



Office of Transport Safety Investigations

RAIL SAFETY INVESTIGATION REPORT

OPPOSING MOVEMENT BETWEEN COAL TRAINS BLOOMFIELD

20 AUGUST 2005



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OTSI File Ref: 04189

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**Office of Transport Safety Investigations
Level 17, 201 Elizabeth Street
Sydney NSW 2000**

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Established on 1 January 2004 by the *Transport Administration Act 1988*, the Office is responsible for determining the causes and contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence.

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EXECUTIVE SUMMARY

The Accident

At approximately 11.27am on 20 August 2005, two Pacific National Limited (PNL) coal trains, designated DS184 and DS233 respectively, were routed into the same section of track from opposing directions. The 'opposing movement'¹ occurred when DS233 exited one of four sets of parallel lines² at Thornton in the Hunter Valley Region of NSW, under controlled signalling arrangements, and entered the single line track leading into the Bloomfield Colliery. As it approached the Thornton staff hut where it was required to stop and where its crew was required to communicate with the Train Controller, DS233 was confronted by DS184 which was awaiting a final clearance to depart the Colliery. The Driver of DS233 was able to bring his train to a stand approximately 64 metres from DS184 and all but one service was able to be diverted around DS233, the rear of which remained on one of the main lines. There was no damage or injuries as a result of the incident.

Findings

In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

- i. The opposing movement occurred when the Train Controller at the Broadmeadow Hunter Train Control Centre (HTCC) authorised the movement of DS233 into the Bloomfield Colliery Branch Line, having overlooked the fact that DS184 was awaiting a clearance to exit the same track.
- ii. This oversight was caused by the fact that the Broadmeadow HTCC Train Controller was pre-occupied with the requirement to reschedule train movements elsewhere, due to a points failure at Whittingham, approximately 50kms North West of Thornton. In addition, because DS184 was not standing on circuited track, neither the Broadmeadow HTCC Train Controller nor the Area Controller at Maitland Signal Box (MSB) had the benefit of having the train's position illuminated on their track indication panels.

¹ The term "opposing movement" is used throughout the Australian rail industry to describe any situation in which trains are located, in error, facing towards each other on the same section of track.

² The four lines were the Up and Down main lines and the Up and Down Coal 'Roads'. These lines run in parallel from Port Waratah to Maitland. DS233 entered the single line track leading into the Bloomfield Colliery from the Down Coal 'Road'.

- iii. Operations on the Bloomfield Colliery line are unusual in that it is the only location on the network where a single line “Staff and Ticket”³ section leads into and out of a balloon loop. The frequency of train movements on the line is also irregular. These factors increased the potential for error and were compounded by the fact that DS184 and DS233 were operating at a point where two different systems of safe-working, each with its own procedures, intersected.
- iv. The opposing movement would not have occurred had the Driver of DS184 communicated with the Train Controller (HTCC) and advised him that he could not move as scheduled because he did not have a signal to proceed. However, he was not obliged to do so; delayed departures from the Bloomfield Colliery line are not unusual and Drivers are not always given an explanation for the delays or a revised departure time. Over time, and in the absence of clear instructions in relation to the requirement to communicate in such circumstances, some Drivers have become conditioned to waiting for a proceed signal.
- v. Having lost visibility of DS184 after it left Thornton staff hut⁴, there were no additional procedures or prompts that might have reminded the Area Controller at MSB that the train was still on the Bloomfield Colliery line.

b. Anticipation and Management of Risk

ARTC’s *Network Rules and Procedures* is the capstone reference for train operations in territory controlled by ARTC. These rules are supplemented by *Local Appendix Unit 217 (LAU 217)* and *General Order 8-2001* which contain local and specific orders for safe-working at Thornton.⁵ However, there were subtle differences between these safe-working procedures which, in conjunction with the uniqueness of the track layout at Thornton and the relative infrequency of operations there, resulted in different levels of understanding between some Drivers, Area Controllers and Train Controllers in relation to their obligations to communicate in certain circumstances.

c. Effectiveness of the Emergency Response

Neither train crew operated the emergency function on the Countrynet radio system to report the incident because, having avoided a collision, they did not consider that they had been involved in an emergency. However, part of DS233 was still on the main line

³ The staff and ticket system is but one of a number of systems used to authorise the movement of trains and track machines in a section of track. The staff and ticket system provides for bi-directional movement on a single line track.

⁴ In fact, at this time, this train was still designated DS183 and it was to remain so until it was loaded, after which it became DS184.

⁵ In September 2004, ARTC took control of that part of the Defined Interstate Rail Network that lies within NSW and the NSW Country Rail Network, including the Hunter network. When it did so, it re-badged the network rules previously issued by the Rail Infrastructure Corporation (RIC). LAU 217 was one such document re-badged. However *General Order 8-2001*, issued under the auspices of StateRail to supplement LAU 217, was not withdrawn or re-badged.

and an opportunity to divert a following train was lost. Subsequently, however, all other following trains were effectively diverted.

d. Other Matters That Would Enhance the Safety of Rail Operations

The communications between all of the involved parties did not conform to the requirements contained in *ARTC Network Rules and Procedures*.

Recommendations

In order to prevent a recurrence of this type of incident, the following remedial safety actions are recommended for implementation by the organisations specified below:

a. Australian Rail Track Corporation

- i. Review all of its procedural documentation for operations at Thornton, in collaboration with operators, to ensure:
 - (1) its relevancy and consistency with *Network Rules and Procedures*;
 - (2) procedures are simple, unambiguous and provide a safe system for the working of trains at the Thornton staff hut; and
 - (3) that the roles, responsibilities and reporting functions of all staff involved with the safe-working of trains on the Bloomfield Colliery line are clearly defined.
- ii. Remove all superseded or expired documents from its safe-working documentation system.
- iii. Reinforce the use of proper communication protocols.

b. Bloomfield Collieries Pty Ltd

In conjunction with the Australian Rail Track Corporation, extend the area of track detection on the Bloomfield Colliery line to include the detection of trains standing on the colliery side of the Up stop board at Thornton staff hut.

c. Pacific National Limited

- i. Confirm with its crews the requirement to use the emergency communication function, if fitted, in the event of an emergency, emphasising that any occurrence that is likely to result in significant delays on the network should be regarded as an emergency.
- ii. Reinforce the use of proper communication protocols.

PART 1 INTRODUCTION

Notification and Response

- 1.1 At 1.33pm on Saturday 20 August 2005, the Office of Transport Safety Investigations' (OTSI) Duty Officer was notified by the Australian Rail Track Corporation's (ARTC) North Coast Operations Manager that at approximately 11.30am, an opposing movement between two Pacific National coal trains had occurred on the rail line leading into Bloomfield Colliery at Thornton in the Hunter Valley.
- 1.2 Having been briefed on the incident by the involved parties, the Chief Investigator authorised the release of the incident site. An OTSI investigating officer deployed to the incident site on 22 August 2005.

Initiation of Investigation

- 1.3 As a result of the primary evidence collected by OTSI's Investigating Officer at the incident site, the Chief Investigator initiated a Rail Safety Investigation in accordance with s67 of the *Rail Safety Act 2002*.

Interim Factual Statement

- 1.4 On 30 August 2005, the Chief Investigator notified all Directly Involved Parties (DIP) that OTSI was investigating the opposing movement and requested that each organisation nominate an officer to act as the point of contact for all inquiries made by the appointed OTSI Investigator in Charge. The Terms of Reference for the Investigation were provided to the DIPs with this notification.
- 1.5 An Interim Factual Statement notifying OTSI's investigation and describing the incident in terms of what had happened was published on the OTSI website on 5 September 2005.

Terms of Reference

- 1.6 The Chief Investigator established the following Terms of Reference to determine why the incident had occurred and what to do to prevent recurrence:
 - a. identify the factors, both primary and contributory, which caused the incident;
 - b. identify whether the incident might have been anticipated and assess the effectiveness of any strategies that were in place to manage the related risk/s;
 - c. assess the effectiveness of emergency actions in response to the incident, and
 - d. advise on any matters arising from the investigation that would enhance the safety of rail operations.

Methodology

- 1.7 OTSI utilises the ICAM (Incident Cause Analysis Method) approach in the conduct of its investigations and applies the Reason Model of Active Failures and Latent Conditions to its analysis of causative and contributory factors.
- 1.8 The underlying feature of the methodology is the Just Culture principle with its focus on safety outcomes rather than the attribution of blame or liability.

Consultation

- 1.9 On 2 June 2006, a copy of the investigation Draft Report was forwarded to the Australian Rail Track Corporation (ARTC), Pacific National Limited (PNL), Bloomfield Collieries Pty Ltd (BCPL), the Australian Services Union NSW & ACT (Services) Branch (ASU) and the Independent Transport Safety and Reliability Regulator (ITSRR). The purpose was to provide all DIPs with the opportunity to contribute to the compilation of this Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and providing any commentary that would enhance the structure, substance, integrity and resilience of the Investigation Report. DIPs were requested to submit their comments by 16 June 2006. Submissions were received from ARTC, PNL, BCPL, the ASU and ITSRR.
- 1.10 The Chief Investigator considered all representations made by DIPs and where appropriate, reflected their advice in this Final Report. On 17 July 2006, the Chief Investigator informed DIPs which matters from their submissions had been incorporated in this Final Report and where any proposal was not included, the reasons for not doing so.

Investigation Report

- 1.11 This report describes the opposing movement which occurred on the Bloomfield Colliery line on 20 August 2005 and explains why it occurred. The recommendations that are made are designed to contribute to the safety of the operating environment for rolling stock operators and to minimise the potential for a recurrence of this type of incident.

