

Route Access Standard

General Information

Applicability

ARTC Network Wide

SMS

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Amendments to the RAS are published at the following link

<https://www.artc.com.au/customers/standards/route/access/>

Refer to ERG-38-01 Route Access and Operations Standards Glossary for terms used throughout the RAS and their definitions

All changes in this document are highlighted with this colour

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1 Rolling Stock

1.1 Registration and Warranty

All rolling stock (including locomotives) to be operated on the ARTC Network shall be registered with ARTC per the Registration of Rolling Stock procedure ERP-32-01. ARTC shall enter registration data into an ARTC maintained database with data and operating conditions that are relevant to the ARTC RAS published in **RAS Appendix C – Rolling Stock Data**. The following test and trial scenarios shall be managed by a **Route Access Condition Notice (RACN)**:

- new and modified vehicles that are being assessed through operational tests for registration,
- alterations to approved train configurations where applicable operating conditions are prescribed in the Route Access Standard or Section Pages. E.g. alterations to route capacity tables.

When new rolling stock is added to a fleet, or if rolling stock operational or engineering characteristics are modified, the Operator or rolling stock leasing company shall provide ARTC with a written warranty that the rolling stock complies with and will be operated and maintained in accordance with the ARTC Rolling Stock Standards and Access Agreement.

Registration of rolling stock will be in accordance with **ARISO (formerly RISSB)** and ARTC interface standards. Locomotive and rolling stock data to be provided by the Operator to ARTC shall include but not limited to:

- automatic equipment identification
- maximum axle loading (tonne/axle)
- maximum speed (empty)
- maximum speed (loaded)
- number of axles
- number of platforms
- tare weight (tonne)
- tractive horsepower (locomotive)
- maximum axle loads
- length over couplers
- unique vehicle description (class and number)
- rolling stock type (e.g. passenger type, freight hopper, locomotive type)
- rolling stock outline

Operators shall establish systems and manage all requirements associated with managing their registered rolling stock fleet, whether leased or owned, to ensure only rolling stock that is fit for use on the ARTC Network is allocated for access to any or all the ARTC Network.

All standard gauge rolling stock shall be fitted with an automatic equipment identification (AEI) tag for identification by ARTC Wayside equipment and assigning of data as measured. Track maintenance vehicles may be excluded from this requirement.

Operators shall manage consists and loading for all pathing in accordance with the Route Access Standard Section Page route capacity tables.

1.2 Wheel Profiles

Operators shall establish systems and manage all requirements associated with ensuring compatible Australian standard wheel profiles are used on the ARTC Network as set out in Table 1.2.

Rolling stock with worn wheel profiles may continue to be used provided re-profiling to the correct standard is scheduled as part of a regular rolling stock maintenance program.

Where vehicles are redeployed the operator shall ensure that the wheel profiles are compatible with the appropriate wheel profile for the ARTC Network.

Table 1.2- ARTC Network Compatible Wheel Profiles

WHEEL PROFILE	AREA
ANZR-1*	DEFINED INTERSTATE RAIL NETWORK
	HEAVY HAUL NETWORK
	INTRASTATE NETWORK
WPR 2000*	HEAVY HAUL NETWORK (FOR COAL TRAFFIC ONLY)
* for more details: refer to AS 7514.2 Appendix A	

1.3 Wheel Tread Hollowing

Excessive wheel tread hollowing can cause damage to rails or to wheels themselves.

Wheel hollowing is permitted up to 3mm as defined in the RISSB Industry Standards – Wheel Defects Code of Practice.

Operators shall establish systems and requirements to manage wheel tread hollowing, in accordance with RISSB Industry Standards – Wheel Defects Code of Practice.

2 Route Standards

2.1 Train Numbering

Train Numbering is updated and maintained on the ARTC website, covering the whole network. ARTC owns and issues train numbers for the ARTC Network. For all information related to train numbering, refer to **Route Access Standard Appendix B - Train Numbering**.

