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SOCIETY CONTACT INFORMATION

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MINUTES OF MEETING HELD FRIDAY 20 NOVEMBER 2020

The SRSV meeting scheduled for Friday 20 November 2020 was held as an online meeting on the internet using the 'ZOOM' application. This was due to the restrictions imposed on public gatherings announced by the Victorian Government in response to the COVID-19 (Coronavirus) pandemic.

Present: – Ken Ashman, Noel Bamford, Phil Barker, Robert Bremner, Brett Cleak, Graeme Cleak, Glenn Cumming, John Dennis, Warren Doubleday, Michael Formaini, Chris Gordon, Judy Gordon, Andrew Gostling, Graeme Henderson, Bill Johnston, Chris King, Keith Lambert, David Langberg, Neil Lewis, Andrew McLean, Phillip Miller, Eddie Oliver, Andrew Pardy, Roo Richards, Peter Silva, James Sinclair, Rod Smith, David Stosser, Bob Taaffe, Rob Weiss and Andrew Wheatland. (31)

Apologies: – David Langley, Laurie Savage and Brian Sherry.

Visitors: – Jim Gordon, Paul Horder and Chris Sullivan.

The Vice-President Mr. Bill Johnston, took the chair & opened the meeting at 20:14 hours (8.14 pm).

Minutes of the September 2020 Meeting: – Accepted as published. Michael Formaini / Robert Bremner. Carried.

Business Arising: – Nil.

Correspondence: – Letters to Surrey Hills Neighbourhood Centre cancelling our booking for the meeting in November 2020. Bob Taaffe / Chris King. Carried.

Reports: – Future meetings. The Secretary will circulate a list of proposed meeting dates for 2021.

General Business: – Chris King reported that the level crossing works on the Upfield Line had been completed. However, the Moreland and Coburg Railway Stations are not yet open for passengers.

Phillip Miller asked about the reliability of axle counters. Axle counters manufactured by Thales and Frauscher are used in Victoria. It was noted that the Frauscher axle counter is preferred by Metro Trains Melbourne.

Keith Lambert provided details about the various level crossing removal projects in the Metropolitan District. A summary of the discussion follows: –

- The level crossing removal works at Werribee Street, Werribee, are scheduled for completion on Monday 7 December 2020.

(Front cover). Bungaree West Junction lasted from 7 December 2005 to 26 December 2021. When this portion of the line was opened in 1879 it was a short, minor, branch to Gordon, running from a junction with the main line at Warrenheip. It was so minor that, for many years, the single line does not even appear to have been worked by Staff. The line meandered about the plateau, dodging around the volcanic cones and valleys and serving the towns of Dunnstown, Bungaree, Wallace, and Gordon. It was extended eastward to Ballan in 1886 and in 1889 the section between Bacchus Marsh and Ballan was opened to form a direct line between Melbourne and Ballarat. For over 100 years, however, all trains made a detour via Bungaree and Wallace. In 1995, the RFR project constructed a direct line between Millbrook and a point near Dunnstown. The original line was retained as a sort of lengthy crossing loop, and two new junctions were provided at Bungaree East Junction and Bungaree West Junction. In this photo we are looking west from Torpys Rd towards Ballarat. The original line curves to the right over a 65 km/h turnout, with the straight line being the new direct line. In 2020 another upgrade of the Ballarat line added a lengthy crossing loop on the cut-off and the original line via Bungaree was no longer required and was closed. Photo Andrew Waugh

- The Ringwood – Lilydale Line will be closed between Friday 11 December 2020 – Monday 21 December 2020 for level crossing removal works at Mooroolbark and Lilydale.
- Demolition of the railway station at Glenroy will commence in early January 2021.
- Edithvale, Bonbeach and Chelsea railway Stations will be closed for passengers between July 2020 – December 2020.
- The Mordialloc – Frankston Line will be closed for six (6) weeks between September 2020 – November 2020 for level crossing removal works.
- The level crossing removal works at Glenhuntly Road and Neerim Road will involve lowering the railway line. No dates for completion are known at this time.

Keith Lambert advised that revision number 7 for the Victorian Book of Rules and Operating Procedures will be released in October 2020.

It was noted that single line working between Thornbury – Reservoir will be used when the Bell Street level crossing is removed. This is to ensure access to the train maintenance centre at Epping.

Chris Gordon noted that while the Broad Gauge Lines across the level crossing at Werribee Street, Werribee, will be removed on Monday 7 December 2020, the Standard Gauge Line across the level crossing will not be removed until Tuesday 26 January 2021.

Chris Gordon reported that the Ballarat Line will close on Sunday 27 December 2020 for five (5) weeks for the removal of the line via Bungaree and to commission the new crossing loops at Ballan and Millbrook. The introduction of the new timetable has been delayed until these works are complete.

Chris Gordon noted that the duplication of the Cranbourne Line is planned for completion in January 2022.

Phillip Miller described a development in the UK where an internet interface has been established to connect two Tyer's electric key token machines to replace the traditional aerial line wires.

Syllabus Item: – The Vice-President introduced SRSV member Ken Ashman from Hamilton, New Zealand.

Using a digital camera operated by Chris Sullivan, Ken proceeded to give the meeting a guided tour of his railway signalling museum at his home in Hamilton, New Zealand.

Over many decades Ken has gathered a fascinating collection of railway signalling equipment. Much of the collection has been restored to operating condition and Ken has built a computer simulator to demonstrate how the equipment works.

The extensive collection includes many samples of signals, relays, interlockings (both mechanical and relay), power frames, CTC equipment, level crossing equipment, telephones and much more.

The simulator was set to work with four (4) 'virtual' trains being let loose on the 'virtual' railway in Ken's museum.

Ken and Chris followed the progress of the trains around the museum and at each location Ken demonstrated and detailed the history and operation of the signalling equipment at each station and signal box.

Ken has a special interest in signalling relays and the variety of working relays is one of the features of the museum.

Many questions were asked and answered as Ken worked the trains through each station and as various pieces of signalling equipment operated.

At the completion of the Syllabus Item, the Vice-President thanked Ken for the tour of his museum and Chris for assistance as camera operator.

Meeting closed at 22:38 hours.

The next meeting will be on Friday 19 February, 2021, commencing at 20:00 hours (8.00pm).

SIGNALLING ALTERATIONS

The following alterations were published in WN 42/20 to WN 52/20, and ETRB A circulars. The alterations have been edited to conserve space. Dates in parenthesis are the dates of publication, which may not be the date of the alterations.

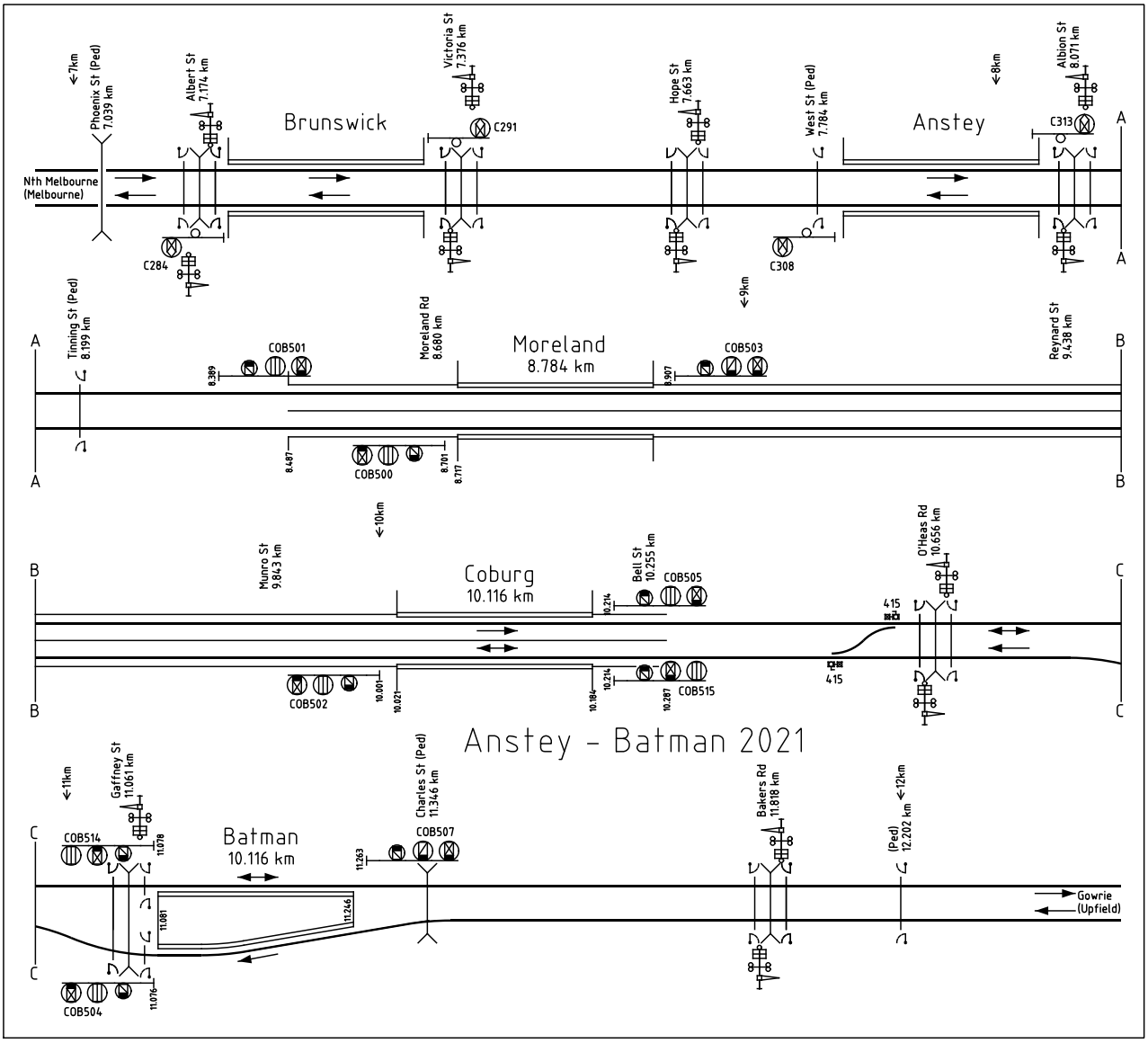
28.10.2020 Book of Rules, Section 2 (Fixed Signals) (SW 752/20 & 194/20, WN 44)

On Wednesday, 28.10., Section 2 (Fixed Signals), Rule 13i was amended (text in italics has been added):

At locations where the signalling transitions from two position signalling to three position signalling, *or for three position signalled corridors at the exit from a Signal [sic] Track Section of an extended distance*, Repeating Signals are provided to give the Driver advance indication of the next Fixed Signal.