PART 2 FACTUAL INFORMATION

Incident Synopsis

2.1 At approximately 11.27am on 20 August 2005, two Pacific National Limited (PNL) coal trains, designated DS184 and DS233 respectively, were routed into the same section of track from opposing directions. The 'opposing movement'⁶ occurred when DS233 exited one of four sets of parallel lines⁷ at Thornton in the Hunter Valley Region of NSW, under controlled signalling arrangements, and entered the single line track leading into the Bloomfield Colliery. As it approached the Thornton staff hut where it was required to stop and where its crew was required to communicate with the Train Controller, DS233 was confronted by DS184 which was awaiting a final clearance to depart the Colliery. The Driver of DS233 was able to bring his train to a stand approximately 64 metres from DS184 and all but one service was able to be diverted around DS233, the rear of which remained on one of the main lines. There was no damage or injuries as a result of the incident.

Sequence of Events

Before the Incident

2.2 An empty PNL coal service, DS183, arrived at the Thornton staff hut at 07.45am having departed Kooragang Coal Handling Facilities at 7.05am. At the Thornton staff hut, its crew contacted the Train Controller at Hunter Train Control Centre (HTCC) at Broadmeadow, using the Train Control telephone in the staff hut, to advise their arrival. The crew then took possession of the staff⁸ for the Thornton/ Bloomfield section, as required by ARTC's Network Rules, before proceeding to the staff hut at Bloomfield. At the Bloomfield staff hut, the earlier process of contacting the Train Controller was repeated, albeit it in reverse order, before the empty DS183 proceeded, under Bloomfield Collieries' Procedures, into the coal loading point. DS183 was loaded by 10.10am and was redesignated DS184 on completion of the loading. DS184 then returned to the Bloomfield staff hut. The layout of the Bloomfield Colliery Line and DS183/184's route is indicated in *Figure 1*.

⁶ The term "opposing movement" is used throughout the Australian rail industry to describe any situation in which trains are located, in error, facing towards each other on the same section of track.

⁷ The four lines were the Up and Down main lines and the Up and Down Coal 'Roads'. These lines run in parallel from Port Waratah to Maitland. DS233 entered the single line track leading into the Bloomfield Colliery from the Down Coal 'Road'.

⁸ The staff, which is sometimes referred to as the 'token', is a metal rod the possession of which gives a crew the authority to enter a section.

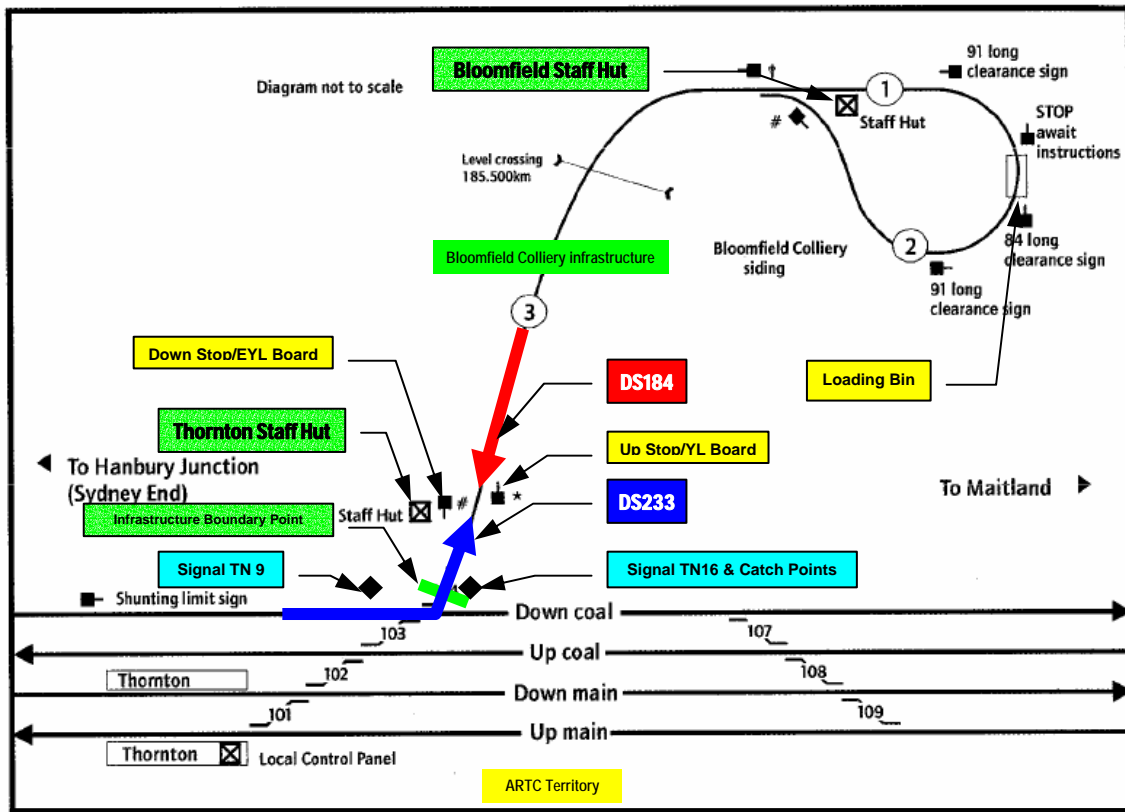


Figure 1: Layout of Bloomfield Colliery Line and Interlocking.

2.3 Upon arrival back at the Bloomfield staff hut, the crew of DS184 notified the Train Controller (HTCC), obtained the staff for the Bloomfield-Thornton section and then proceeded to the Thornton staff hut, arriving at 10.45am.

The Incident

2.4 On entering the Thornton staff hut, the Co-Driver of DS184 surrendered the staff for the Bloomfield/Thornton section and then contacted the Broadmeadow Train Controller (HTCC). The Train Controller indicated to the Co-Driver that DS184 would be cleared to depart “shortly”, at about 10.50am. The Co-Driver recorded this advice in the Train Register Book and informed the Driver upon his return to DS184. As DS184 was entering an area controlled by signals, the crew waited for the facing signal (TN 16), which was clearly visible to them, to indicate that the route ahead was clear.

2.5 At 11.22am, the Broadmeadow Train Controller (HTCC) authorised the Area Controller at the Maitland Signal Box (MSB) to set the points and signals for DS233 to enter the Bloomfield Colliery line. DS233 entered the Bloomfield Colliery line at 11.27am. As DS233 approached the Thornton staff hut, where it was required to

stop, the crew of DS233 observed DS184 standing stationary at the yard limit board⁹. The Driver of DS233 immediately applied the train's brakes, bringing the train to a stand 64 metres from DS184 (see *Photograph 1*).



Photograph 1: Relative Positions of DS233 to DS184 after the Incident (Photo supplied by ARTC)

After the Incident

- 2.6 The Drivers of both trains immediately sent their Co-drivers forward to confer with each other. At this point, ARTC network Rules required both Drivers to report the incident to Train Control using the “emergency” function on the Countrynet radio system. Instead, the Co-driver of DS184 contacted the Broadmeadow Train Controller (HTCC), using the train control phone in the Thornton staff hut. At the same time, the Driver of DS233 attempted to contact Maitland MSB using the Countrynet radio system. After three unsuccessful attempts, he switched to a mobile phone, whereupon contact was established.
- 2.7 Having been informed of the opposing movement, the Broadmeadow Train Controller (HTCC) conferred with the Maitland Area Controller (MSB) and directed him to leave

⁹ The purpose of these limit boards is described in paragraph 3.4 of this report.

both DS184 and DS233 in situ while he addressed a points failure that had occurred at Whittingham.

- 2.8 A preliminary investigation was subsequently conducted at the incident site, and after consultation with OTSI, DS233 was cleared from the Bloomfield Colliery line and DS184 entered the main line at 3.35pm.

Site Location

- 2.9 The Bloomfield Colliery line is owned and operated by Bloomfield Colliery Pty Ltd (BCPL). The line is located near the township of Thornton in the Hunter Valley, approximately 25 kilometres West of Newcastle by rail, on the Main North line between Broadmeadow and Maitland.

