points were run-through in the trailing position[3] resulting in damage to associated rodding and interlocking mechanisms. The driver changed position to the opposite-end driving cab and moved VL05 towards signal 556 in readiness to proceed to the maintenance facility.

At the time VL05 entered the Up Main Suburban Line an opposing V/Line passenger train, № 8118, was also on this line at North Melbourne Station. It travelled up to signal 482, about 240 metres from where VL05 was standing. Signals 482 and 554, had reverted to Stop as a result of VL05 having occupied the track between signals 556 and 554 (Figure 1).

Neither Metrol(the control centre for train operations on the metropolitain rail network) nor V/Line was able to contact the driver of VL05 by radio or phone during or after the incident. It was not until a Locomotive Driver Supervisor dispatched from Southern Cross Station arrived on the scene that the driver of VL05 became aware of the incident. The driver was relieved at signal 556 and breath tested with no alcohol being detected. No other impairment tests were conducted.

There was no injury to the public or rail personnel. At the time of the incident the weather was fine with clear visibility.

[1] This refers to an area of interlocking that controls the junction access between the East and Main Suburban Lines and the Southern Cross Terminal. Historically, the location was controlled by the 'Franklin Street signalbox'.

[2] Refers to direction *away-from* Melbourne.

[3] *Trailing points* are the movable switch rails when approached in the converging direction, whereby two lines merge to become one. If the points are not set to facilitate the train movement—and are electrically-driven—the train or locomotive will force the blades across to accommodate its movement, potentially damaging the drive mechanism in the process.