02.11.2020 Anstey – Batman (SW 740/20 & SWP 7/20, WN 42)

On Monday, 2.11., the new 1,780 metre viaduct between 8.487 km and 10.267 km will be brought into use. Rail traffic will resume to Upfield, but the new stations at Moreland (8.797 km) and Coburg (10.102 km) will not be opened.



The alterations consisted of:

- The following signals were provided: COB500, COB501, COB502, COB503, COB504, COB505, COB507, COB514, & COB515. All signals are LED type. Signal post telephones are not provided.
- Trailing Crossover 415 was provided at the Down end of the viaduct for terminating trains. The crossover is worked by dual control point machines (the WN incorrectly states that in-bearer point machines were provided). Terminating facilities were provided at Coburg (Up trains) and Batman (Down trains).
- Train detection will be by axle counters. On the Down line these extend from 8.205 km (6 metres on the Down side of Tinning St pedestrian crossing) to 11.164 km (at the 3 car stop mark, 99 metres on the Up side of COB507). On the Up line these extend from 8.193 km (6 metres on the Up side of Tinning St pedestrian crossing) to 11.263 km (17 metres on the Down side Batman platform). The axle counters are provided with 'Supervisory' reset; 'Point Supervisory' reset, 'Next train' reset, 'Occupation' reset, and full counting head control.
- The level crossing controls for Gaffney St at Batman were altered to provide SPAD mitigation controls. The level crossing will commence to operate if a Down train approaches even though no route has been set past Home COB504. The level crossing will cease to operate after the expiry of a timer unless a route is set from Homes COB504 or COB514 or a Down train is approaching.
- The Coburg station limits extend on the Down line from COB501 to C459, and on the Up line from COB514 to C308.

- A road/rail vehicle on/off-tracking pad (ASY1) was provided at 8.309 km just before the Up end of the viaduct.
- A new Coburg SSIs was commissioned with vital blocking.
- As neither Coburg or Moreland will initially be opened, the stopping mode on Homes COB500 and COB505 will be inhibited.

The Signaller, Western Signal panel, Metrol, will control the signalling between Moreland and Upfield.

Diagrams 61/20 (Flemington Bridge – Coburg) & 63/20 (Batman – Upfield) replaced 27/20 & 7/17 respectively. Northern Group Operating Procedure 20 (Coburg – Gowrie – Upfield, control of rail traffic movements) was reissued.

The temporary turnback facilities at Anstey were removed:

- Homes COB550 and COB551 were abolished. Points 450 were abolished. The speed proving train stop and friction arresting buffer in the Up platform were removed.
- The axle counter sections between Hope St and the platforms at Anstey were removed and the track circuits reinstated.
- Automatics C308 and C313 were restored to service. Automatic C313 was converted to LED.

02.11.2020 **Upfield** **(SW 740/20, WN 42)**

On Monday, 2.11., the SSI was replaced by a new SSI with vital blocking. The derailers in the sidings were provided with a self-normalisation function.

(03.11.2020) **Swan Hill** **(SW 195/20, WN 44)**

Operating Procedure 124 (Swan Hill) was reissued to cover the level crossing upgrades described in SW 187/20. SW 155/20 was cancelled.

09.11.2020 **Echuca** **(SW 197/20, WN 45)**

On Monday, 9.11., traffic light co-ordination was provided at Murray Valley Hwy (248.934 km).

Down Bendigo line trains will be restricted to 30 km/h for 457 metres approaching the level crossing, and Up trains towards Bendigo to 20 km/h for 270 metres. Notice boards will be provided at the start of each speed restriction. The existing 40 km/h speed restriction for Up trains (and the associated signage) was abolished.

The operation of the level crossing for Toolamba line trains remains unaltered.

Diagram 68/20 (Rochester to Echuca) replaced 18/17.

13.11.2020 **Lilydale** **(SW 793/20, WN 46)**

On Friday, 13.11., the pedestrian crossing on the Up side of Maroondah Hwy was closed to allow grade separation works. The pedestrian gates and associated fencing were removed.

16.11.2020 **Antwerp** **(TON 433/20, WN 46)**

On Monday, 16.11., the siding between 379.068 km and 379.505 km was booked back into use for stabling track machines only. TON 55/16 is cancelled.

16.11.2020 **Stratford** **(SW 205/20, WN 46)**

On Monday, 16.11., the track over the new Avon River bridge was provided and placed under Absolute Occupation. The points at each end are at 221.081 km and 222.296 km. Baulks are provided at each end of the new track.

16.11.2020 **Chelsea** **(SWN 796/20, WN 46)**

On Monday, 16.11., the pedestrian crossing at Wellwood St was temporarily closed to allow grade separation works. The Down side pedestrian gate and fencing was removed. It is anticipated that the pedestrian crossing will be reopened on Sunday, 20.12.2020.

22.11.2020 **South Geelong** **(SW 200/20, WN 45)**

On Sunday, 22.11., the approach section indicator for Up trains from the Queenscliff Siding was relocated 35 metres in the Down direction. The 3VL stop marker was relocated 88 metres in the Down direction, and the 6VL stop marker will be relocated to a position 80 metres beyond the 3VL stop marker.

Amend Diagram 74/18 (South Geelong).

(24.11.2020) **Book of Rules, Train Staff & Ticket Working** **(SW 210/20, WN 47)**

With the introduction of the new revision of the Book of Rules, the following procedures apply when an Absolute Occupation is to be granted on a corridor operated by Train Staff & Ticket.

The Train Staff is to be locked away by the Signaller issuing the Absolute Occupation. The Absolute Occupation form is to be endorsed that the Staff has been locked away. Protection of the Absolute Occupation is to be in accordance with Book of Rules, Section 15, Rule 9.

(24.11.2020) **Ballarat – Ararat** **(SW 210/20, WN 47)**

Operating Procedure 70 (Ballarat – Ararat Staff Working) was reissued to reflect the securing of the Staff during an Absolute Occupation. SW 170/17 was cancelled.

27.11.2020 **Melbourne Yard – Wagon Storage Yard & Reversing Loop** **(SW 212/20, WN 48)**

Between Friday, 27.11., and Monday, 30.11., the connections to the South Hump Avoiding Track, Wagon Storage Yard and Reversing Loop were formally abolished.

Points MYD129, MYD131, MYD141, MYD199, & MYD203 were abolished. Home MYD122 was abolished. Dwarfs MYD128, MYD186, & MYD234 were abolished.

The route indicator on Dwarf MYD280 was altered to abolish the arrow pointing towards the Reversing Loop.

Amend Diagrams 122/14 (West Tower) & 124/14 (Moonee Ponds Creek).

27.11.2020 **Stratford** **(SW 215/20, WN 48)**

Between Friday, 27.11., and Monday, 7.12., the new Avon River bridge was brought into use. The new bridge is on the upstream (Down) side of the existing bridge and extends between 221.618 km and 222.122 km. The old bridge was taken out of use.

Boom barriers and pedestrian gates were provided at the existing flashing lights at McAlister St (221.839 km) and are operated by the existing axle counters. The Down notice board located 207 metres on the Up side of McAlister St controlling the speed approaching the crossing was abolished. The Down notice board located 310 metres on the Up side of Hobsons St restricting Down trains to 40 km/h to the crossing has been relocated to a point 20 metres on the Up side of McAlister St and now applies to both crossings.

The 10 km/h speed restriction over the old bridge was abolished, and the TPWS equipment and associated signage was removed. The line speed over the new bridge is 90 km/h.

Diagram 64/20 (Stratford – Hillside) replaced 44/19.

28.11.2020 **Flinders Street** **(SWN 817/20, WN 48)**

Between Saturday, 28.11., and Sunday, 29.11., Up Homes 767 (Special Line) & 945 (Platform 12) were equipped with TPWS.

(01.12.2020) **Melton** **(SW 213/20, WN 48)**

Up Home MEL712 applies to trains from No 2 Road towards the Up line and displays Medium and Low Speed Aspects. Drivers are reminded that when this signal displays a Clear Medium Speed indication the 40 km/h speed restriction applies to the next fixed signal.

14.12.2020 **Anstey - Brunswick** **(SWN 857/20, WN 49)**

On Monday, 14.12., circuit alterations corrected the existing Down express timing deficiency at Dawson St.

14.12.2020 **Moreland – Coburg** **(SWN 857/20, WN 49)**

On Monday, 14.12., Moreland and Coburg stations were opened for passenger traffic.

The stopping approaches for Tinning St (Up trains), O'Hea St (Down trains), and Gaffney St (Down trains) were restored to service.

14.12.2020 **Gowrie** **(SWN 857/20, WN 49)**

On Monday, 14.12., Up Home GOW529 was altered so that the illuminated '65' indication will NOT be displayed when the signal displays Medium Speed Warning.