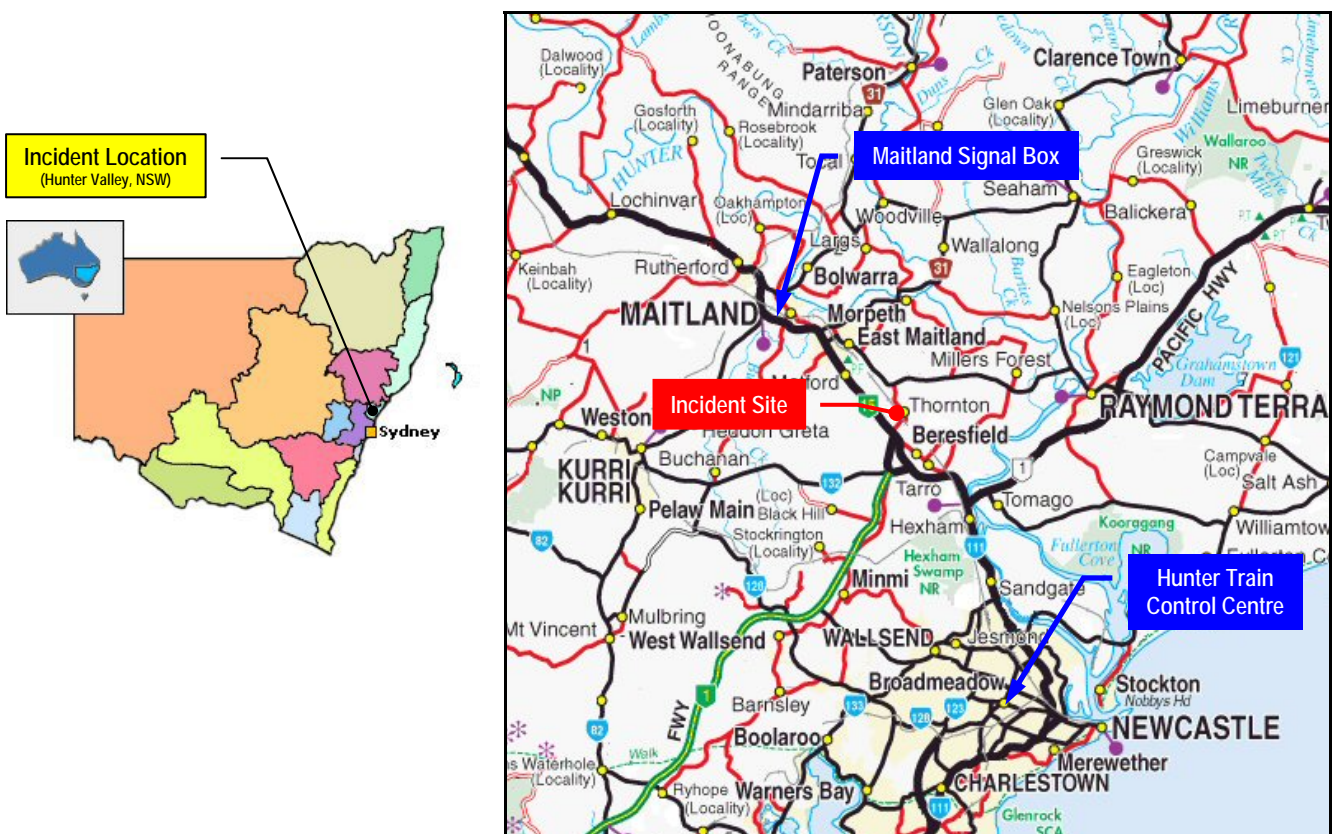


Figure 2: Incident Location and Region

Track Arrangement

- 2.10 The Bloomfield Colliery line is a single line branch measuring approximately eight kilometres in length with a ‘balloon’ loop at its outer extent (as shown in Figure 1). While there has been rail access into different parts of the site since the 1930’s when mining operations were commenced, the current track configuration was not commissioned until 1991.

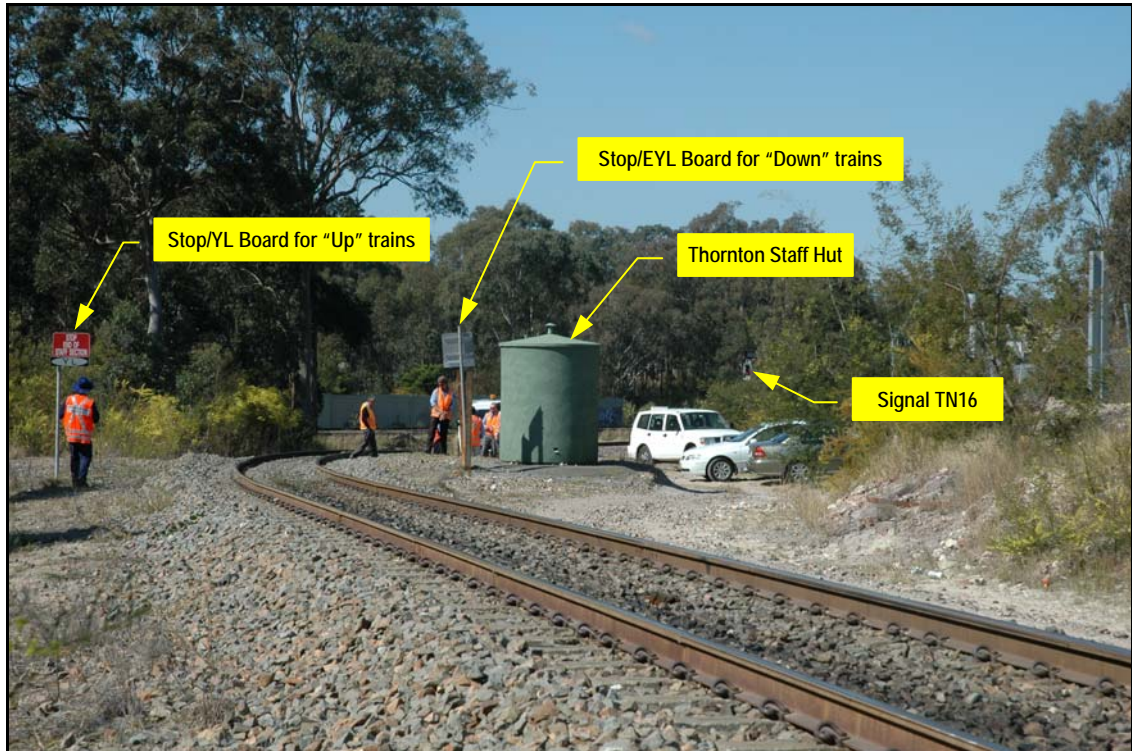
- 2.11 Delineation of the responsibilities and authorities for train operations on the Bloomfield Colliery line are contained in a series of Safety Interface Agreements (SIAs) between BCPL, ARTC and PNL. Under the SIAs, ARTC provides the train control services for the Bloomfield Colliery line, and Operators on the line are required to conform to ARTC's network rules. However, the movement of trains at Bloomfield Colliery's loading facilities are conducted under specific procedures designated by BCPL.
- 2.12 Train movements between the main lines and the Thornton staff hut are detected by a Rail Vehicle Detection System (RVDS)¹⁰. The Area Controller Maitland (MSB) controls all train movements in the section under the authority of the Train Controller Broadmeadow (HTCC). The entry of trains from the Down Coal line into the Bloomfield Colliery line is controlled via Signal TN 9 and No.104 points. The departure of trains from the Bloomfield Colliery line onto the Up Coal line is controlled via Signal TN 16. The electrical detection for the RVDS finishes at the point 182.673kms, approximately 40 metres short of the Thornton staff hut. In addition to ARTC's *Network Rules and Procedures, Local Appendix Unit 217 (LAU 217)* is used to provide additional, site-specific procedures for train movements at the Thornton staff hut. A copy of *LAU 217* is attached at *Appendix 1*.
- 2.13 Movement beyond 182.673kms, i.e., on the Bloomfield Colliery line, occurs in accordance with ARTC's Network Rule *ANSY 506, "Staff and Ticket Working"* and BCPL's procedures within the balloon loop section. *ANSY 506* provides for bi-directional train movements between the Thornton and Bloomfield staff huts utilising a staff (or a ticket in lieu of the staff). At each end of the section, whether entering or departing, the Driver is required to confer with the Train Controller before proceeding. At the Bloomfield staff hut, train crews must confer with BCPL staff before entering the loading facilities. BCPL procedures dictate the requirements for the movement of trains through the Colliery's loading facilities and permit two trains to occupy the area within the Balloon Loop simultaneously.
- 2.14 The track in the immediate vicinity of the Thornton staff hut and leading to the main line falls at a gradient of 1:60. Stop boards and yard limit (YL & EYL¹¹) signs, indicating the boundaries of Thornton Yard, are located on either side of the staff hut in both the Up and Down directions (as shown in *Photograph 2*). The boards and yard limit signs provide a six metre area of separation between the section limits.

¹⁰ The Rail Vehicle Detection System uses continuous track-circuiting or axle counters to detect the presence of rail traffic in a section, and prevents following rail traffic entering occupied sections of track.

¹¹ EYL – End Yard Limit

Train Information

- 2.15 DS184 consisted of three 82 Class locomotives and 54 loaded wagons of the NHPH, PHCH and NHRH type. The train measured 927 metres in length and was hauling a 6,600 tonne load. DS233, which also consisted of three 82 Class locomotives and 54 unloaded wagons of the NHPH, PHCH and NHRH type, measured 919 metres in length.



Photograph 2: Looking in a Northerly direction, from the Thornton staff hut, towards the main lines.

Emergency Response

- 2.16 As previously described, the Co-driver of DS184 provided the initial report of the incident to the Broadmeadow Train Controller (HTCC) at 11.32am. The Driver of DS233 contacted the Maitland Area Controller (MSB) at approximately the same time. The Train Controller then reported the incident to the Shift Manager who, in turn, notified ARTC's Manager Operations, North Coast at 11.43am. The ARTC Safety Officer at Broadmeadow was simultaneously notified and deployed immediately to MSB.
- 2.17 The crew of DS233 reported the incident to Pacific National's Train Crew Supervisor at Port Waratah at 11.45am. The Supervisor and another officer departed Port Waratah at 12.30pm and arrived at the incident site at 12.50pm. ARTC's Manager Train Control at Broadmeadow notified OTSI of the incident at 1.33pm.

- 2.18 After the completion of preliminary investigatory activity at the scene, and after consultation with OTSI, DS233 was cleared from the Bloomfield Colliery line and DS184 entered the line at 3.35pm.