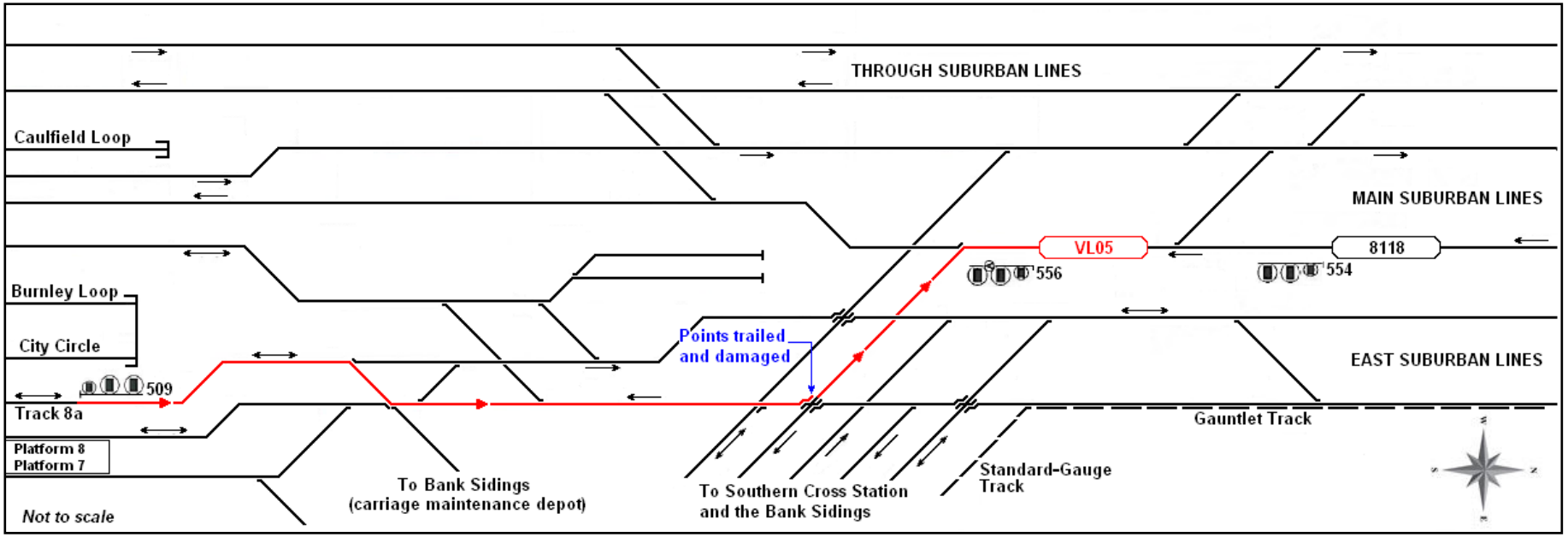

Figure 1: Diagram of route taken by VL05 from signal 509 to beyond signal 556

2. FACTUAL INFORMATION

2.1 Background

V/Line service 8214 from South Geelong to Melbourne is normally scheduled to arrive into Platform 2 at Southern Cross Station. In this situation any subsequent shunt movements to the sidings or maintenance facility are a straightforward movement from the platform and are controlled from the V/Line Southern Cross Station signalling complex (Number One Signal Box).

On 23 December 2011 train 8214 was altered to arrive at Platform 8 South, an area of Southern Cross Station controlled by Metrol. This alteration was necessary on account of Platform 2 being occupied by a late departing train. VL05 was the trailing DMU car set on train 8214 and was required to be detached and transferred to the maintenance facility in the Bank sidings. To facilitate the transfer movement from Platform 8 South, VL05 was required to be routed via the Down East Suburban Line to the Down Main Suburban Line, controlled by Metrol, and then to reverse direction back towards an area of Southern Cross Station controlled by Number One Signal Box in order to access the maintenance facility.

2.2 Signal 509

Signal 509 is a three-position Down Home signal fitted with LED-type lamps and short hoods[4]. It controls movements along track 8a towards the Southern Cross carriage sidings, the Down East Suburban Line, and the Down Main Suburban Line. The 'A' light (top) is a fixed red marker light; the 'B' light (middle) is a tri-colour lens and a 'C' light that displays a Low Speed indication as required (Figure 2). A Train Stop device is also provided as an engineering intervention against suburban trains passing the signal at Stop (See section 2.5.2).

A review of the signalling system event recorder identified that signal 509 was and remained at Stop when VL05 was first brought to a stand and when the subsequent movement towards the Up East Suburban Line was made. The position and alignment of this signal did not contribute to any phantom aspects being displayed and the investigation did not identify any sighting issues. There was no history of SPAD events at this signal.

[4] A signal hood is an extended shade mounted above the signal lamp. It functions to reduce the negative effects that sun-glare has on the visibility of the signal display.

Figure 2: Signal 509 at Stop

2.3 Network Control

2.3.1 Background

Trains operating on the Melbourne suburban network are controlled from Metrol. The area controller has a panel that displays, amongst other information, the status of points and signals together with the movement of trains.

2.3.2 Area Controller

On the day of the incident, the area controller at Metrol—when monitoring the passage of another V/Line service exiting the MTM network at Franklin Street—observed some abnormal signalling system activity. At first it was believed that some track circuits had not cleared as they should have after the passage of a previous train; however, it was identified by the sequence of track circuit occupations that an unauthorised movement was occurring in the Down direction on the Up East Suburban Line. The controller identified that the reason for the abnormal indications was a movement by VL05 which had been intended to be held at signal 509.

2.3.3 Communications

V/Line locomotives and DMU's are fitted with a train-to-base radio system to communicate directly with Centrol, the V/Line train control centre. Direct train-to-base radio communication between Metrol and V/Line locomotives and DMU's is not available. However, there is a limited ability for Metrol to contact non-suburban trains in the inner area of the metropolitan network—which includes the Southern Cross Station precinct—on Channel 1 of the local radio system.

V/line communication protocols dictate that for arrival at Southern Cross Station and for any shunting that may be required, train or locomotive radios be tuned to channel 8 on the local radio system for communications with the Yard Foreman. Centrol does not have any interaction with trains post-arrival. Procedures are silent as to what local radio channel is required for a V/Line local transfer move operating from Platforms 7, 8 or 8 South and negotiating MTM territory. The practice has evolved for transfer movements when negotiating the MTM network to remain on the local radio Channel 8. In this situation these movements are isolated from communications from Metrol.