14.12.2020 **Upfield** **(SWN 857/20, WN 49)**

On Monday, 14.12., the existing foul track condition on track circuit 504T at Upfield was corrected.

(15.12.2020) **South Geelong** **(SW 220/20, WN 50)**

Diagram 18/20 (South Geelong) replaced 74/18 as in service.

15.12.2020 **Croydon** **(SW 863/20, WN 50)**

Between Tuesday, 15.12., and Friday, 18.12., Automatics H949, H971, and H1005 were converted to LEDs.

16.12.2020 **Praters Block Point** **(SW 223/20, WN 50)**

On Wednesday, 16.12., Praters Block Point was provided at 334.000 km on the Sea Lake line. The Train Order sections are now Granites BP – Praters BP – Wycheproof BP.

Block Point signs were provided at 334.000 km, and Up and Down Location Boards were provided 2,500 metres from the Block Point at 331.500 km and 336.500 km. Location Clearance signs were provided on the rear of both Location Boards.

Diagram 82/20 (Wychitella – Glenloth) replaced 40/20.

16.12.2020 **Warne Block Point** **(SW 223/20, WN 50)**

On Wednesday, 16.12., Warne Block Point was provided at 377.880 km on the Sea Lake line. The Train Order sections are now Wycheproof BP – Warne BP – Sea Lake.

Block Point signs were provided at 377.880 km, and Up and Down Location Boards were provided 2,500 metres from the Block Point at 375.380 km and 380.380 km. Location Clearance signs were provided on the rear of both Location Boards.

Diagram 80/20 (Wycheproof – Warne) replaced 42/20.

Operating Procedure 131 (Train Order Territory) was reissued and SW 94/20 was cancelled.

16.12.2020 **Somerton** **(TON 479/20, WN 51)**

On Wednesday, 16.12., No 3 Rd has been booked out of service due to a broken V crossing at the Down end. Track closure devices have been provided at SOMV4 and SOMV6.

21.12.2020 **Mooroolbark** **(SW 862/20, WN 50)**

Between Friday, 11.12., and Monday, 21.12., the following alterations took place. The Down side boom barriers at Manchester Rd were relocated closer to the track, and the flashing lights and masts were relocated further from the track. Homes MLK302 and MLK304 were converted to LEDs.

22.12.2020 **Warracknabeal** **(TON 482/20, WN 52)**

On Tuesday, 22.12., No 2 Road was booked back into service for stabling of Track Machines only. The Up end points (348.319 km) were restored to service, and the siding was restored to use as far as the Down end Derail. The Down end points at 349.079 km remain secured normal.

23.12.2020 **Sea Lake** **(TON 485/20, WN 1)**

On Wednesday, 23.12., the main line points at each end of Nos 2 & 3 Roads (420.000 km & 421.100 km) were booked back into service.

24.12.2020 **Werribee** **(SW 867/20, WN 51)**

On Thursday, 24.12., the following interim track and signalling arrangements will come into effect for the resumption of suburban train services to Werribee. The permanent alterations were postponed.

The East and West lines between Laverton and Werribee were booked back into service, but are not available for bi-directional movements. All Down trains will operate on the East Line and all Up trains on the West Line. The East and West Lines between Werribee and the MTM lease boundary will remain closed to rail traffic and the Absolute Occupation will remain in force.

Down Home LAV739 at Laverton will be prevented from clearing for a movement to the West Line. Up Homes 4, 12, & 16 at Werribee will be prevented from clearing for a movement to the East Line. Homes 6, 8, 14, 18, 20, 22, 24, 26, 28 & 30 will be secured at Stop. Automatics G1178 & GG1178 will be secured at stop. Crossovers 21 & 23 will be commissioned into service solely for the purpose of providing signal overlaps.

Crossover 9 was abolished.

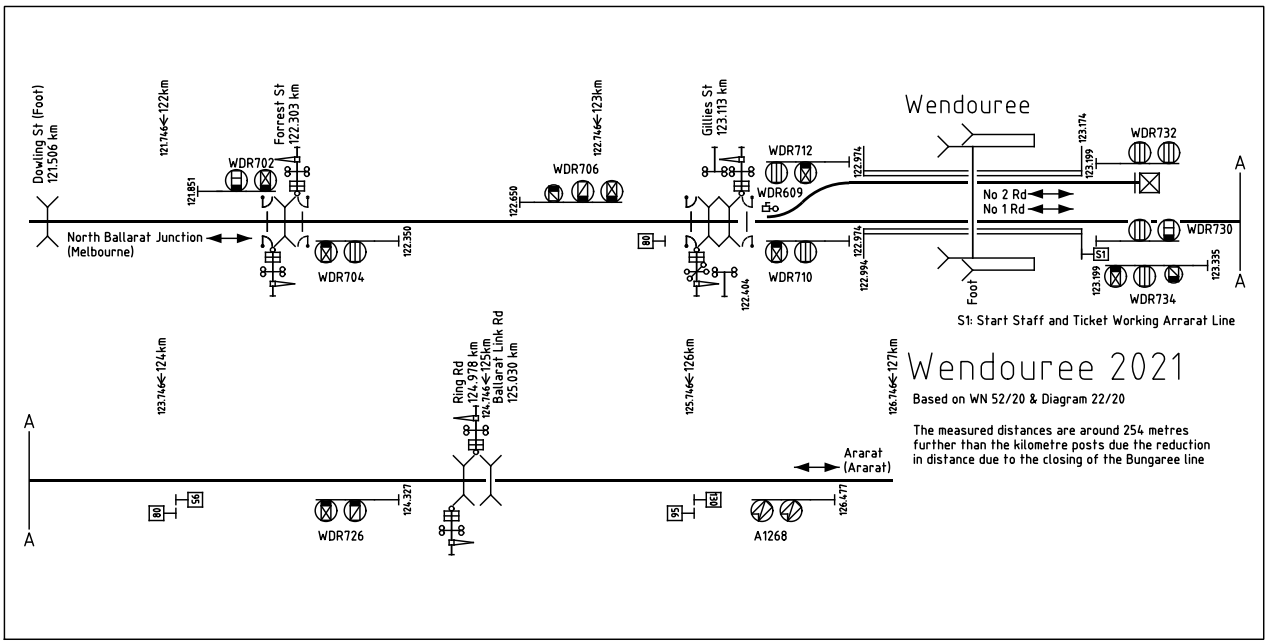
Axle counters will replace track circuits on the East and West Lines between 31.133 km (2 metres on the Up side of signal bridge holding Homes 2 & 14) to 31.781 km (at signal bridge holding Homes 22 & 26). The axle counters are provided with 'Supervisory' reset, 'Point Supervisory' reset, 'Next train' reset, 'Occupation' reset, and full head counting control.

The axle counter overlays at Cherry St were removed and SW 208/16 is cancelled.

Amend Diagram 47/20 (Aircraft – Werribee).

29.12.2020 **Echuca** **(TON 486/20, WN 1)**

On Tuesday, 29.12., hand Points 19 were booked out of service. These points form part of the Down end crossover from No 3 Road to No 2 Road, and have been secured to lie for No 3 Road.



04.01.2021 Tandarra (TON 20/21, WN 2)

On Monday, 4.1., the Up end main line points were booked out of service due to the condition of the point timbers. The Down end points remain booked out of service (TON 107/15) and the siding has been unavailable for use since 2014 (SW 244/14).

06.01.2021 Wendouree (SW 226/20, WN 52)

Between Sunday, 27.12., and Wednesday, 6.1., the second platform at Wendouree was brought into service. The new platform track is named 'No 2 Road' and the existing main line 'No 1 Road'. The following alterations took place.

Homes WDR702, WDR704, WDR706, WDR712, WDR730, WDR732, & WDR734 were provided. Homes 102 & 108 were renumbered WDR710 & WDR726 respectively. Up Repeating A1268 was altered to display Reduce to Medium Speed. TPWS was provided at all Home signals.

Points WDR609 (112.904 km) were provided and equipped with a dual control point machine.

A friction buffer was provided 50 metres on the Down side of Home WDR732. No vehicles are permitted to stand between the Home signal and the buffer stops.

Down Home 105 was abolished.

Diagrams 56/20 (North Ballarat Junction) & 22/20 (Wendouree – Beaufort) replaced 94/18 & 62/19 respectively.

22.01.2021 Parwan Loop – Ballarat East (SW 227/20, SW 2/21 & 3/21, WN 52 & 3)

Between Sunday, 27.12., and Wednesday, 22.1., the extended crossing loop at Bacchus Marsh was commissioned, long crossing loops were provided at Ballan and Millbrook; and the North Line (the original line) at Bungaree was closed.