2.2 Train Speeds and Axle Load Limits (Wagons)

Operators negotiate with ARTC for train paths that give them access to the ARTC Network. Train paths are identified in Access Agreements as network train entry and exit times. Typical train types operating on the ARTC Network, their speed and axle load limits are set out in Table 2.2.1.

Table 2.2.1 Train Speed and Axle Load Limits for ARTC Network Operations

TRAIN TYPE	TRAIN SPEED (KM/H)	AXLE LOAD (TONNE)	TRAIN TYPE EXAMPLES
EXPRESS PASSENGER	ABOVE 115	UP TO 19	XPT, INTRA-URBAN, INTRASTATE
PASSENGER	MAXIMUM 115	UP TO 19	LONG DISTANCE PASSENGER
EXPRESS FREIGHT	MAXIMUM 115	UP TO 20	INTERMODAL
SUPER FREIGHT	MAXIMUM 110	UP TO 21	INTERMODAL, LAND BRIDGING
REGULAR FREIGHT	MAXIMUM 80	UP TO 23	STEEL, ORE, CEMENT, CONCENTRATES
HEAVY FREIGHT	MAXIMUM 80	UP TO 25	LIMESTONE / COAL
STANDARD FREIGHT	MAXIMUM 80	UP TO 23	GENERAL FREIGHT INCLUDING GRAIN, MINERALS, STEEL PRODUCTS. ²
HUNTER VALLEY COAL	MAXIMUM 60 ¹	UP TO 30	COAL

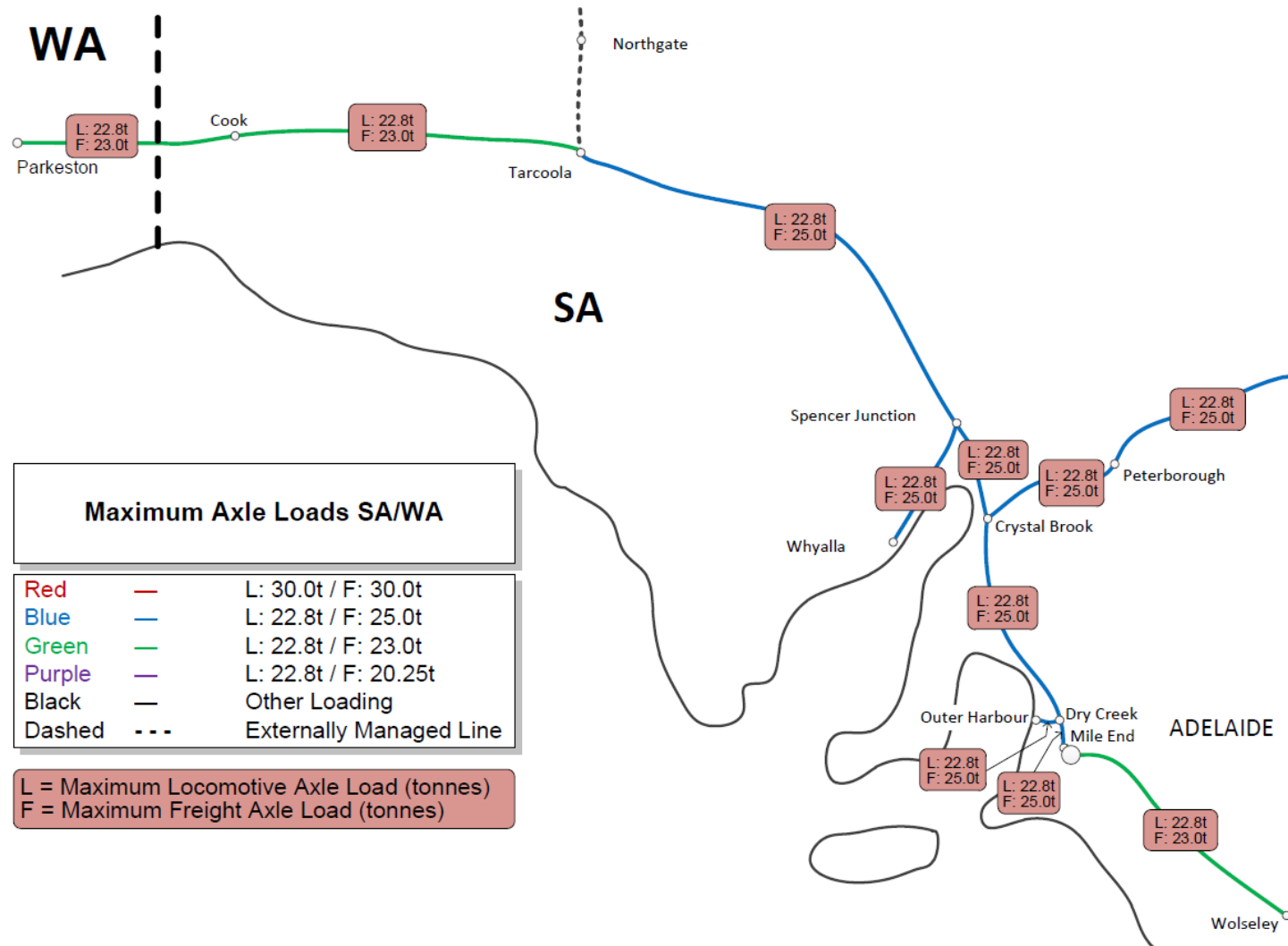
*UNLESS SPECIFICALLY EXCLUDED, AXLE LOADS PERMITTED TO OPERATE ON MAIN LINES ARE PERMITTED TO OPERATE IN SIDINGS.