MTM and V/Line did not have an interface co-ordination plan that specified the communication protocols for the network in general or specifically pertaining to the Southern Cross Station precinct.

2.4 Driver

The driver had extensive experience in negotiating Southern Cross Station trackage and signalling. He was qualified to operate VLocity trains and had last been assessed medically fit on 30 July 2009. His next scheduled medical was due in 2012. He was not required to wear corrective eyewear. The driver's most recent safety audit was conducted on 28 January 2011 and did not identify any requirement for retraining or corrective action.

The driver reported that in accordance with his daily roster, he ran the 0709 service from South Geelong Station to Southern Cross Station. On arrival at Southern Cross Platform 8 South, he was informed that the train had been routed into the wrong platform[5] and was requested to detach car set VL05 and proceed to the Bank sidings maintenance depot via Franklin Street. This shunt activity was incorporated into the allocation of work for this driver's shift.

Departing Platform 8 South, the train proceeded along track 8a towards signal 509 where it was brought to a stand. The driver stated that after standing at signal 509 for a brief period, he believed that the signal indication had changed to a Medium Speed Warning (Red over Yellow) and he responded to this interpretation by proceeding, expecting to be routed directly into the carriage sidings because of the lay of the facing points. The driver reported that he was not distracted when stationary at signal 509. Although he identified that the route was not set as he expected he continued towards North Melbourne, stopping behind signal 556 and changing ends as required to proceed back towards Southern Cross Station and the maintenance facility. At no time did he consider, or become aware that, he had passed signal 509 at Stop or that he had taken an incorrect route until he was advised by the Locomotive Driver Supervisor who arrived to ascertain what had happened.

[5] It was in fact an intentional alteration due to operational requirements.

The driver had been on duty for five consecutive days – the last off-duty day being 18 December 2011. The four shifts prior to 23 December 2011 commenced between 0209 and 0458. On 23 December 2011 his shift commenced at 0640. The roster rotation for the period 14 December to 23 December 2011 was subjected to FAID®[6] analysis and was compliant with V/Line's rostering guidelines for the management of driver fatigue.

2.5 Safety management systems

2.5.1 Risk management

MTM manages the Melbourne metropolitan rail network, providing access to other Accredited Rail Operators (AROs) such as V/Line Pty Ltd. As AROs, MTM and V/Line are required to maintain Safety Management Systems that provide, among other things, for hazard identification and risk management in accordance with their statutory obligations.

An extract from the MTM Risk Register provided to the investigation identified the hazard of '...a SPAD leading to a collision due to another operator's train crew error due to the poor visibility of signals from the cab'. The existing control for this hazard and associated risk included rolling stock approval processes and network access agreement conditions.

V/Line's principle Risk Register, Controls and Treatments documentation did not identify the risk of a train-to-train collision following a SPAD on the MTM network.

Between 1 January 2006 and 31 December 2011 V/Line services operating on the metropolitan network have been involved in 13 SPAD incidents where the train has exceeded its movement authority by 200 metres or more, travelled on the wrong line and/or damaged points.

2.5.2 SPAD defences

Procedural

Both MTM and V/Line apply the requirements of the *Book of Rules and Operating Procedures 1994*. Section 10, Working of Trains, Rule 18 part (b) states, 'Before starting the train, the Driver must ensure by observation or by obtaining the appropriate fixed signal, that the line ahead is clear'.

[6] Fatigue Audit InterDyne, a software product for assessing the risk of roster-related worker fatigue.

Engineering defences

Train-Stops and trip levers

A Train-Stop is a trigger device that is installed adjacent to fixed signals and which operates in conjunction with the signal indication. The device has a motorised arm that is raised when the signal to which it applies is at Stop, and is lowered when the signal displays a Proceed indication. The Train-Stop system is intended to provide a safety defence against trains passing signals displaying a Stop indication and continuing into the section.