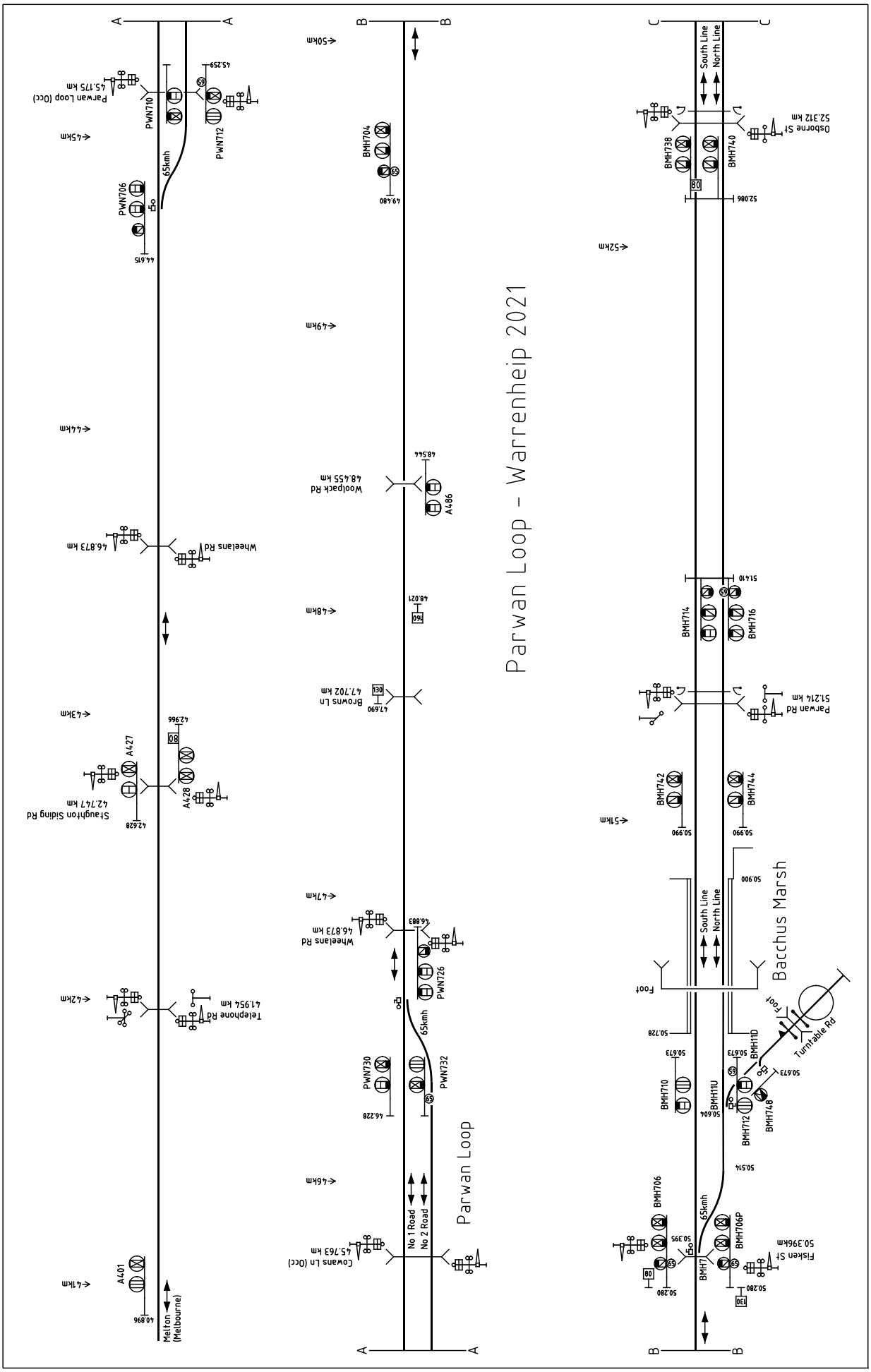
The safeworking sections are now: ATC: Parwan Loop – Bacchus Marsh – Rowsley Loop – Bank Box Loop – Ballan – Millbrook – Ballarat. The double track sections at Bacchus Marsh, Ballan, & Millbrook are worked under the Automatic Block Signalling rules on both the North & South Lines.

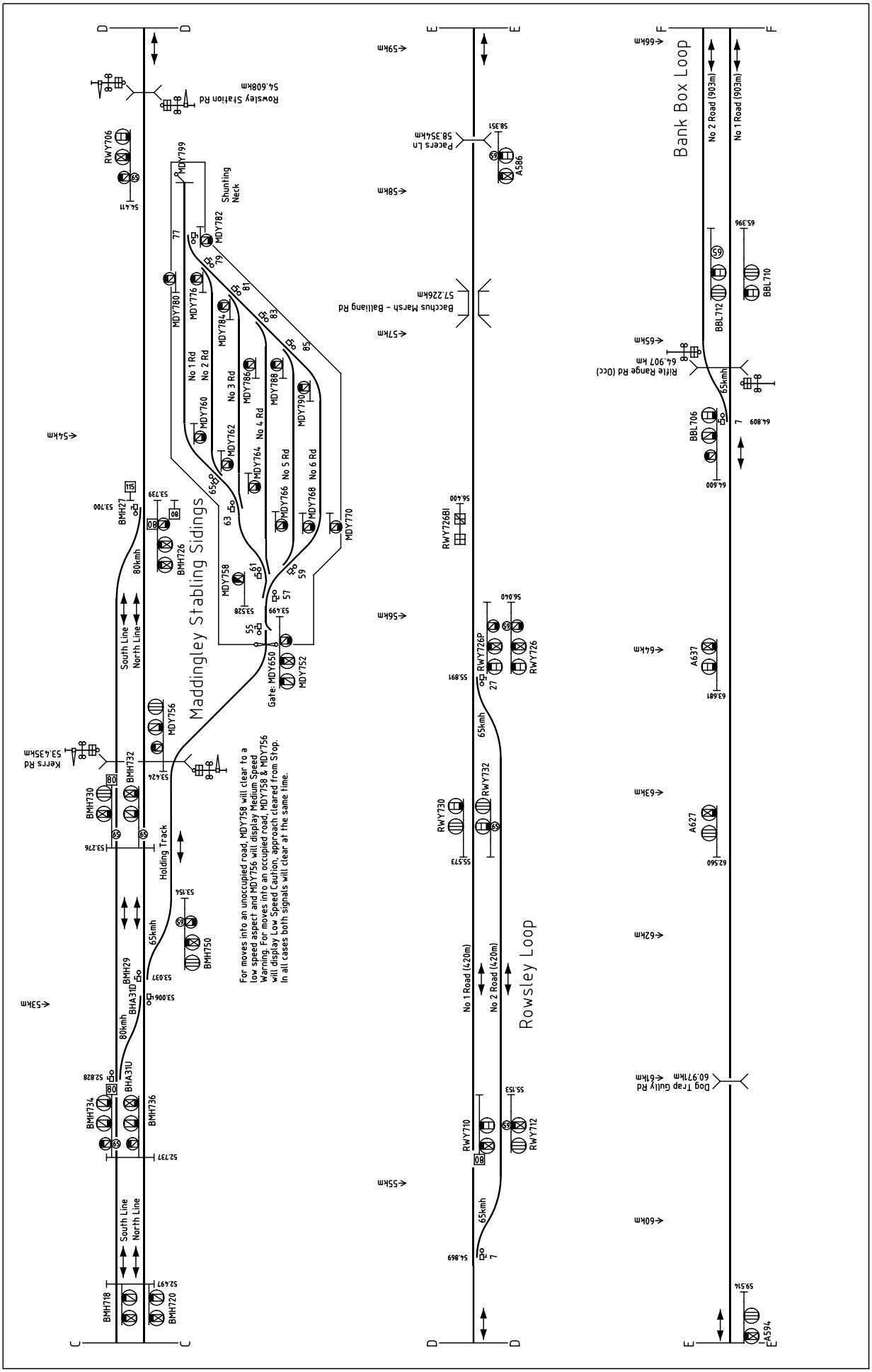
Parwan Loop – Ballan

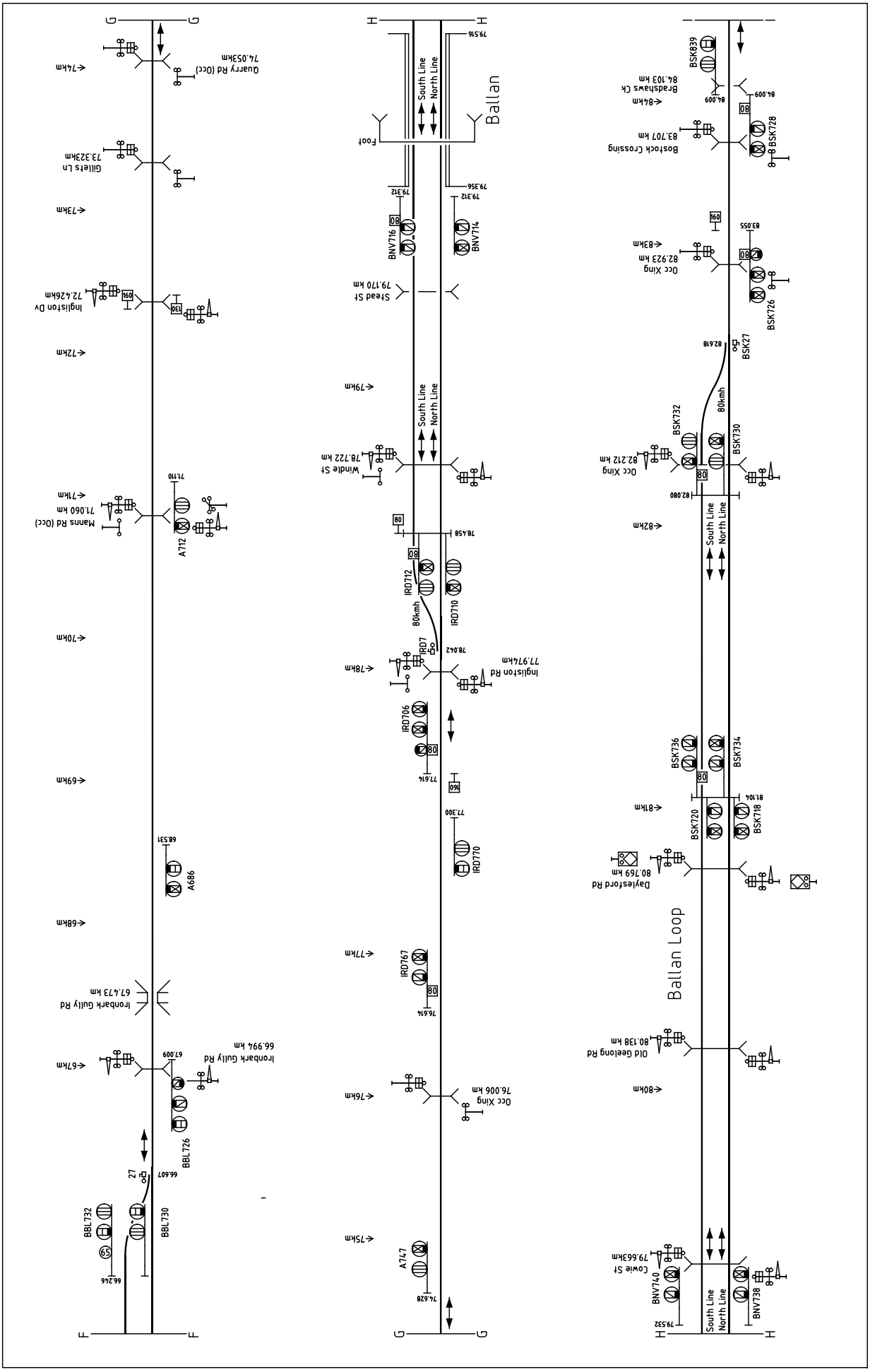
- Up Automatic A486 was redressed as a Home signal, but will retain its number. This intermediate Home signal has manual replacement/blocking function controlled from the corridor VDU.