Employee Information

Network Control Staff

- 2.19 The Broadmeadow Train Controller had been employed in the rail industry for 28 years and had spent 12 years in Train Control related positions. The Area Controller at Maitland had 24 years rail experience, 18 of which had been spent as a Signaller/Area Controller. Both employees had undergone medical and competency testing within the required periods.

Pacific National Train Crews

- 2.20 The Driver of DS184, who was based out of Port Waratah, had 29 years driving trains and was familiar with, and qualified for, the route. The Co-driver had 19 years experience. Both crew members had undergone medical and competency testing within the required periods.
- 2.21 The Driver of DS233 based out of Port Waratah, had 23 years driving experience, and was familiar with, and qualified for, the route. The Co-driver had 20 years experience. Both employees had undergone medical and competency testing within the required periods.

Medical and Toxicological Information

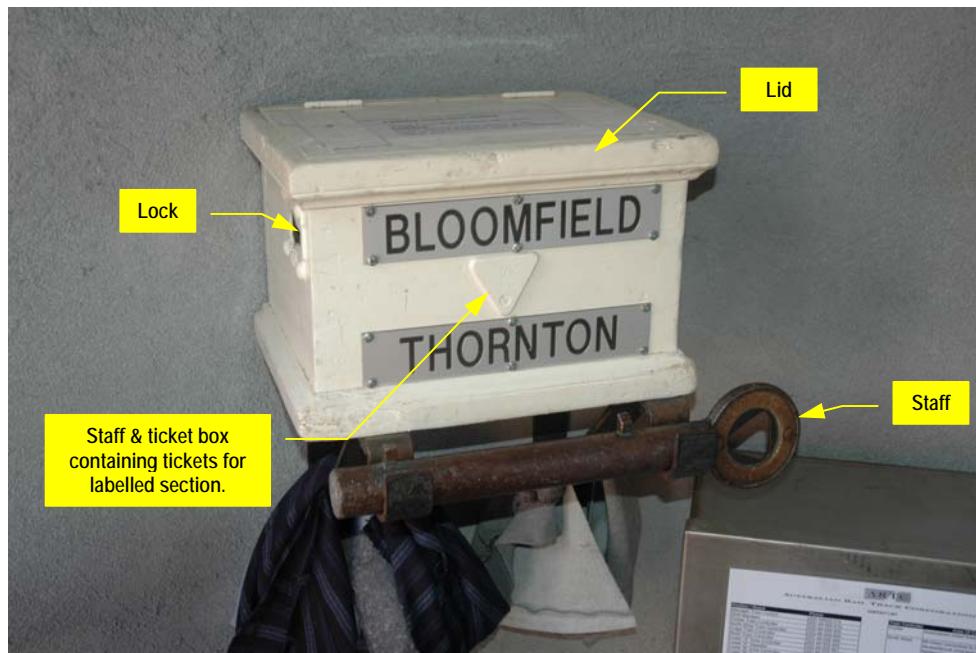
- 2.22 The crew members of both DS184 and DS233 were breath-tested by authorised staff from PNL at 12.56pm and returned negative results. ARTC breath-tested the Broadmeadow Train Controller at 1:33pm and he also returned a negative result. ARTC's Safety Officer from Broadmeadow decided not to test the Maitland Area Controller (MSB) on the basis that he had not been part of the decision-making chain in relation to the incident.

PART 3 ANALYSIS

Rules and Procedures

- 3.1 The incident occurred in territory controlled by ARTC, and under the requirement of its *Network Rules and Procedures*, but at a point between two different control or 'safe-working' systems: Rail Vehicle Detection System (RVDS) and Staff and Ticket Working. These systems are described in ARTC's Network Rules *ANSY 500* and *ANSY 506* respectively and are augmented by *Local Appendix Unit 217 (LAU 217)* which provides additional detail and site-specific procedures for train movements at Thornton.
- 3.2 As DS184 arrived at the Thornton staff hut, the crew deposited the staff for the Thornton/Bloomfield section (see *Photograph 3*), as required by *ANSY 506*, and conferred with the Broadmeadow Train Controller (HTCC) to report their arrival time. The Train Controller then advised the crew that their departure time was 10.50am. The crew recorded the departure time in the Train Register Book, an action which is not supposed to occur until a train actually commences its departure. OTSI notes that *ANSY 506* states that at such unattended locations, if rail traffic cannot clear a section and stand wholly within the yard limits of the exit-end location "departure must be reported only after the rail traffic has cleared the departure-end yard limit of the location". OTSI also notes that in this instance DS184 was not, and could not be, standing wholly within the yard limits before reporting departure because the length of the train was such that this would have required it to be forward of signal TN16, which had not cleared, and across some, if not all of the main lines.¹² The reporting actions of the crew of DS184 therefore need to be seen in context.

¹² Such an action would also have had the potential to derail DS184



Photograph 3: Staff and Ticket Box with Staff in place

- 3.3 ANSY 506 requires the train crew to report departure when their train has cleared the departure end yard limit. In staff and ticket areas, this system prevents following trains from entering a section still occupied by part of a departing train. OTSI noted in this instance that the Broadmeadow Train Controller gave direction for DS184 to depart at 10.50am but that, as was the normal practice at Thornton, the crew waited for a clearance of signal TN 16. This clearance was dependent on the Area Controller at Maitland MSB being instructed to authorise the movement of DS184 by the Train Controller at Broadmeadow HTCC. No such instruction was issued.
- 3.4 A Yard limit (YL) sign is located on the Southern side of Thornton staff hut to indicate the limits of travel for trains travelling in the Up direction and for entrance into a location controlled by a signaller. Procedures for passing YL signs are detailed in ARTC Network Rules ANSG 418 and ANSG 606 which, in essence, stipulate that YL signs can only be passed on the authority of the Network Control Officer¹³. As DS184 came to a stand at the Up YL sign at the Thornton staff hut, the crew required a new authority to move into the Thornton Yard and out onto the Main Lines. However, neither ANSG 418 nor ANSG 606, or any other document located by or provided to OTSI, specifically designated the Broadmeadow Train Controller (HTCC) or the Maitland Area Controller (MSB) as the Network Control Officer for the purposes of authorising movement from the staff hut into the area indicated by the Thornton Yard limits¹⁴. Additionally, there were no instructions or procedures

¹³ The glossary in the Network Rules and Procedures describes the Network Control officer as "a Train Controller for an unattended location, a Signaller for an attended location, or a delegate carrying out some functions of a Train Controller or Signaller".

¹⁴ Train Controllers direct the movement of trains, whereas Area Controllers control signals and points to permit the actual movement of trains in accordance with the directions of Train Controllers.

contained in *LAU 217* which specified the approval/s necessary to proceed beyond the Up YL board at Thornton. OTSI noted that previous instructions issued by the Manager Train Control¹⁵ at Broadmeadow in August 2001, *General Order 8-2001* (a copy is attached at *Appendix 2*), required train crews to seek permission from the Maitland Area Controller (MSB) to pass the Up YL sign at Thornton, after which the Area Controller would advise the Broadmeadow Train Controller (HTCC) of a train's approach to Signal TN 16. In December 2002, as part of a major update of the Network Rules and Procedures, RIC re-issued *LAU 217* amending all previous instructions for Thornton. However, the amendment to *LAU 217* did not clearly stipulate whether *General Order 8-2001* had been rescinded.

3.5 A number of crews informed OTSI that, because of the steep grade, it was usual practice at the Thornton staff hut to confer with the Broadmeadow Train Controller (HTCC) then wait until the Maitland Area Controller (MSB) cleared Signal TN 16 before they proceeded past the Up YL sign. They believed that once TN 16 had cleared, it served as the authority from the Area Controller to pass the Up YL sign. *Figures 3 and 4* depict the control locations and arrangements.

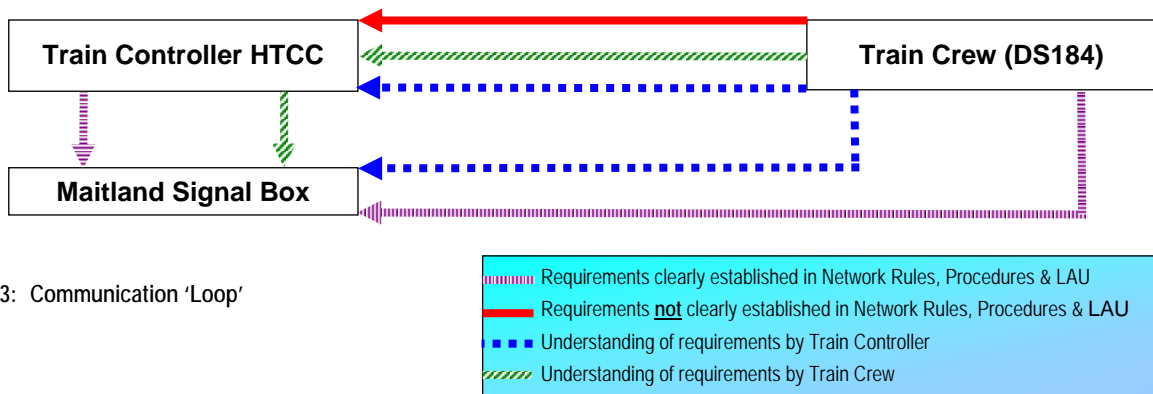


Figure 3: Communication 'Loop'

¹⁵ Broadmeadow Train Control was under to the control of StateRail before the lease of the Defined Interstate Rail Network (DIRN) and Hunter Valley lines to ARTC in 2004.