FOR MORE DETAILED INFORMATION ABOUT SPEED AND AXLE LOAD LIMITS FOR WAGONS AND LOCOMOTIVES, REFER TO THE ROUTE CAPACITY TABLE IN THE APPROPRIATE RAS SECTION PAGE.

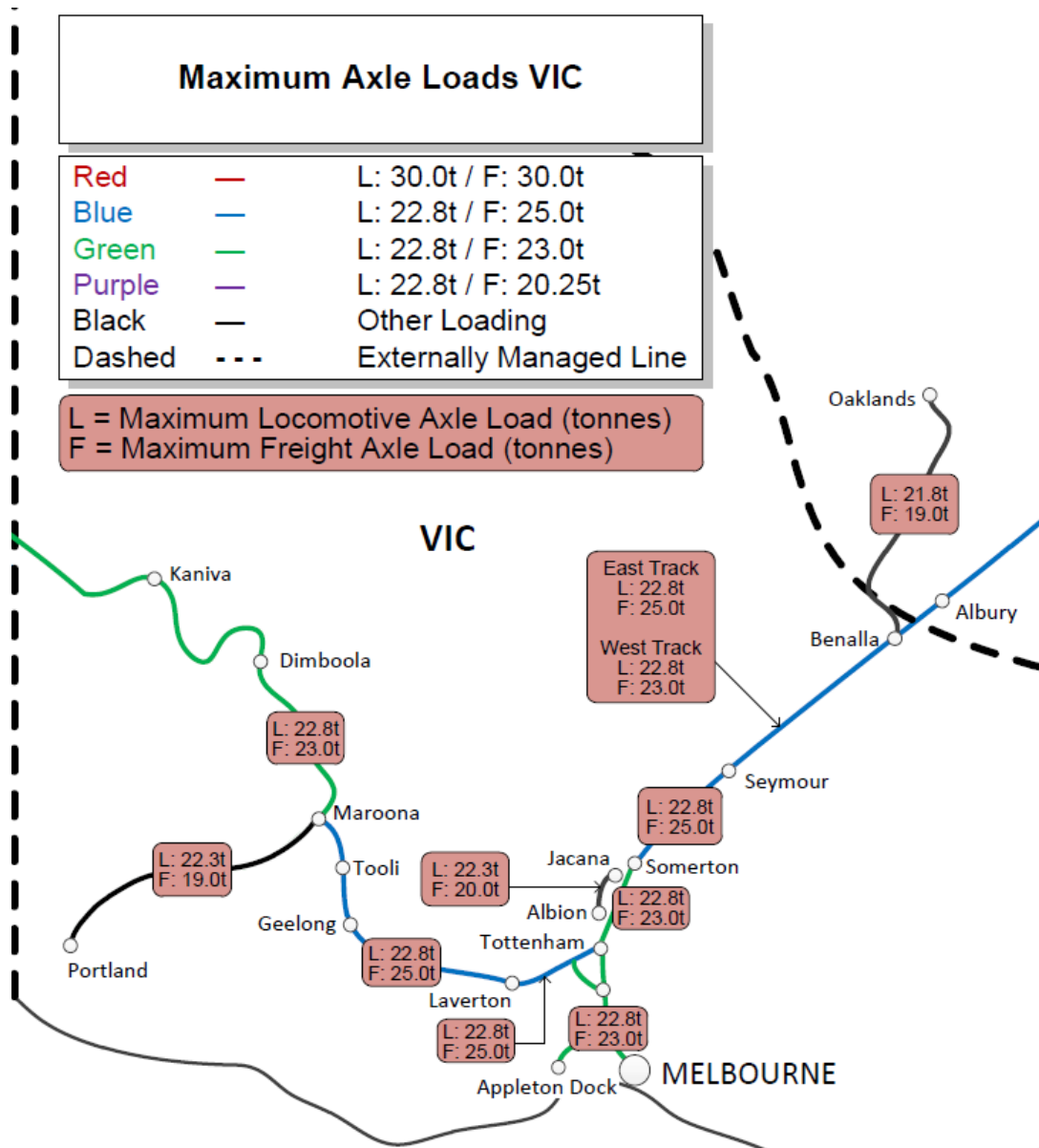
Note: ¹ Higher speeds apply on certain track sections. See section pages for specific corridor speed and axle load details.