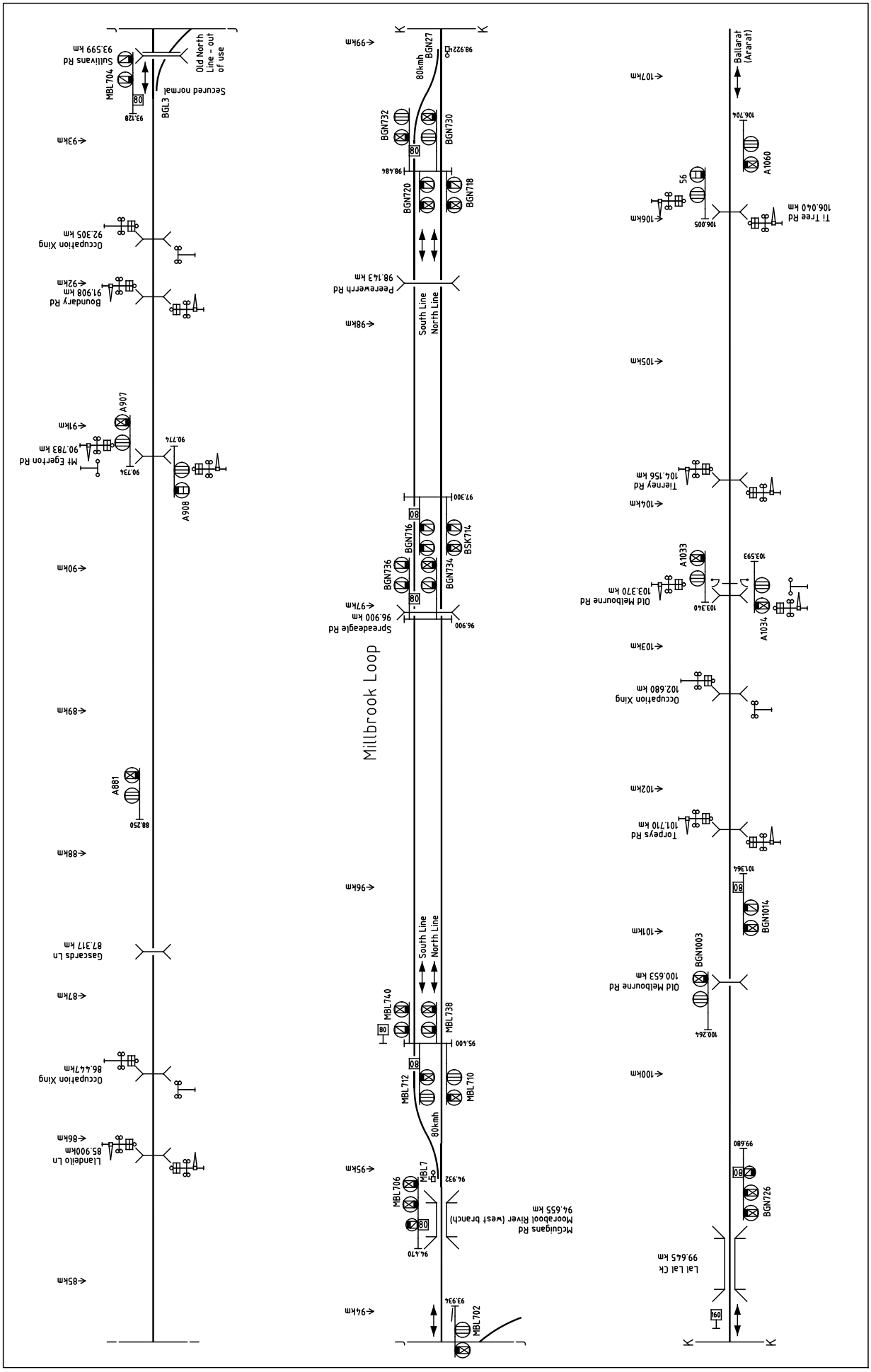
Bacchus Marsh

- The crossing loop was extended at the Up end to Fisken St and at the Down end nearly to Rowsley Loop. The existing No 1 Road was renamed the 'North Line', and No 2 Road the 'South Line'. A second platform was provided on the South Line.
- No 3 Road and Sidings B & C were abolished.
- Homes BMH710, BMH712, BMH714, BMH726, BMH728, BMH732, & BMH734 were abolished. Dwarfs BMH718, BMH736, BMH740, BMH744, BMH746, & BMH748 were abolished. Fixed signal BMH799 was abolished. Automatic A537 was abolished. Crossovers 9 & 27 were abolished. Points 25 were abolished. The Down 'T' board at 48.460 km was abolished. The Up notice board at Home BMH750 was abolished.
- Down Home BMH706 was renumbered BMH704 and was provided with an illuminated '65' indicator.
- Homes BMH706, BMH706P, BMH710, BMH712, BMH714, BMH716, BMH718, BMH720, BMH726, BMH730, BMH732, BMH734, BMH736, BMH738, BMH740, BMH742, & BMH744 were provided. Dwarf BMH748 was provided.
- Points BMH7 (65 km/h) were provided at the Up end of the extended crossing loop. The existing Points 11 to the Turntable Siding were renumbered BMH11U. A catch point was provided in the Turntable Siding and numbered BMH11D. Crossover BAH31 (80 km/h) was provided to form a connection from the South Line to the North Line and Maddingley Stabling Sidings. Points BMH27 (80 km/h) were provided at the Down end of the crossing loop. The points will be operated by dual control point machines.
- Automated pedestrian gates (with emergency gate control locks) were provided on the Down side of Parwan Rd.
- Train detection was altered to axle counters between BMH704 (49.480 km) and the Down side of Rowsley Station Rd (54.613 km).
- Fisken St (50.396 km), Parwan Rd (51.214 km), Osborne St (52.312 km) and Kerrs Rd (53.435 km) were altered to be worked by axle counters.


Parwan Loop - Warrenheip 2021
Parwan Loop
Bacchus Marsh
Melton (Melbourne)
A4401
Telephone Rd 41.954 km
Wheelans Rd 46.873 km
Straughton Siding Rd 42.747 km
A4427
A428
Parwan Loop (Occ) 45.175 km
PWN710
PWN712
PWN706
65kmh
Wheelans Rd 46.873 km
Woolpack Rd 48.455 km
A486
Browns Ln 47.702 km
PWN726
PWN730
PWN732
No 1 Road
No 2 Road
Cowans Ln (Occ) 45.763 km
BMH704
BMH706
BMH706P
BMH710
BMH712
BMH714
BMH716
BMH738
BMH740
BMH742
BMH744
BMH748
BMH11D
BMH11U
South Line
North Line
Osborne St 52.312 km
Parwan Rd 51.274 km
Fiskens St 50.396km
Turntable Rd
Foot
40kmh
45kmh
50kmh
65kmh
80
130
160


Maddingley Stabling Sidings
Rowsley Loop
Bank Box Loop
Rowsley Station Rd
54.608km
Shunting Neck
Pacers Ln
58.354km
Bacchus Marsh - Balliang Rd
57.226km
Rifle Range Rd (Occ)
64.907 km
Dog Trap Gully Rd
60.971km
Kerrs Rd
53.435km
No 1 Rd
No 2 Rd
No 3 Rd
No 4 Rd
No 5 Rd
No 6 Rd
South Line
North Line
Holding Track
No 1 Road (420m)
No 2 Road (420m)
No 1 Road (903m)
No 2 Road (903m)
80kmh
65kmh
For moves into an unoccupied road, MDY758 will clear to a low speed aspect and MDY756 will display Medium Speed Warning. For moves into an occupied road, MDY758 & MDY756 will display Low Speed Caution, approach cleared from Stop. In all cases both signals will clear at the same time.