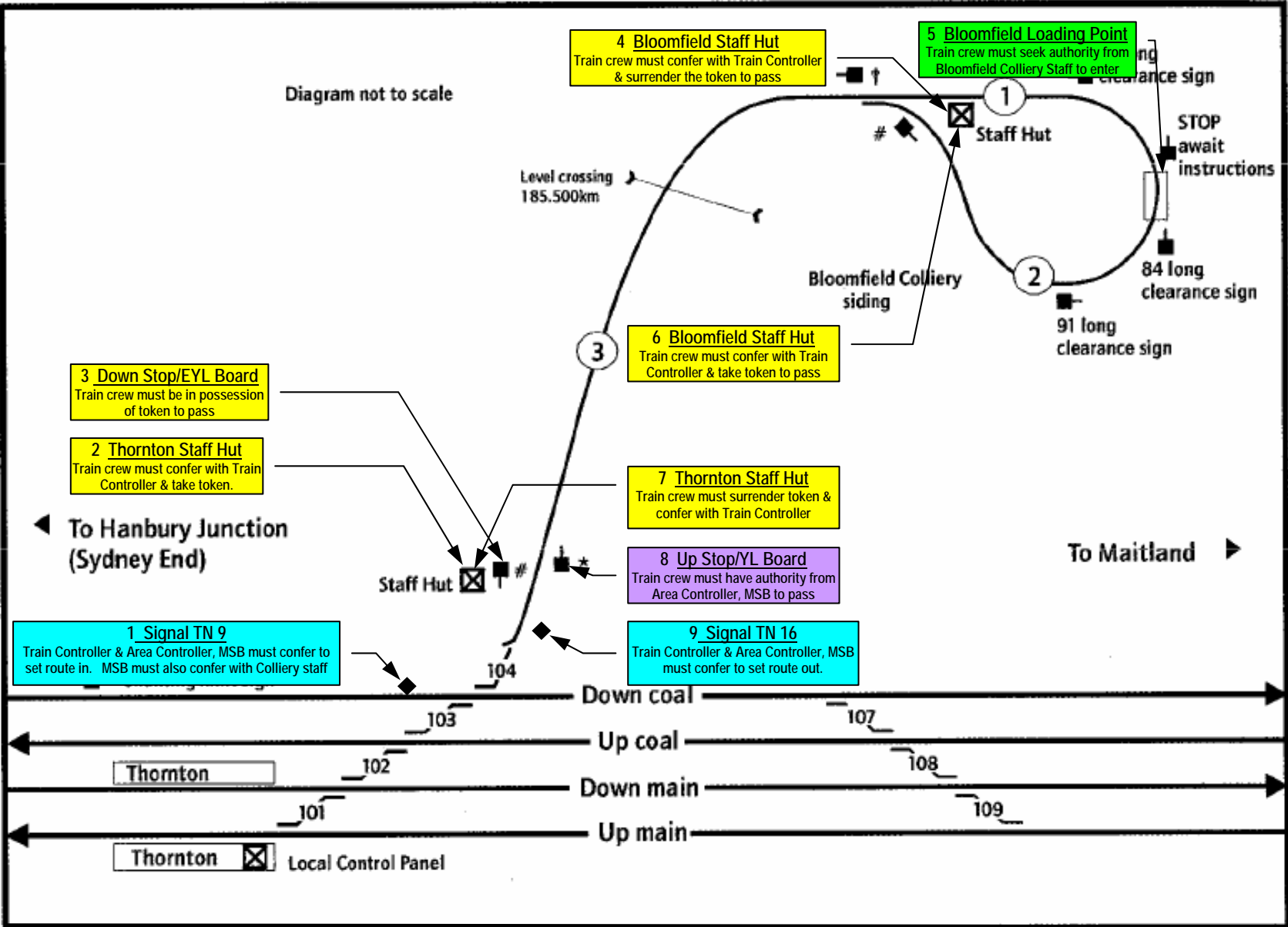
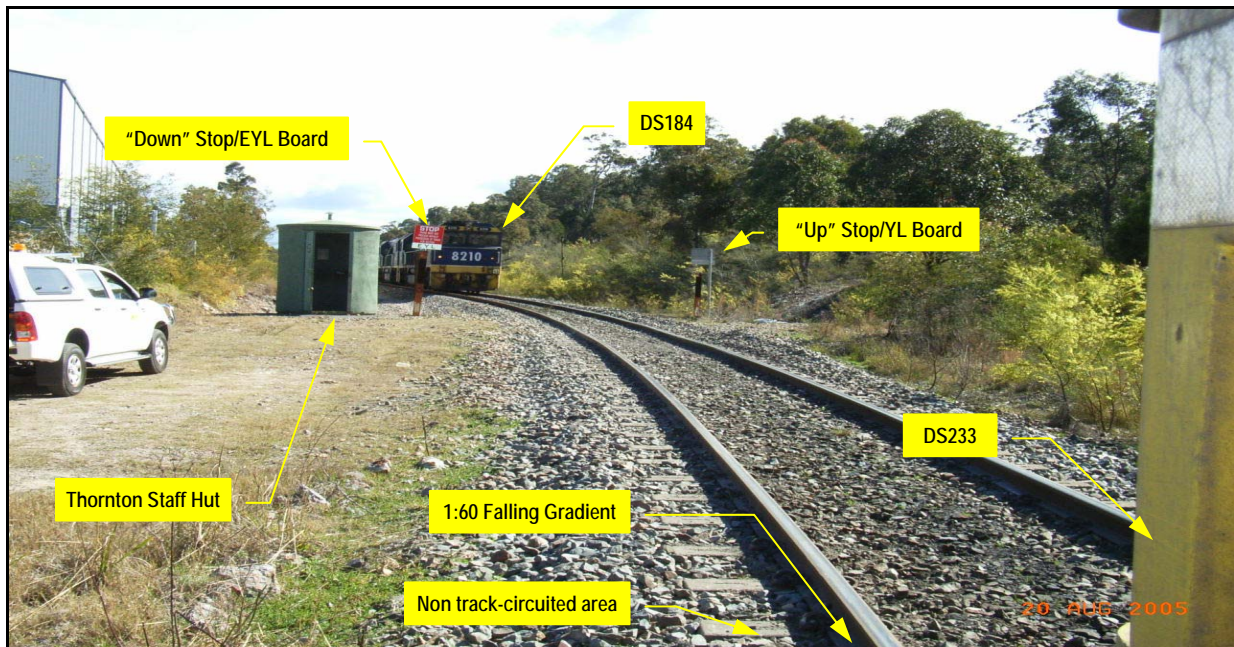
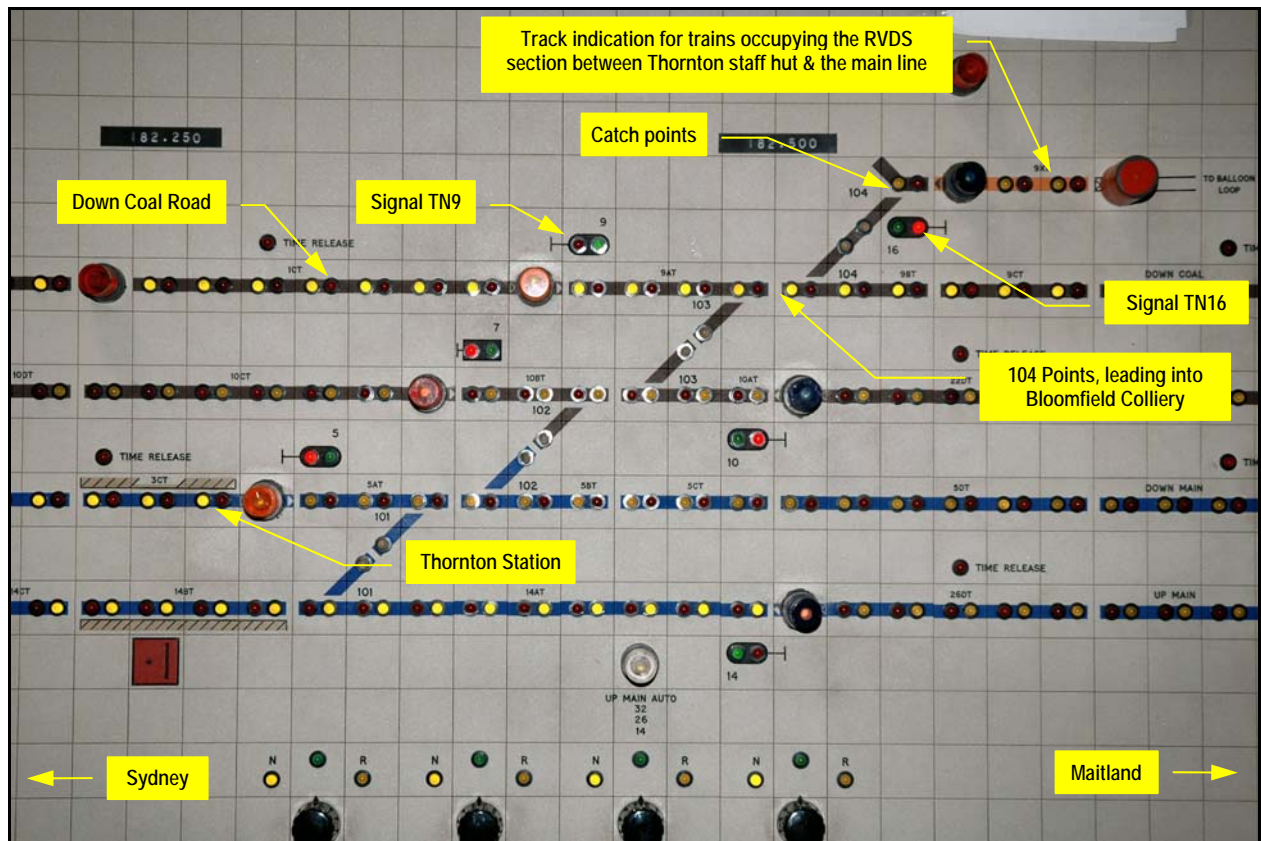


Figure 4: Key communication points throughout Bloomfield Colliery.