MTM suburban trains are fitted with trip levers that are active on the lead driving car. The levers are located adjacent to the leading left-hand wheel (in the direction of travel) of the leading bogie and when actuated by the Train Stop an Emergency brake application will be initiated. V/Line trains are not equipped with this apparatus.

Train Protection Warning System (TPWS)

TPWS is an electronic train protection system that will activate an emergency brake application where a train passes a signal at Stop. The system comprises track-mounted transmitters and train-mounted receivers that are interfaced to the train brake system. The V/Line passenger train fleet is equipped with this system to facilitate operation on the Regional Fast Rail (RFR) network which has a maximum speed of 160 km/h.

In 2009 the Director of the then Public Transport Safety Victoria[7] wrote to the Director of Public Transport recommending that train protection for regional trains operating in the metro area be introduced; the recommendation being confined to the Craigieburn, Pakenham and Stony Point lines. Other lines that accommodate regional services were not identified in the correspondence as the signalling systems associated with these lines were scheduled to be upgraded as part of the Regional Rail Link Project[8].

At the time of release of this report Metro Trains Melbourne stated that TPWS was active at two sites at Newport. Ongoing TPWS projects include installations at Dandenong and between North Melbourne and Kensington that are scheduled to be completed by June 2013. There are no plans to install TPWS on any current V/Line or MTM trackage within the Southern Cross Station precinct.

[7] The rail transport safety regulator for Victoria at that time.

[8] Regional Rail Link is a major new rail line running from West Werribee through Deer Park and suburbs including Sunshine and Footscray to Southern Cross Station.

3. ANALYSIS

3.1 The incident

The 0709 Up service from South Geelong Railway Station to Southern Cross Station is normally scheduled to arrive on Platform 2. However, on 23 December 2011 due to Platform 2 being occupied by a late departure, it was necessary to route the service to arrive on Platform 8 South. As a consequence of this alteration, the shunt move of VL05 that would normally be from Platform 2 direct to the Bank sidings and the maintenance facility now required a transfer movement from Platform 8 South via the 'Franklin Street junction' and the Main Suburban running lines.

After departing Platform 8 South, VL05 stopped at signal 509 for less than a minute and when it restarted, it was against the Stop indication displayed on the signal. VL05 then travelled towards oncoming traffic on an unsignalled and unauthorised route traversing a set of points that were set against it. VL05 was brought to a stand just beyond signal 556 as if the driver was satisfied that he had taken the correct route and in anticipation of a move back towards the maintenance facility. Had the driver not stopped in the vicinity of signal 556 there was the potential for VL05 to continue along the Up Main Suburban Line, increasing the risk of a collision with the opposing train 8118.

The investigation concluded that signal 509 was passed at Stop due to the driver's diminished cognitive performance and loss of situational awareness. The investigation did not identify the reason(s) for this reduced level of performance. The driver was experienced in the signalling system and routes at Southern Cross Station and maintained that he was not distracted or preoccupied when the SPAD occurred. There were no sighting issues with signal 509 and all infrastructure operated as designed.

This incident highlights the network's vulnerability to the failure of a single defence, the performance of the driver, against SPAD events involving non-suburban services.

3.2 System interventions

3.2.1 Engineering defences

The Melbourne metropolitan rail network provides an engineering intervention to stop suburban trains should they pass fixed signals displaying a Stop indication. However, the system has no such interface with non-suburban trains. The unauthorised movement of VL05 was able to continue for 800 metres in conflict with the signalling system towards an opposing passenger train. Had there been some form of intervention in place for V/Line trains at Signal 509 then VL05 would have been brought to a stand immediately after passing this signal, alerting the driver to the SPAD, and it is unlikely that the post-SPAD continuance of movement would have occurred.