Ballan Loop
Ballan
South Line
North Line
Foot
Daylesford Rd
80.769 km
Old Geelong Rd
80.138 km
Cowie St
79.663km
Bostock Crossing
83.707 km
Bradshaws Ck
84.103 km
Ocr Xing
82.923 km
Ocr Xing
82.212 km
Ocr Xing
76.006 km
Steed St
79.170 km
Windle St
78.722 km
Ingliston Rd
77.974km
Manns Rd (Ocr)
71.060 km
Ingliston Dv
72.426km
Gillets Ln
73.323km
Quarry Rd (Ocr)
74.053km
Ironbark Gully Rd
67.473 km
Ironbark Gully Rd
66.994 km
BSK839
BSK728
BSK726
BSK27
BSK732
BSK730
BSK736
BSK734
BSK720
BSK718
BNV740
BNV738
BNV716
BNV714
IRD712
IRD710
IRD707
IRD706
IRD770
IRD767
A747
A712
A686
BBL732
BBL730
BBL726
80kmh
82.618
82.080
81.104
79.532
79.516
79.356
79.312
78.458
78.042
77.614
77.300
76.614
76.628
74.628
71.110
68.531
66.607
66.246
84.009
83.055
80
60
27
59
82kmh
81kmh
80kmh
79kmh
78kmh
77kmh
76kmh
75kmh
74kmh
73kmh
72kmh
70kmh
69kmh
68kmh
67kmh


Millbrook Loop
Ballarat (Ararat)
Old North Line - out of use
Secured normal
Sullivans Rd 93.599 km
Occupation Xing 92.305 km
Boundary Rd 91.908 km
Mt Egerton Rd 90.783 km
Gascards Ln 87.317 km
Occupation Xing 86.447km
Llandello Ln 85.900km
Spreadeagle Rd 96.900 km
Peereverrh Rd 98.143 km
McGuigans Rd Moorabool River (west branch) 94.655 km
Old Melbourne Rd 100.653 km
Occupation Xing 102.680 km
Old Melbourne Rd 103.370 km
Tierney Rd 104.156 km
Torpeys Rd 101.710 km
Ti Tree Rd 106.040 km
Lal Lal Ck 99.645 km
South Line
North Line
80kmh
BGL3
MBL704
MBL702
MBL706
MBL7
MBL710
MBL712
MBL738
MBL740
BGN27
BGN718
BGN720
BGN730
BGN732
BGN734
BGN736
BSK714
BGN716
A881
A907
A908
A1033
A1034
BGN1003
BGN1014
BGN726
A1060
56
V/L
85km
86km
87km
88km
89km
90km
91km
92km
93km
94km
95km
96km
97km
98km
99km
100km
101km
102km
103km
104km
105km
106km
107km

Maddingley Stabling Sidings

- Up Home BMH750 was relocated 22 metres in the Down direction.
- Up Home MDY752 was altered to display Reduce to Medium Speed and Low Speed aspects.
- Down Home MDY756 was relocated 14 metres in the Down direction and altered to display Medium Speed indications.
- Dwarf MDY758 was replaced by a ground mounted Down Home that will only display Stop and Low Speed Caution.

Rowsley Loop

- Up Home Departure RWY710 was altered to display Reduce to Medium Speed and Medium Speed indications and was provided with an illuminated '80' indicator.
- Up Home Arrival RWY726 and RWY726P and Banner Indicator RWY726BI were altered to display Reduce to Medium Speed.

Rowsley Loop – Bank Box Loop - Ballan

- Automatics A586, A594, A627, A637, A686, A712, & A747 were redressed as Home signals, but will retain the same number. These intermediate Home signals have manual replacement/blocking function controlled from the corridor VDU.

Ballan

- A crossing loop was provided between 78.042 km and 82.618 km. The existing main line was renamed the 'North Line' and the new crossing loop the 'South Line'. A new platform was provided on the South Line.
- Homes IRD706, IRD710, IRD712, IRD767, IRD770, BNV714, BNV716, BNV738, BNV740, BSK718, BSK720, BSK726, BSK728, BSK730, BSK732, BSK734, BSK736, BSK839 were provided.
- Points IRD7 (80 km/h) were provided at the Up end of the crossing loop and BSK21 (80 km/h) at the Down. The points will be operated by dual control point machines.
- Train detection was altered to axle counters between 75.740 km on the Up side of the Occupation crossing (75.982 km) and 84.009 km (Homes BSK728/BSK839).
- The level crossing protection equipment at Occupation Crossing (76.006 km) (Up trains only), Ingliston Rd (77.974 km), Windle St (78.722 km), Cowie St (79.663 km), Old Geelong Rd (80.138 km), Daylesford Rd (80.769 km), Occupation Crossing (82.212 km), & Occupation Crossing (83.707 km) (Down trains only) were converted to axle counter operation. The level crossing predictor boards were abolished.
- Automatics A785, A790, & A822 were abolished.

Ballan – Bungaree East End

- Automatics A881, A907, & A908 were redressed as Home signals, but will retain the same number. The '65' indicator on A907 was abolished. These intermediate Home signals will have manual replacement/blocking function controlled from the corridor VDU.
- Banner Indicator A907BI was abolished.

Bungaree – Millbrook

- The Bungaree North line between 90.000 km and 106.594 km was abolished. Points BGL3 were retained to provide access to the former North line, now renamed a Maintenance Siding. The points are secured in the normal position and baulks are provided at 93.284 km and 94.194 km on the abolished line. The Maintenance siding is not available for rail vehicles.
- Homes BGL718, BGL728, BGL734, & BGL736 was abolished. Automatics A953, A954, A979 & A980 on the former South Line were abolished. Automatics AA952, AA976, AA1031, & AA1051 on the former North Line were abolished.
- The level crossings at Old Melbourne Rd (94.411 km), Wescotts Rd (97.952 km), Bungaree/Wallace Rd (98.444 km), Bungaree/Wallace Rd (102.639 km), and Lester Rd (103.827 km) were abolished.
- Points BGL5 at Bungaree West End were abolished.
- The passive 160 speed signs at 93.160 km (Up trains) and 102.025 km (Down trains) were abolished.
- Millbrook Loop was provided between 94.932 km and 98.922 km. The existing main line was renamed the 'North Line' and the new crossing loop the 'South Line'.
- Points MBL7 (80 km/h) and MBL27 (80 km/h) were provided. The points will be operated by dual control point machines.

(Continued on Page 18)

WILLIAM ROBINSON & THE TRACK CIRCUIT

Andrew Waugh

William Robinson invented the track circuit, one of the key innovations in railway signalling. His innovation is particularly noteworthy as other key innovations – block signalling and interlocking – were the result of a number of people gradually refining ideas. The DC track circuit invented by Robinson in 1872 was complete in all its essential features, and the basic conception of his track circuit hasn't changed in nearly 150 years.

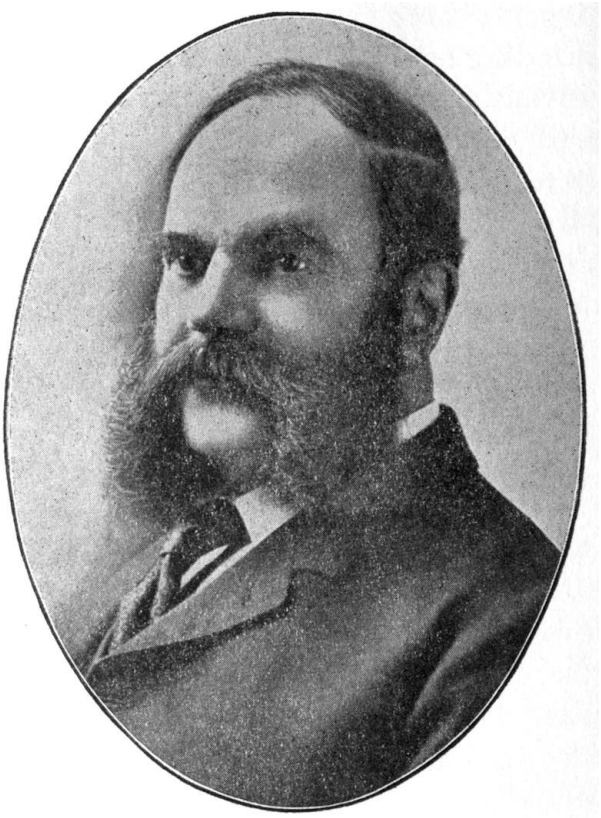
Robinson's tale is an interesting contrast to his contemporary, Thomas Hall. Hall kept sole ownership of his signalling technology, building up a small family business that survived in family hands for about forty years. By contrast, after five years of demonstrations, Robinson involved entrepreneurs, successfully sold his invention to them, but was then forced out by his colleagues.

William Robinson

William Robinson can best be described as a professional inventor. Apart from the track circuit, Robinson developed a moderately successful three axle radial truck for tramway use, held a key patent in the development of the bicycle coaster (back pedal) brake, and patented roller bearing skates, spot welding, and improvements to turbines.

Robinson was born on 22 November 1840 in Coleisland, County Tyrone, Ireland (now Northern Ireland)[1]. His parents, John Robinson and Mary E. Robinson (nee Clarke) were described as of Scotch-Irish and English descent. The family emigrated to the United States around 1845. In the 1860 census, what was probably the family was recorded as living in Brooklyn. The household was headed by Mary Robinson (58), with children Sarah A Robinson (24), James Robinson (22), Mary J Robinson (20), and William (20). Sharing the house was Sarah Painter (19), born in New Jersey, and a one month old baby, William, born in New York.

Robinson received a B.A. in 1865 from the Wesleyan University, Middletown, Connecticut. Going to university strongly suggests that the family were reasonably well off. After graduating Robinson became a school teacher. He was the principal and a natural science teacher at the Ansonia, Connecticut, high school in 1865-6. In 1866 he briefly worked in the oil region of Western Pennsylvania. He returned to teaching in 1867 at Stamford, Connecticut. During 1867-69, he served as a principal of Spring Valley Academy, Spring Vale, New York. In 1868 he received an M.A. from the Wesleyan University. He returned to the western Pennsylvania oil industry between 1869-1872,



during which time he invented the track circuit. In 1870 it is known that he was living in the township of Petroleum Center, PA[2], and in September 1872 in the town of St Petersburg, Clarion County, PA.