3.6 In the absence of communication from the Broadmeadow Train Controller (HTCC) or the crew of DS 184, and in the absence of RVDS equipment in the immediate area, the Maitland Area Controller lost visibility of DS184 as he set the route for DS233 to enter the Bloomfield Colliery line. Had the crew of DS184 sought authority to pass the UP YL (see *Photograph 4*), the Maitland Area Controller (MSB) would not have cleared the route for DS233. Had RVDS been extended up past the UP YL sign, the Area Controller would have been alerted to DS184's presence at the Thornton staff hut by his track indication panel (see *Photograph 5*) in the process of setting the signals necessary to allow DS233 to enter the Colliery line.



Photograph 4: Looking South from DS233 towards DS184. (Photo supplied by ARTC)



Photograph 5: RVDS Indication Panel of Bloomfield Colliery line at Maitland Signal Box.

3.7 Train Controllers advised OTSI that it was usual practice at Broadmeadow HTCC to authorise the departure of trains from the Thornton staff hut during a phone hook-up between the Train Controller and Area Controller as train crews conferred with the Train Controller (HTCC), or as the Train Controller recorded train arrival/departure times on his/her train control graph. Train crews then relied on the subsequent clearing of signal TN 16 as the authority to pass the Up YL sign which, in turn, eliminated the necessity to contact the Maitland Area Controller (MSB). However, in this instance, the Broadmeadow Train Controller did not contact the Maitland Area Controller after conferring with the train crew of DS184. It was his understanding that, despite giving DS184 a departure time of 10.50am, *Network Rules and Procedures* still required the train crew to contact the Area Controller (MSB) to obtain permission to pass the Up YL sign into Thornton Yard and towards the Main Lines.

Communication Protocols

3.8 Communication protocols on the ARTC network are contained in *Network Rules ANGE 204 (Network Communications)* and *ANPR 721 (Spoken and Written Communications)*. OTSI noted during analysis of the voice recordings that the standard of communications did not meet the requirements of *ANPR 721*. Specifically:

- a. those initiating calls, or those responding, often failed to comply with *ANGE 204* which requires that parties identify themselves;
 - b. key information was not repeated by the receiver to acknowledge that it had been received and was understood, and
 - c. there was considerable use of jargon, contrary to the requirement to use standard terms as specified in *ANPR 721*.
- 3.9 OTSI also noted that *ANPR 721* requires emergencies on the network to be reported immediately using “whatever communications method is available”. *ANPR 721* specifically instructs crew to use the emergency button, if fitted, on communication equipment in the event of an incident that might result in significant delays on the network. Both crews considered that an ‘emergency’ had been avoided and neither therefore thought it necessary to activate this function on their Countrynet radio system. OTSI notes that, while the possibility of a head-on collision had been avoided, the rear of DS233 was still obstructing the Down Coal Road and as such was clearly going to delay the movement of other services on this line. The Train Controller (HTCC) similarly did not see the incident as constituting an emergency. He directed DS184 and DS233 to remain where they were until he resolved another problem. The net effect was that the opportunity for a network-wide broadcast, which might have prevented a train that was behind DS233 from becoming ‘trapped’, was lost. This train might have been diverted but instead was delayed several hours.

Human Factors

- 3.10 OTSI noted a number of matters that would have influenced the expectations and/or behaviour of those involved in the incident. The level of train movements in and out of the Bloomfield Colliery line is dependent on ships being available for loading at Port Waratah or Kooragang and is therefore sporadic. Both HTCC and MSB staff indicated that on some days there might not be any movements on the line, whilst on other days up to four trains might be loaded. PNL train crews indicated that they only worked on trains on the Bloomfield Colliery line two to three times per year. The effect of such a pattern of activity is that train crews do not have the same level of familiarity with the local working arrangements as they would have in other locations where they work more frequently.
- 3.11 OTSI examined train control diagram (graph) number 35, compiled by Train Controllers at HTCC on 20 August 2005. There was an absence of some detail on the graph, not all of which could be attributed to a single Controller: sign-on and sign-off details were incomplete, as were consist details in some instances, and there was

an absence of annotation to explain why trains were stationary at various points in time. The graph did indicate DS183's entry into the Colliery; its redesignation as DS184 and its progression throughout the loop before coming to a stop at the Thornton staff hut. It also indicated the intended departure time of DS184 as being 10.50am and that the Train Controller's workload was relatively light until 11.06am when points failed on the Up Main line at Whittingham, near Singleton. In fact, the graph indicated that there was a lull in train movements throughout the territory at the time DS184 contacted HTCC regarding its arrival at the Thornton staff hut.

- 3.12 The points failure at Whittingham required the Broadmeadow Train Controller (HTCC) to plan alternate train working to alleviate significant disruption to services in the territory. One of the Train Controller's immediate priorities was to ensure that the potential for an intrastate passenger train service, whose arrival was imminent, was minimised. The Train Controller (HTCC) assumed that DS184 had departed from Thornton staff hut during his conversation with the Area Controller (MSB) at 11.22am and focused on dealing with the points failure, amending the train control graph and authorising the route for DS233 to enter the Bloomfield Colliery line. At 11.29am, as he spoke to PNL's Train Crewing Supervisor at Port Waratah, the Train Controller (HTCC) was under the impression that DS184 was in the vicinity of Hanbury Junction, some 15 kilometres down the line, based on his assumption that DS184 had left the Thornton staff hut at or before 10.50am. Had the Train Controller (HTCC) checked the track indication panel for the Hanbury Junction area, he would have noticed that this was not the case.
- 3.13 Voice recordings of conversations between HTCC and MSB reveal that the Train Controller (HTCC) was surprised when informed that DS184 had not exited the Bloomfield Colliery line. When made aware of the opposing movement, the Train Controller (HTCC) instructed the Area Controller (MSB) that DS184 and DS233 were to remain where they stood until such time that he had dealt with the points failure at Whittingham, after which he would provide further instructions. Despite admitting DS183 into Bloomfield Colliery earlier in the morning, the Area Controller had failed to appreciate that the train, albeit now designated as DS184, was still somewhere on the Bloomfield Colliery line. DS183 would have disappeared from the Area Controller's track indication panel, as seen in *Photograph 6*, after the train departed the Thornton staff hut and entered the Bloomfield Colliery line.



Photograph 6: Train Controller's Indication Panel at HTCC. (Photo supplied by ARTC)

- 3.14 Despite having been informed that their departure time was 10.50am, the crew did not communicate with either MSB or HTCC when Signal TN 16 remained at STOP. At interview, the crew from both DS184 and DS233 indicated that it was their practice to communicate immediately with either the Train Controller or the Area Controller in charge of the relevant area if they considered they were going cause a delay. However, when they were delayed by others, it was their practice to wait for instructions from the relevant Controller. They cited infrastructure problems, congestion on the network, problems at the unloading stations and train problems as common causes for such delay, and indicated that it was not unusual for trains to be delayed without explanation from the Controller. Consequently, the crew of DS184 were not concerned when they were delayed at the Thornton staff hut and, given that they were not the cause of the delay, saw no reason to communicate with the Train Controller (HTCC) or the Area Controller at MSB.
- 3.15 The Broadmeadow Train Controller (HTCC) indicated to OTSI that he had not had the benefit of a physical inspection of the interlocking or workings at Thornton and that his decisions in relation to Thornton were based on his wider knowledge of the Network Rules, documented procedures and track diagrams.

Rostering and Fatigue

- 3.16 An analysis of the rosters and discussions with all of the involved parties allowed OTSI to conclude that fatigue did not cause or contribute to the cause of the incident.