The Southern Cross Station precinct has not been identified in any risk assessment as requiring an intervention system, such as TPWS, for non-suburban trains. Given the circumstances and the potential consequences of this incident it would be appropriate for MTM and V/Line to revisit their SPAD risk assessments for this area.

3.2.2 Signalling system

The signalling system provided intervention by displaying a Stop indication to the opposing train(8118) when signals 482 and 554 reverted to Stop once VL05 occupied the track between signals 556 and 554. There were no signals facing VL05 in this section of track and the potential existed for VL05 to have continued unchecked into conflict with train 8118.

3.3 Communications

The current practice for V/Line drivers on transfer movements from Platforms 7, 8 and 8 South to the maintenance facility at Southern Cross Station is to remain on local radio Channel 8 even though they are operating within MTM territory. This practice excludes any possibility of Metrol having radio communication with these movements as they (Metrol) only have access to local radio Channel 1. Under these circumstances, radio communications are required to be relayed by way of the Southern Cross Station Yardmaster. In this instance, an effective radio communications link between Metrol and the V/Line train may have minimised the extent of the unauthorised movement of VL05.

Radio communication between Metrol and V/Line services is known to be problematic and the train radio systems on both the urban and regional networks are undergoing replacement programs. However, the seamless integration of communication between V/Line trains and Metrol is not scheduled to be completed until 2017, leaving the system with identified vulnerabilities in the interim.

Neither MTM nor V/Line could provide the investigation with a communications interface agreement applicable to the network or the Southern Cross Station precinct that addressed communication protocols for the train transfer movement being conducted. To address the communication deficiencies identified in this case, current communication practices for V/Line trains within the Southern Cross Station precinct should be reviewed and a communications interface coordination plan developed and implemented.

4. CONCLUSIONS

4.1 Findings

1. The driver had been assessed medically fit and was current in operational qualifications to perform all duties.

2. The signalling system functioned as designed by reverting signals 482 and 554 (facing train 8118) to Stop.

3. It is a practice for V/Line transfer movements that move into MTM territory from Southern Cross Platforms 7, 8, and 8 South to remain on the V/Line local Channel 8, thus limiting communications to just the Yardmaster and preventing any possibility of radio contact intiated by Metrol.

4.2 Contributing factors

1. The driver's diminished cognitive performance and loss of situational awareness after stopping at Home signal 509 that resulted in the empty car movement passing this signal at Stop.

2. The absence of an engineering intervention to control the potential outcomes of a SPAD event involving V/Line train movements on the Metro Trains Melbourne network within the Southern Cross Station precinct.

5. SAFETY ACTIONS

5.1 Safety Actions taken since the event

V/Line removed the driver from train running duties and managed his return to work in accordance with the company SPAD and Employee Assistance Program policies and procedures.

V/Line's principle Risk Register Controls and Treatments documentation was updated to identify the risk of a train-to-train collision with a V/line train following a SPAD on the MTM network.

5.2 Recommended Safety Actions

Issue 1

The Melbourne suburban rail system provides an engineering signal enforcement intervention that is capable of stopping suburban trains should they pass fixed signals presenting a Stop indication.

The Metro Trains Melbourne-controlled area of the Southern Cross Station precinct provides such signal enforcement intervention for suburban services however this area of operation has not been identified as requiring an intervention system for V/Line services. Given this incident, this risk assessment warrants review.

RSA 2013002

That Metro Trains Melbourne reviews the risks associated with a SPAD event by a non-suburban train within the Southern Cross precinct and the options for risk controls, including train protection.

Issue 2

There is no interface agreement between Metro Trains Melbourne and V/Line that addresses critical communications requirements for V/Line transfer movements when operating on the MTM network in the Southern Cross Station precinct.

In the absence of such an agreement, practices have developed that inhibit the ability of the network controllers(Metrol) to directly contact V/Line trains in this precinct.

RSA 2013003

That Metro Trains Melbourne and V/Line develop and implement a communications interface plan for the Southern Cross Station precinct that assures safety critical radio communications between Metrol and V/Line services.