Between 1872 and 1877, Robinson appears to have been engaged in promoting the track circuit, first in Pennsylvania and then in Boston. At the beginning of 1878 he was involved in floating the Union Electric Signal Company, to which he sold his patents. Robinson then left on a 15 month tour of Europe and Palestine, and took no further part in the development of the track circuit.

Robinson then turned his attention to other fields of invention. He received his first patent for a three axle radial truck for tramway use in 1881. This rotated the outer axles of a three axle car, allowing a longer car with reduced friction in curves. His design was a minor success – around 200 were supplied, the most of any similar design in the US. Long term, bogie cars, of course, were the preferred solution.

In 1907 he received a PhD from Boston University; the course included electrical and mechanical engineering. He joined the American Institute of Electrical Engineers in 1909 and became a fellow of the Institute in 1913. His

[1] It has proved to be surprisingly difficult to find details of William Robinson's life – even the details of his family's entry into the US couldn't be found. Most of the details of Robinson's life have been taken from 'William Robinson, Railroad Signal Innovator', Donald F. Morrison, Railroad History, No 203 (Fall-Winter 2010), p51-55 retrieved from JSTOR https://www.jstore.org/stable/43525154, and obituaries in the Brooklyn Daily Eagle of 4 January 1921 p1, https://www.newspapers.com/image/57089668/?article=8d99524d-e7e1-4a72-a116-e2e62d2c1f24&focus=0.19311929%2C0.17093658%2C0.32514748%2C0.51509446&xid=3355, and in the Journal of the American Institute of Electrical Engineers, February 1921, p166.

[2] Petroleum Centre is now a ghost town in western Pennsylvania. It was founded in 1866, briefly boomed, and was essentially abandoned in 1873.

references included Frank J. Sprague, and Professor Elihu Thomson.

Robinson died of a heart attack on 2 January 1921. At this time he was living at 687 Putman Ave, Brooklyn. Robinson never married, but was survived by nine nieces and nephews.

Most of what we know about Robinson's invention of the track circuit comes from an extraordinarily libellous book self-published by Robinson in 1906[3]. At the beginning of 1906 there were around 6,200 miles of automatic block signalling in the US which were entirely based on the DC track circuit. The track circuit was by far the most successful of all Robinson's inventions and he was aggrieved that not only had the industry had forgotten that he was the original inventor of the track circuit, but that the industry was actively supressing his role.

Robinson's purpose in writing the book can best be described by his words in the preface:

> The reason for this anomalous condition [the lack of information about the origins of automatic block signalling] is that the heads of these signal companies are systematically supressing the facts of history and putting out the signal systems fraudulently under their own pseudonyms for the purpose of appropriating to themselves credit and reputation belonging not to them but to another.

He specifically named George Westinghouse, the Union Switch and Signal Company, and the Hall Signal Company as culprits.

In view of these "systematic efforts of interested parties to bury the truth in muck and supplant it by satanic falsehood," Robinson decided to write an authentic history of automatic electric railroad signalling for the "vindication of his own reputation as an epoch making inventor, the verity of outraged history which is being daily perverted by audacious 'grafters' of his reputation [and] the duty of exposing the thieving jackals and rapacious gray wolves of graft that beset the footsteps of every creator of a valuable invention."

Robinson was successful in gaining acknowledgement of his invention of the track circuit. So much so that when he died in 1922, the Signal Section of the American Railroad Association published a small book on Robinson and his invention.

Much of the following description of the history is based on Robinson's 1906 book. Given its purpose and heavily polemical style, the book does need to taken cautiously. It seems to be generally accurate, but Robinson invariably puts the most favourable gloss on events.

The precursor to the track circuit

Robinson describes his motivation and original idea for signalling as follows:

> About 1867 Mr William Robinson, then a recent graduate from college, entered actively upon the development of an automatic signal system for preventing accidents of various kinds on railroads. His attention was called to the subject by the consideration of certain railroad accidents which had occurred, and for the prevention of which there were no adequate means known.
>
> From this starting point he developed such a system, and in 1869, constructed an elaborate model illustrating the same, which he exhibited at the American Institute Fair in New York city, in 1870.
>
> This model was in continuous and perfect operation throughout the duration of the fair.

The American Institute of New York was a society promoting science, industry and the arts. It held a large annual fair that was intended to showcase American arts, manufacturers, and inventions. The scope of the fair was enormous and eclectic. In the September 1870 fair, for example, one hall was filled with paintings, while another contained two large stationary steam engines on which elaborate efficiency tests were conducted. The annual report of the society for that year noted that Robinson had gained an honourable mention for his 'electro-magnetic railway signals' in Department VI, Group 4 (Department of Intercommunication/communications)[4]. It is notable that the American Institute did not include Robinson in Group 1 which dealt with railways, including all apparatus used in operating railways. This suggests that Robinson's exhibit may not have been included with the other railroad exhibits, which could partially explain the lack of interest in his invention.

A curious feature is that Robinson does not mention in his book the three patents that he obtained at this time for railroad signalling equipment. This may be because none of the patents were for automatic block signalling per se, and consequently did not support the narrative he was trying to establish. The first two patents were granted on 19 July 1870. The first, No 105,493, was for an 'Electromagnetic gate and signal apparatus for railroads' – essentially a treadle operated boom barriers. This will be discussed in the next section. Patent 105,494 was also for a boom barrier mechanism – in this variant a treadle was used initiate the boom barrier operation, but a mechanical timer was used to raise the barriers after a set period. On 25 October 1870, Robinson was granted a patent for an 'Improvement in electro-magnetic railroad-signals'. This patent (108,633) was essentially an approach operated

[3] History of automatic electric and electrically controlled fluid pressure signal systems for railroads, William Robinson, Crist. Scott & Parshall, Cooperstown, NY, 1906. The description of the development of the track circuit was subsequently republished verbatim in 'The invention of the track circuit', published by the Signal Section of the American Railway Association in 1922 to commemorate Robinson's work. The Signal Section did not, however, reprint the portions of Robinson's work that attacked the signal industry or George Westinghouse. A third source on the history of the development of the track circuit is an article on William Robinson in the Railway Signal Engineer, Sept 1916 p259-61. Although based on Robinson's book, the author of the article clearly interviewed Robinson and it contains a number of technical details not available elsewhere.

[4] Annual Report of the American Institute of the City of New York for the years 1870-71, p50 https://hdl.handle.net/2027/uc1.b3021986

switch detector. It detected the position of a set of facing points, but only gave an alarm if a train passed over a treadle approaching the switch.

It is worth comparing Robinson's position in 1870 with Thomas Hall. Hall had patented his first railway signalling invention in 1867 – an impractical switch detector. In 1869 he patented the forerunner of his enclosed disc signal and several applications that would use it – an improved switch detector, a drawbridge detector, and a latched version of his signal to protect level crossings. In 1870 he patented a treadle intended for use to control level crossings and further improvements to his signal. Around 1870, the Hall system was applied to a drawbridge and it appears that this system was in use until in 1880. At this time, Hall was clearly in advance of Robinson, but both were clearly working in the same field.

There seemed to be little interest in Robinson's invention at the fair.

> At the close of the fair Mr Robinson had some of his descriptive circulars left over. These he immediately sent out to railroad companies at random.

Robinson's book includes a portion of a circular issued by him in 1870 describing the application of his railroad signalling system. This is almost certainly from the circular produced for the Fair and sent out afterwards. It shows the applications that Robinson had in mind at that time for his invention:

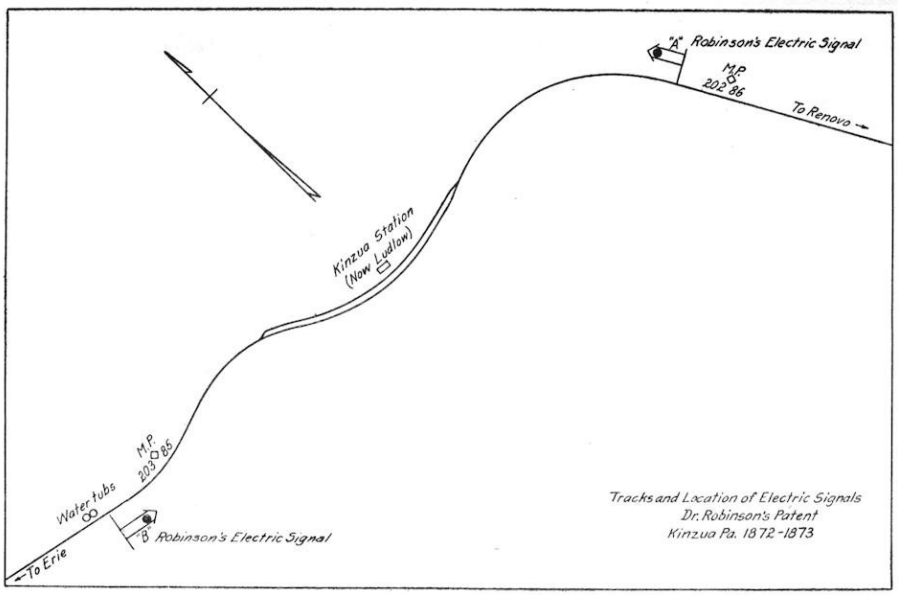
> CURVE AND TUNNEL SIGNALS.
>
> A train approaching a curve will throw up a red signal around the curve as a warning to trains from the opposite direction, and will also exhibit a signal in its rear. Thus, collisions from front or rear are guarded against. These signals many be used throughout the whole extent of a road.
>
> In entering a tunnel a train will exhibit a signal at the other end to indicate its entry, and when it gets through it will lower the signal and ring a bell at the opposite end to indicate its exit
>
> STATION SIGNALS.
>
> A train when it leaves a station, and at various points as it passes, will indicate to the stations along the line its Location, Direction, Rapidity and Length. Thus all necessary information regarding moving trains will be automatically announced every few minutes at the stations.
>
> SWITCH AND DRAW-BRIDGE SIGNALS.
>
> If a switch or draw-bridge is misplaced an approaching train will set an alarm ringing at the station and will also exhibit a red signal ahead of the train as a warning to the engineer that the switch is misplaced.