² Ad-hoc movements (non-contracted).

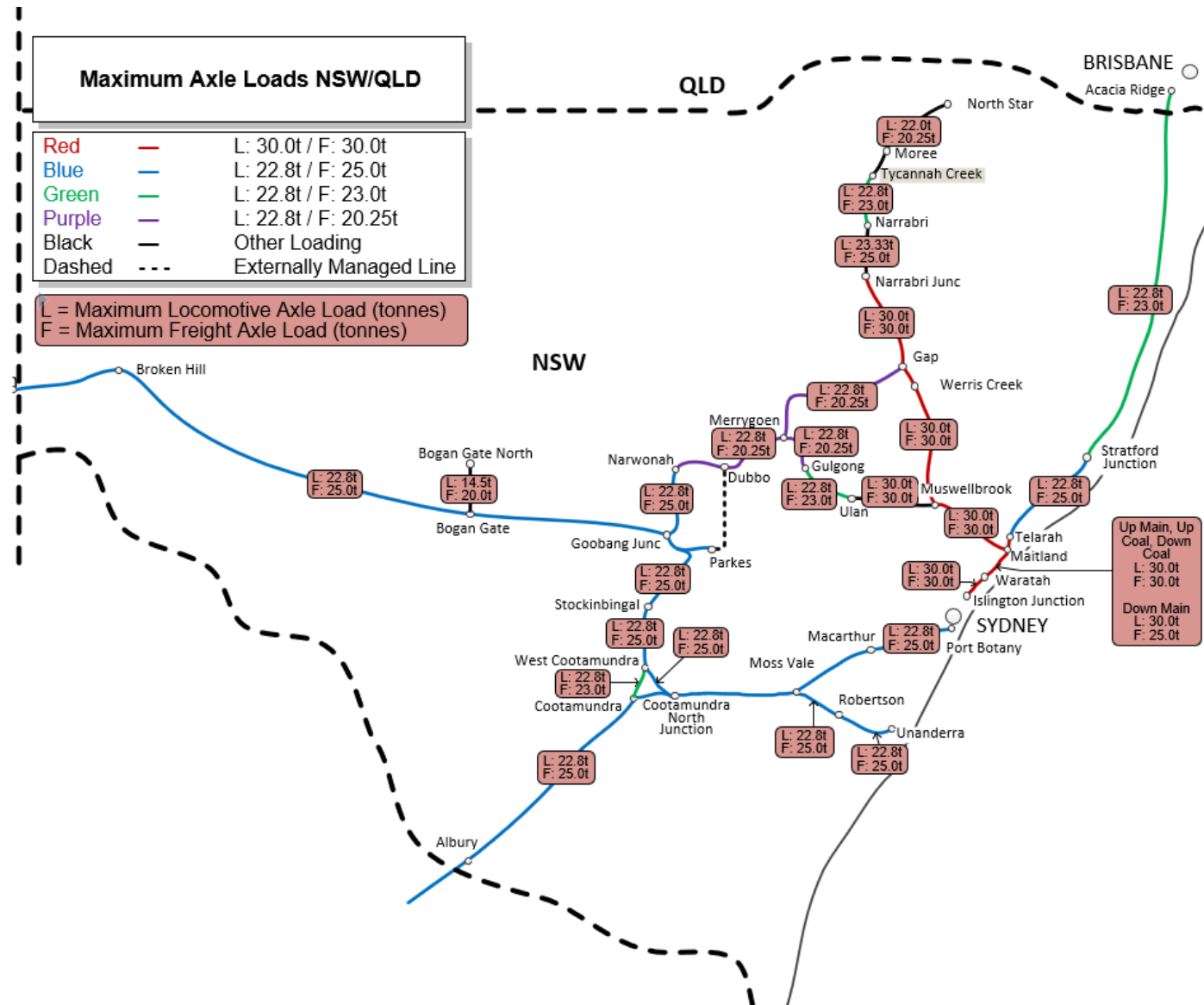
Figure 2.2.1 Maximum Axle Loads by Corridor