Subsequent Actions

- 3.17 On 18 January 2006, ITSRR issued an Improvement Notice to both BCPL and ARTC which required them to undertake the following actions by 15 February 2006:
- a. produce a Safety Interface Agreement (SIA) between the parties that adequately described the safe-working system, rules and procedures for trains operating on the Bloomfield Colliery line;
 - b. ensure the communication requirements required to permit a train to exit the Bloomfield Colliery line were described within the new SAI, and
 - c. provide ITSRR with a plan of any related timeframes associated with the program by which the parties intended to comply with the Improvement Notice.
- 3.18 BCPL were additionally required, under the terms of the Improvement Notice, to:
- a. ensure that any instructions in the Thornton and Bloomfield Staff huts were authorised and controlled by the relevant responsible organisation. This required that BCPL also ensured that such documentation was consistent with authorised safe-working rules for the Bloomfield Railway;
 - b. inform Pacific National of the BCPL's safe-working requirements as documented in the BCPL and ARTC SIA;
 - c. update the BCPL and PNL SIA to reflect the change in infrastructure ownership from RIC to ARTC, and
 - d. update the BCPL and PNL SIA to reflect the updated safe-working information defined in the BCPL and ARTC SIA.
- 3.19 In response to the Improvement Notice, ARTC issued *Safe Notice No. 2-192 "Clarifying all Roles and Responsibilities associated with all train working in and out of the Bloomfield Colliery Branch Line (Thornton)"* on 1 February 2006. OTSI notes that this notice generally reiterates *General Order 8-2001* and stipulates that the train crew at Thornton staff hut must contact the Broadmeadow Train Controller to provide arrival/departure times in the Staff and Ticket area then contact the Area Controller at Maitland MSB to seek authority to pass the Up stop board. This places the onus on train crews to contact the Area Controller (MSB) to gain authority to pass the "Up" YL sign, after having reported their arrival time at Thornton Staff hut to the Train Controller (HTCC). It then requires train crews to also report their departure time from Thornton Staff hut to the Train Controller (HTCC) after they have received authorisation from the Area Controller to pass the Up YL sign. The train must then draw down to signal TN 16 and wait for the Maitland Area Controller (MSB), acting on the authority of the Broadmeadow Train Controller (HTCC), to clear the signal before

departing. However, while OTSI considers these procedures, properly followed, will reduce the prospect of an opposing movement between trains exiting and entering the Colliery line, it also considers the procedures to be convoluted. They would be less so if the Train Controller (HTCC) included the Area Controller (MSB) in his/her communications to train crews when authorising their movement from the Colliery line onto the main lines. Although there is no formal requirement for this to occur, other Train Controllers at HTCC indicated that this was their normal practice and the Train Controller involved in this incident indicated that this was his usual practice. OTSI believes this 'three-way' communication, between the Broadmeadow Train Controller (HTCC), the Area Controller (MSB) and train crews waiting to depart from the Thornton staff hut should be formally adopted as a standard operating procedure.

- 3.20 ARTC and BPCL reached an agreement on 8 March 2006 to extend the Rail Vehicle Detection System (RVDS) so that trains departing the Colliery will automatically become 'visible' to the Area Controller at MSB before reaching the Thornton staff hut.

PART 4 FINDINGS

4.1 In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

- i. The opposing movement occurred when the Train Controller at the Broadmeadow Hunter Train Control Centre (HTCC) authorised the movement of DS233 into the Bloomfield Colliery Branch Line, having overlooked the fact that DS184 was awaiting a clearance to exit the same track.
- ii. This oversight was caused by the fact that the Broadmeadow HTCC Train Controller was pre-occupied with the requirement to reschedule train movements elsewhere, due to a points failure at Whittingham, approximately 50kms North West of Thornton. In addition, because DS184 was not standing on circuited track, neither the Broadmeadow HTCC Train Controller nor the Area Controller at Maitland Signal Box (MSB) had the benefit of having the train's position illuminated on their track indication panels.
- iii. Operations on the Bloomfield Colliery line are unusual in that it is the only location on the network where a single line "Staff and Ticket"¹⁶ section leads into and out of a balloon loop. The frequency of train movements on the line is also irregular. These factors increased the potential for error and were compounded by the fact that DS184 and DS233 were operating at a point where two different systems of safe-working, each with its own procedures, intersected.
- iv. The opposing movement would not have occurred had the Driver of DS184 communicated with the Train Controller (HTCC) and advised him that he could not move as scheduled because he did not have a signal to proceed. However, he was not obliged to do so; delayed departures from the Bloomfield Colliery line are not unusual and Drivers are not always given an explanation for the delays or a revised departure time. Over time, and in the absence of clear instructions in relation to the requirement to communicate in such circumstances, some Drivers have become conditioned to waiting for a proceed signal.

¹⁶ The staff and ticket system is but one of a number of systems used to authorise the movement of trains and track machines in a section of track. The staff and ticket system provides for bi-directional movement on a single line track.

- v. Having lost visibility of DS184 after it left Thornton staff hut¹⁷, there were no additional procedures or prompts that might have reminded the Area Controller at MSB that the train was still on the Bloomfield Colliery line.

b. Anticipation and Management of Risk

ARTC's *Network Rules and Procedures* is the capstone reference for train operations in territory controlled by ARTC. These rules are supplemented by *Local Appendix Unit 217 (LAU 217)* and *General Order 8-2001* which contain local and specific orders for safe-working at Thornton.¹⁸ However, there were subtle differences between these safe-working procedures which, in conjunction with the uniqueness of the track layout at Thornton and the relative infrequency of operations there, resulted in different levels of understanding between some Drivers, Area Controllers and Train Controllers in relation to their obligations to communicate in certain circumstances.

c. Effectiveness of the Emergency Response

Neither train crew operated the emergency function on the Countrynet radio system to report the incident because, having avoided a collision, they did not consider that they had been involved in an emergency. However, part of DS233 was still on the main line and an opportunity to divert a following train was lost. Subsequently, however, all other following trains were effectively diverted.

d. Other Matters That Would Enhance the Safety of Rail Operations

The communications between all of the involved parties did not conform to the requirements contained in ARTC's *Network Rules and Procedures*.

¹⁷ In fact at this time, this train was still designated DS183 and it was to remain so until it was loaded; after which it became DS184.

¹⁸ In September 2004, ARTC took control of that part of the Defined Interstate Rail Network that lies within NSW and the NSW Country Rail Network, including the Hunter network. When it did so, it re-badged the network rules previously issued by the Rail Infrastructure Corporation (RIC). LAU 217 was one such document re-badged. However *General Order 8-2001*, issued under the auspices of StateRail to supplement LAU 217, was not withdrawn or re-badged.

PART 5 RECOMMENDATIONS

5.1 In order to prevent a recurrence of this type of incident, the following remedial safety actions are recommended for implementation by the organisations specified below:

a. **Australian Rail Track Corporation**

- i. Review all of its procedural documentation for operations at Thornton, in collaboration with operators, to ensure:
 - (1) its relevancy and consistency with *Network Rules and Procedures*;
 - (2) procedures are simple, unambiguous and provide a safe system for the working of trains at the Thornton staff hut, and
 - (3) that the roles, responsibilities and reporting functions of all staff involved with the safe-working of trains on the Bloomfield Colliery line are clearly defined.
- ii. Remove all superseded or expired documents from its safe-working documentation system.
- iii. Reinforce the use of proper communication protocols.

b. **Bloomfield Collieries Pty Ltd**

In conjunction with the Australian Rail Track Corporation, extend the area of track detection on the Bloomfield Colliery line to include the detection of trains standing on the colliery side of the Up stop board at Thornton staff hut.

c. **Pacific National Limited**

- i. Confirm with its crews the requirement to use the emergency communication function, if fitted, in the event of an emergency, emphasising that any occurrence that is likely to result in significant delays on the network should be regarded as an emergency.
- ii. Reinforce the use of proper communication protocols.

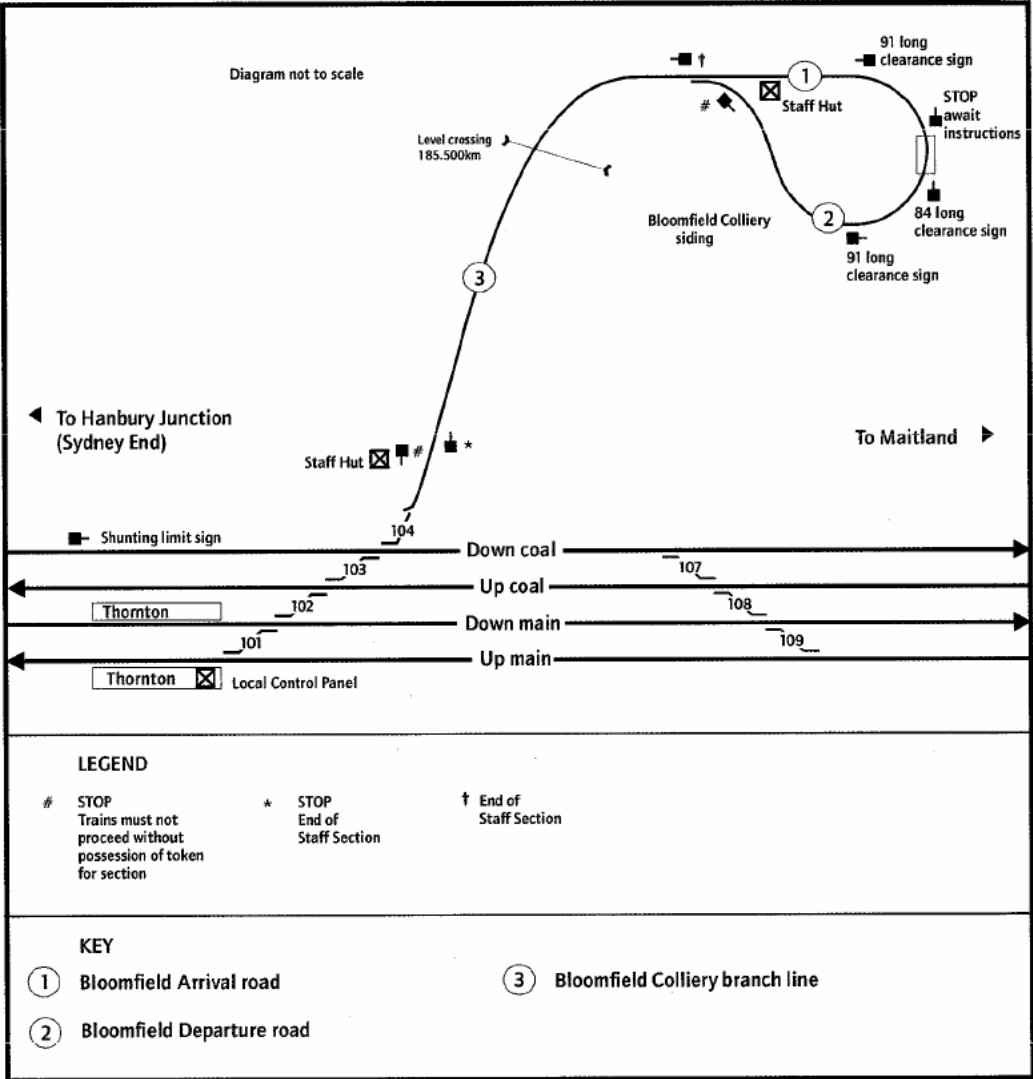
APPENDIX 1 – LAU 217

LAU 217

Thornton

182.194 kms

Diagram of Thornton [a]



Broadmeadow (excl) to Maitland (incl):
Thornton

LAU 217

Operation of points and signals [b]

The points and signals at Thornton are controlled from Maitland signalbox.