It is clear that Robinson's main focus at this time was the use of isolated signals used to protect discrete points of danger. In one area, Robinson appears to have been conceptually in advance of Hall: Robinson clearly had in mind signals automatically operated by trains to warn other trains. Robinson continued:

> One of these circulars at least, was a seed sown in good ground. It elicited an immediate response from Mr William A Baldwin, General Supt of the Philadelphia and Erie Railroad, with the result that Mr Baldwin, who was an old telegraph operator and a very able and progressive railroad man, on looking into the system was so impressed with its practicability and importance that he at once arranged with Mr Robinson to make an installation of the system on his road. […]
>
> This installation was made at Kinzua, Pa, [in 1871] and after a little experimenting was soon in perfect working order, performing all claimed for it, and considered satisfactory by the railroad company.

The Philadelphia & Erie Railroad connected the town of Sunbury in central Pennsylvania with Erie on the shores of Lake Erie. The line had been chartered in 1837 as the 'Sunbury and Erie Railroad', but construction did not commence until 1852. Construction progress was slow. The Pennsylvania Rail Road took control of the P&E in 1862 and the single track line had been completed in 1864.

Figure 1. A plan of the trial installation at Kinzua (Ludlow) in 1871, which were reused for the track circuit trial in 1872. The veracity of this drawing cannot be determined; it was included in 'The Invention of the Track Circuit' published in 1922 by the Signal Section of the American Railroad Association, and many have been based on interviews with old employees.



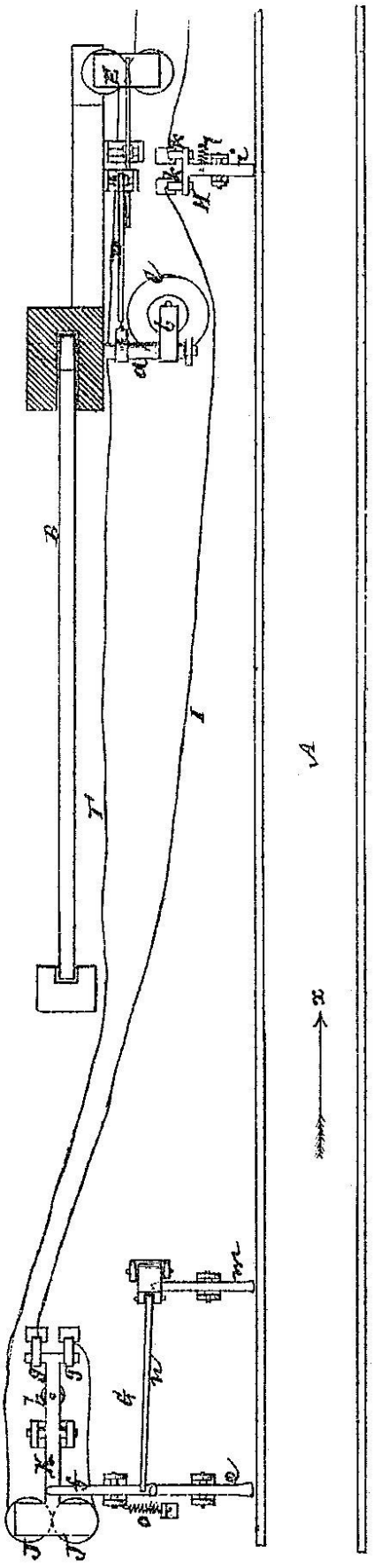


Figure 2. The train detection from Robinson's Patent 105,493 which appears to be almost identical to that used by Robinson at Kinzua in 1871. This patent was for a boom barrier protecting a road level crossing. The 'on' treadle and stick relay is at the left hand end of the drawing; and the 'off' treadle is at the right hand end.

The line followed a sinuous course across north western Pennsylvania through the Appalachian mountains[5].

Kinzua is the modern village of Ludlow, PA[6]. Even today, Ludlow is remote – deep in the Allegheny National Forest in the narrow and winding valley of the TwoMileRun river which the railway follows from Sheffield east to a summit near Kane. One possible reason for choosing such a remote location to trial the new system was that Robinson was working in the Pennsylvania oil industry at the time – about 65 km away as the crow flies – but there would be far more accessible sites on the P&E than Ludlow.

The installation at Kinzua was not an automatic block system as we would understand it today. A plan (Figure 1) shows that the two signals provided protected the siding at Kinzua. Trains passing one of these signals when arriving at the station would put both to danger until the train left the station past the other signal. The station agent could also place the signals to danger using a switch at the station.

While Robinson claimed the system "work[ed] perfectly and accomplish[ed] all claimed for it". However, it is likely that, while it did work, it did not work reliably.

Hall's first automatic block signalling patent was granted at much the same time as Kinzua installation was brought into service.

Robinson's first mechanism

From the description in his 1906 book, the train detection mechanism of the first Kinzua trial was identical to that used in his model at the American Fair, and it appears to be almost identical to that proposed in his 1870 boom barrier patent (Figure 2).

In the figure, the train is approaching the level crossing from the left. When the 'on' treadle (e) is depressed, the treadle lever mechanically raises the armature (K) of an attached relay and makes the relay's front contact (g-g). This feeds current to the relay coils (J-J) which hold up the armature, and the relay 'sticks' up when the wheels leave the treadle. The current is also fed to the boom barrier mechanism (essentially a long pull magnet), but Robinson notes it could also operate one or more signals. A second 'off' treadle (H) is provided at the crossing. Depressing this treadle opens a contact and cuts the feed to the relay, which drops and resets the circuit. The 'on' treadle has a second treadle arm (m). If this is depressed by a train travelling from the right, it mechanically disengages the primary treadle arm from the relay, thus preventing operation of the relay. In this patent, Robinson almost

[5] Almost all of the line was still in use in June 2019. The western half is now owned by the Buffalo and Pittsburgh Railroad, a subsidiary of the Genesee and Wyoming, and the eastern half by the Norfolk Southern https://gis.penndot.gov/BPR_pdf_files/MAPS/Statewide/parail.pdf

[6] An 1871 map of the Philadelphia & Erie (https://www.loc.gov/item/98688771/) shows Kinzua to be 6.6

invented the stick relay – a fundamental signalling circuit where a relay is held up by a feed over one of its own front contacts.

This circuit, as shown in his patent, has two major problems, one which would make it dangerous, and a second that would make it unreliable.

The major problem was the contact in the 'off' treadle. If this did not close (due to wear or damage), or became high resistance (due to corrosion), the signal would not operate at all. This was the one aspect of the circuit that was different in Robinson's 1906 description of the circuit in the model and at Kinzua: "In the model described the reversing lever operated to open the relay circuit by cutting off the battery therefrom by short circuiting." Exactly how this worked is not clear, but a likely possibility is that the contact in the 'off' treadle was reversed so that it made when a wheel passed, and that this short circuited the rest of the circuit by provided a low resistance path across the battery (not shown, but off the drawing to the right). The advantage of this approach is that a failure of the treadle contact to close would simply prevent the signal from ceasing to operate. We will never know, but if this interpretation is correct Robinson was getting very close to the concept of a track circuit.

The second problem, which was apparently common to the patent, the model, and the installation at Kinzua, was the combination of the 'on' treadle and the relay. Experience with track mounted equipment has since shown that the track is, mechanicall, a very hostile environment – with significant vibration and heavy impacts as the wheels pass.

Hall developed at least three designs of treadle before he produced one that was successful in this operating environment. It was extremely likely that Robinson's combination treadle and relay was extremely failure prone. It is quite possible that Robinson developed the track circuit because his treadles were not sufficiently robust for reliable operation.

British patents

On 30 August 1871, Robinson obtained British Patent 2280 covering 'Electric gate and signal apparatus for railroads". This covered the use of compressed air to operate a level crossing gate or a signal, and controlled by electricity (possibly, in turn, controlled by the location of a train.). This patent was also issued in France on 29 February 1872 with the addition of the closed track circuit.

SIGNALLING ALTERATIONS

(Continued from Page 13)

- Home BGL704 was renumbered MBL704 and was provided with an '80' indicator. Home BGL716 was renumbered MBL702.
- Homes MBL706, MBL710, MBL712, MBL738, MBL740, BGN714, BGN716, BGN718, BGN720, BGN726, BGN730, BGN732, BGN734, BGN736, BGN1003, & BGN1014 were provided.
- Train detection was altered to axle counters between 93.932 km (Home MBL702) and 101.364 km (Home BGN1014).

Millbrook – Ballarat East

- Automatics A1033, A1034, A1060 & A1147 were redressed as Home signals but will retain the same number. These intermediate Home signals will have manual replacement/blocking function controlled from the corridor VDU.

General

- TPWS was provided at all Home signals.
- All points and signals are worked from the corridor VDU at Centrol.

Diagrams 102/19 (Melton – Parwan Loop), 112/19 (Bacchus Marsh – Rowsley), 106/19 (Bank Box – Ingliston), 108/19 (Ballan – Gordon), 100/19 (Millbrook Loop) & 116/19 (Warrenheip – Ballarat East) replaced 88/19, 104/19, 18/19, 48/19, 114/19 (Bungaree), and 188/11 respectively.

End£

miles east of Sheffield. The July 1882 Official Guide shows Ludlow to be 7 miles east of Sheffield.