Note – Refer to Route Access Standard Section Pages for more detail on speed and axle load limits for locomotives and wagons.



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Note – Refer to Route Access Standard Section Pages for more detail on speed and axle load limits for locomotives and wagons.

2.3 Length of Trains

Operators shall provide an effective means of accurately determining the length of a train (including locomotives). The length of a train shall not exceed the specified maximum length for any portion of the train's transit. For long trains, allowance should be made for 'train slack' when determining train length.

The train length is specified in the Access Agreement for that train over the corridors of operation and may be equal to or less than the network infrastructure limits (refer to table 2.3.1).

The length is specified to enable the train to transit through the network within the scheduled transit time. Trains not exceeding the length are able to cross or pass other trains at most crossing loop locations distributed within that corridor with either train able to be accommodated within the location's main line or crossing loop facility.

ARTC shall specify the length of trains within the Access Agreement where the train length is required to vary from the network infrastructure limits.

Except as provided for in section 2.3, operators shall ensure the specified train length shall not be exceeded at any time and make allowance for rolling stock (including locomotives) to be attached within the network.

Table 2.3.1 ARTC Infrastructure Train Length Limits

AREA	TRAIN LENGTH (M)
DEFINED INTERSTATE RAIL NETWORK	
ACACIA RIDGE – ISLINGTON JUNCTION	1500
PORT BOTANY – MELBOURNE	1800 ²
MELBOURNE – ADELAIDE	1500 / 1800 ¹
GOOBANG JUNC – COOTAMUNDRA	1800
GOOBANG JUNC – BROKEN HILL	1800
GOOBANG JUNC – NARROMINE	1800
BROKEN HILL – ADELAIDE	1800
MOSS VALE – UNANDERRA	1500 ²
ADELAIDE – PARKESTON	1800
INTRASTATE NETWORK	
	AS SPECIFIED IN ACCESS AGREEMENTS OR AS DETAILED IN RAS SECTION PAGES
HUNTER VALLEY NETWORK	
	AS SPECIFIED IN ACCESS AGREEMENTS OR AS DETAILED IN RAS SECTION PAGES

¹ MELBOURNE - ADELAIDE – paths exceeding 1500m are permitted however may incur delays to service enroute due to limited crossing locations available to accommodate services exceeding 1500m in length when required to cross other opposing overlength services,

² Refer to Section Pages for specific Information

2.4 Over-Length Trains

An over-length train is a train exceeding the network infrastructure limits for train length.