A local control panel is provided in the traffic hut at Thornton to allow the interlocking to be operated locally. All indications displayed by the local control panel will also be displayed on the indicator diagram in Maitland signalbox.

All points worked from the interlocking machine are controlled by track circuit and cannot be moved unless the track(s) controlling the points is unoccupied.

Switching the local control panel in or out [c]

A three-position key-locked switch is provided in the control panel to allow the signalbox to be switched in (local), switched out (closing), or switched to remote control.

Indicator lights inscribed "local control", "closing" and "remote control" respectively are provided to indicate when the control panel is switched in, switched out, or switched to remote control.

Locking [d]

<i>Type</i>	<i>Provided</i>
Approach	Yes
Route	Yes

Operation of power-operated points in an emergency [e]

All points worked from the signalbox are electrically power-operated.

If these points fail to operate correctly, a transit alarm will sound and the Signaller *must* try to restore the points to their previous position to allow trains to continue running. However, if it is necessary to alter the route, the points may be manually operated.

The Signals maintenance representative *must* be promptly advised of the circumstances.

Broadmeadow (excl) to Maitland (incl):
Thornton

LAU 217

Signalling power supply indicators

[f]

Three power supply indicator lights are provided in groups labelled "South", "Local" and "North" for the signalling power supplies in the Thornton area.

The green "Normal" indication will be displayed when all the normal signalling power supplies are available.

The yellow "Warning" indication will be displayed when the normal power supply has failed but the emergency supply is available and is operating.

The red "Fail" indication will be displayed when a total failure of both the normal and the emergency power supply has occurred.

An alarm is provided to warn of any alteration to the power supply and the signaller *must* acknowledge the alteration by depressing the alarm pushbutton.

When there is any alteration or interruption to the power supplies to the signalling, the Signaller *must* promptly inform the Signals maintenance representative .

Signal lamp indicators

[g]

A yellow indicator light inscribed "Filament fail" will be displayed when a partial failure of a signal lamp in a controlled signal is detected.

A red indicator light inscribed "Lamp fail" will be displayed when a total failure of a signal lamp in a controlled signal is detected.

A yellow indicator light inscribed "Auto Filament fail" will be displayed when a partial failure of a signal lamp in an automatic signal is detected.

When any signal lamp indicator is displayed or becomes extinguished, the Signaller *must* promptly inform the Signals maintenance representative.

Shunting limit sign

[h]

A shunting limit sign is provided at Thornton. The sign is located on the Down side of the Down coal line between the Thornton Road overbridge and the platform on the Down coal line.

The sign is inscribed "Shunting limit on Down coal", and applies to shunting movements in the Up direction from the Bloomfield Colliery line to the Down coal line.

Broadmeadow (excl) to Maitland (incl):
Thornton

LAU 217

Bloomfield Colliery branch line and coal siding

[i]

General arrangements

The Bloomfield Colliery branch line is connected to the Down coal line. The points and signals to and from the branch line are operated from Maitland signalbox (or Thornton, when switched in).

Trains may enter the branch line from either the Down main line or the Down coal line, and depart from the branch line to the Up main line or the Up coal line.

Entry of trains onto the branch line from the Down main line is controlled by Down main to colliery siding signal No. TN5(M)A, and entry from the Down coal line is controlled by Down coal to colliery siding signal No. TN9(M)A.

The departure of Up trains from the branch line to either the Up main line or the Up coal line is controlled by Up home branch signal No. TN16.

Working of trains to and from the branch line

Before a train is admitted to the branch line, the colliery manager at Bloomfield *must* be contacted and advised of the train's impending arrival by the Signaller before clearing signal No. TN9 or No. TN5.

Notice signs

Notice signs, inscribed "Stop trains must not proceed without possession of token for section", are provided:

- on the Down side of the branch line approximately 100 metres on the Bloomfield Colliery side of signal No. TN16
- and at Bloomfield coal siding on the Up side facing Up trains departing the sidings.

A notice sign, inscribed "End of staff section", is provided on the Thornton side of the coal siding points.

A notice sign, inscribed "Stop, end of staff section", is provided adjacent to the staff hut facing Up trains.



NOTE

Unless emergency conditions prevail, trains *must not* come to a stand with any portion of the train fouling the level crossing at 185.500 kms.

Broadmeadow (excl) to Maitland (incl):
Thornton

LAU 217

To clear this level crossing, a coal train consisting of 91 vehicles *must* be drawn forward past the staff hut to the clearance sign provided at 187.250 kms, which is located beyond the staff hut. In this case, the Qualified Worker *must* return to the staff hut to perform any safeworking duties.

Section clearance signs

Section clearance signs are provided at the following locations:

- 400 metres on the departure side of the loading bin for 91 wagon trains
- 200 metres on the departure side of the loading bin for 84 wagon trains
- on the arrival side of the loading bin for all other trains.

Special instructions for isolating the points leading to Bloomfield Colliery branch line and coal siding for maintenance purposes

[i]

To prevent access to Bloomfield Colliery branch line and coal siding during maintenance work within the siding, a special key-locked isolating switch is provided in a locked box to enable the power for No. 104 points to be isolated.

The key for the isolating switch box is held by the infrastructure maintainer for the area.

The isolating switch has two positions, "Normal Operating" and "Siding Isolated". The normal position for the switch is the "Normal Operating" position.

When the switch is locked in the "Normal Operating" position, the points can be operated normally. When the switch is locked in the "Siding Isolated" position, the power supply will be isolated and the points cannot be power-operated.

APPENDIX 2 – General Order 8-2001

Opposing movement of DS 233 on DS 184
Bloomfield Branch line Thornton
20th August 2005

22/4 1
StateRail

Internal Memo

**Network Control
Operations Division
Broadmeadow CTC**
Phone: 52 976
Fax: 52 977

To: Train Controller's North West 'A' Board, Broadmeadow CTC
Area Controller's, Maitland Signal Box

Subject: GENERAL ORDER 8/2001
BLOOMFIELD COLLIERY BRANCH LINE WORKING AS AMENDED IN
WEEKLY NOTICE 34/2001

Date: Wednesday, 31st October 2001

Our Ref: EE/000047.TW: RK

Staff are reminded of the requirements for trains working through unattended staff and ticket locations as set out in SWU 515 and 516.

This working is carried out under the direction of the Train Controller. Train crews are required to contact the Train Controller to obtain permission to enter the section and to determine if the train is to travel on the 'Token' or 'Ticket'.

When arriving out of a staff and ticket section, train crew's are required to contact the Train Controller to report the arrival of the train.

relation to the Bloomfield Colliery Branch Line the following applies:-

1. The section of track between the coal/main lines and the staff hut is yard working under the direction of the Area Controller, Maitland.
2. The staff and ticket section from the staff hut Thornton to the staff hut Bloomfield Colliery is under the direction of the Train Controller North West 'A' Board Broadmeadow CTC.

Working trains into and out of Bloomfield Colliery is carried out as follows:-

1. Signals controlling the entrance and exit to Bloomfield Colliery Branch Line are remotely controlled from Maitland Signal Box. Trains enter and exit the branch line under yard working conditions.
2. When a train arrives at the staff hut to enter the staff and ticket section to proceed to Bloomfield Colliery, the train crew will contact the Train Controller to obtain permission to enter the section and receive direction on the type of authority to travel on (staff or ticket).
3. On arrival at the staff hut at Bloomfield Colliery end, place staff or cancelled ticket in receptacle provided and then proceed towards the loading bin as directed by Bloomfield Colliery employees.
4. The train crew to contact control and advise when the train is clear at the loading bin, 84 or 91 board, whichever is appropriate for the train length.

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Opposing movement of DS 233 on DS 184
Bloomfield Branch line Thornton
20th August 2005

5. When loaded the train is to proceed to the stop board adjacent to the staff hut and contact the Train Controller to obtain permission to enter the section and receive direction on the type of authority to travel on (staff or ticket).
6. On arrival at the staff hut at the Thornton end of the section, place the staff or cancelled ticket in the receptacle provided.
7. The train crew must then contact the Area Controller, Maitland to obtain permission to enter the yard limit area.
8. When the train has arrived in clear of up home signal no. TN16 the Area Controller Maitland is to advise the Train Controller that the train is clear of the staff and ticket section.

The Thornton – Bloomfield branch alteration to method of working amendment in weekly notice 34/2001 requires the 'Driver or other authorised employee must contact the Signaller Maitland and advise that the section is unoccupied' for trains arriving at the Colliery. This contact person is incorrect and is to be disregarded pending an amendment being issued. The correct contact is the Train Controller.

Staff are to ensure that correct reporting procedures are carried out as required in the relevant SWU's.

cc.

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