The ARTC Network Controller shall check train length information to ensure an over-length train will not cause a network blockage.

A train that is found to be over-length without approval shall not be permitted to enter or continue to operate on the network unless approved by an **RACN**.

2.5 Infrastructure Limits

In addition to limits placed on train speed and axle load, there are other infrastructure limits that shall not be exceeded. These are:

- P2 Force limits exerted by rolling stock (Table 2.5.1)
- allowable wheel spacings (Table 2.5.2 and Table 2.5.3)
- RAS Loads (equivalent to Coopers M Rating) (Figure 2.5.1).

Table 2.5.1 – Allowable P2 Force Limits

AREA	AREA SPECIFIC LIMITS	P2 FORCE LIMIT ¹				LATERAL FORCE (KN)
		LOCOMOTIVES		WAGONS		
		10 MRADS	14 MRADS	10 MRADS	14 MRADS	
HHN (HV)	P2 FORCE LIMITS APPLY TO ALL HHN AREAS:	250 KN	295 KN	192 KN	230 KN	84
DIRN	P2 FORCE LIMITS APPLY TO ALL DIRN AREAS:	250 KN ¹	295 KN	192 KN	230 KN	84
IN	P2 FORCE LIMITS APPLY TO ALL IN AREAS EXCEPT AS SHOWN BELOW:	192 KN	230 KN	192 KN	230 KN	50
	NARWONAH – DUBBO ²					
	MERRYGOEN - BINNAWAY - WERRIS CREEK ²					
	MAROONA – PORTLAND ²					
	MOREE – NORTH STAR	-	200 KN	-	200 KN	50

Note:

¹ For non-NSW P2 Limit at 10mrads is 250kn for locomotives. Max total locomotive mass is 134t. Max individual axle load on Locomotive is 22.7t.

² Lower locomotive and wagon line speeds apply on these sections.

Refer AS 7508 Track Forces and Stresses

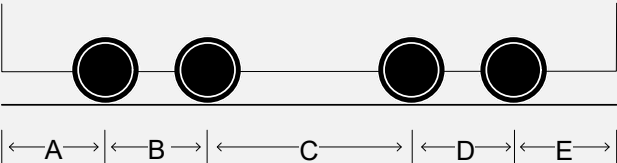
Table 2.5.2 Locomotive Configuration – Bridge Interface Minimum Axle Spacing for Specified Axle Load

INFRASTRUCTURE LIMITS EQUIVALENT TO METRIC COOPER M RATING DESIGN LOAD (REFER FIG 2.5.1)	LOCOMOTIVE MAXIMUM INDIVIDUAL AXLE LOAD (TONNE)	LOCOMOTIVE MAXIMUM OVERALL MASS (TONNE)	LOCOMOTIVE CONFIGURATION - DISTANCE BETWEEN AXLES (MM)							OVERALL LENGTH OF LOCOMOTIVE
										
			A	B	C	D	E	F	G	
RAS 270 (M270)	29.5	177	1800	1800	1800	8200	1800	1800	1800	19000
RAS 210 (M210)	23.0	138	1800	1800	1800	8000	1800	1800	1800	18800
RAS 180 (M180)	20.3	123	2300	1700	1700	7240	1700	1700	2300	18640

Notes:

1. Any locomotive's Load Effects on any bridge span shall not exceed applicable RAS 270 / RAS 210 / RAS 180 Infrastructure Limit.
2. Where a Locomotive is designed with another axle configuration or load, the axle spacing / load shall be adjusted accordingly to comply to the above RAS 270 / 210 / 180 Loading.
3. For any locomotive configurations outside the above, refer to ARTC.
4. Variations to the above table can be applied for and sent to ARTC for review
5. Note that the vehicle schematic for dimensions A and G are from the coupling centreline to the wheel centre.

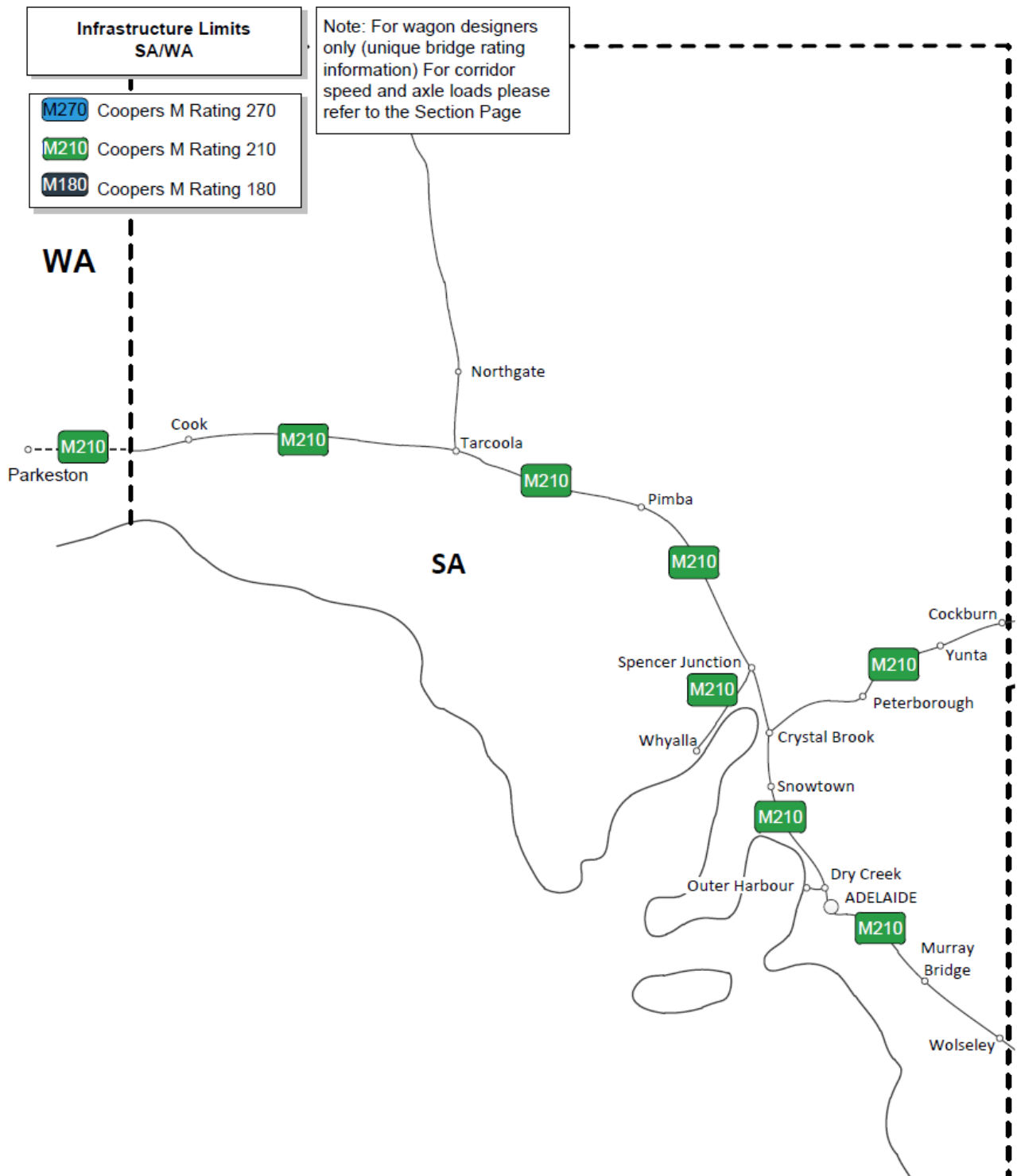
Table 2.5.3 – Wagon Configuration – Bridge Interface Minimum Allowable Axle Spacings for Wagon configurations

INFRASTRUCTURE LIMITS EQUIVALENT TO METRIC COOPER M RATING DESIGN LOAD (REFER FIG 2.5.1)	WAGON MAXIMUM INDIVIDUAL AXLE LOAD (TONNE)	WAGON CONFIGURATION - DISTANCE BETWEEN AXLES (MM)					OVERALL LENGTH (SUM OF INDIVIDUAL SPACING)
							
		A	B	C	D	E	
RAS 270 (M270)	30	825	1780	10490	1780	825	15700
RAS 210 (M210)	25	1050	1720	8400	1720	1050	13940
RAS 210 (M210)	23	980	1720	6150	1720	980	11550
RAS 180 (M180)	20	1040	1720	8000	1720	1040	13520

Notes:

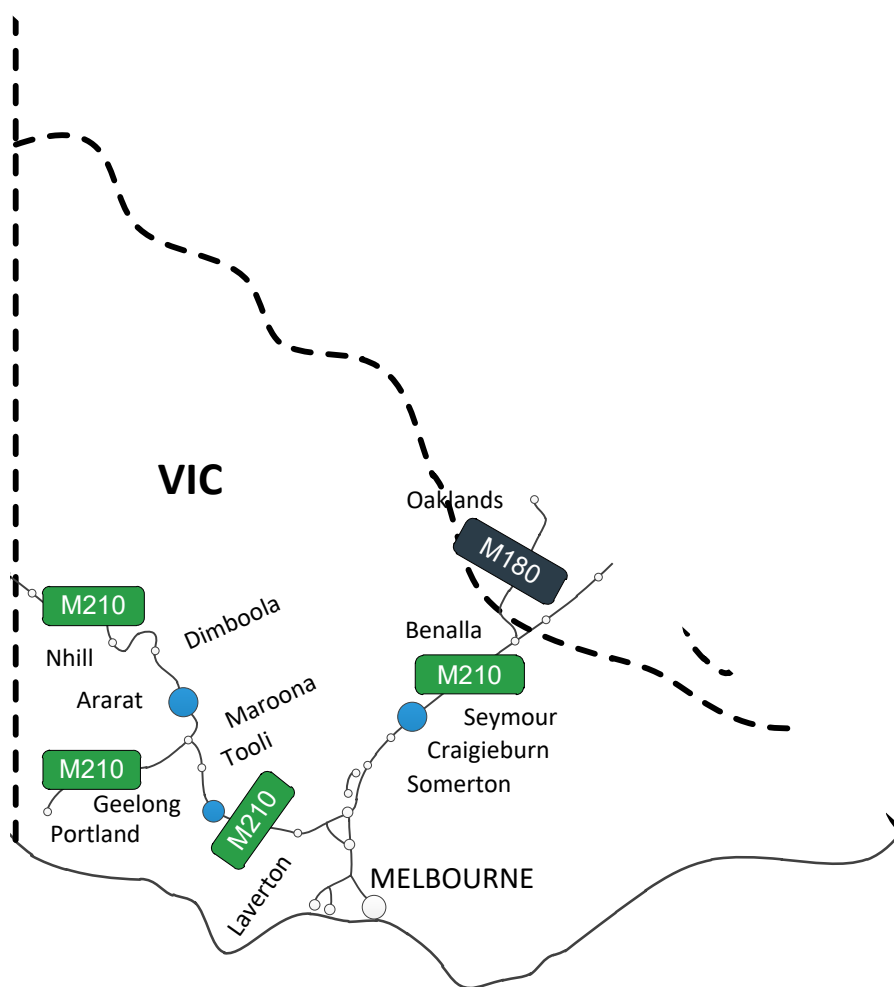
- Any Wagon Load Effects on any bridge span shall not exceed applicable RAS 270 / RAS 210 / RAS 180 Loading.
- Where a Wagon is designed with another axle configuration or load, the axle spacing / load shall be adjusted accordingly to comply to the above RAS 270 / 210 / 180 Loading.
- For any Wagon configurations outside the above, refer to ARTC.
- Variations to the above table can be applied for and sent to ARTC for review.
- Note that the vehicle schematic for dimensions A and E are from the coupling centreline (or for multipack vehicles from the centre of the drawgear) to the wheel centre. (The intra-vehicle axle spacing)

Figure 2.5.1 – Coopers M Rating that Apply to Various ARTC Network Track Segments



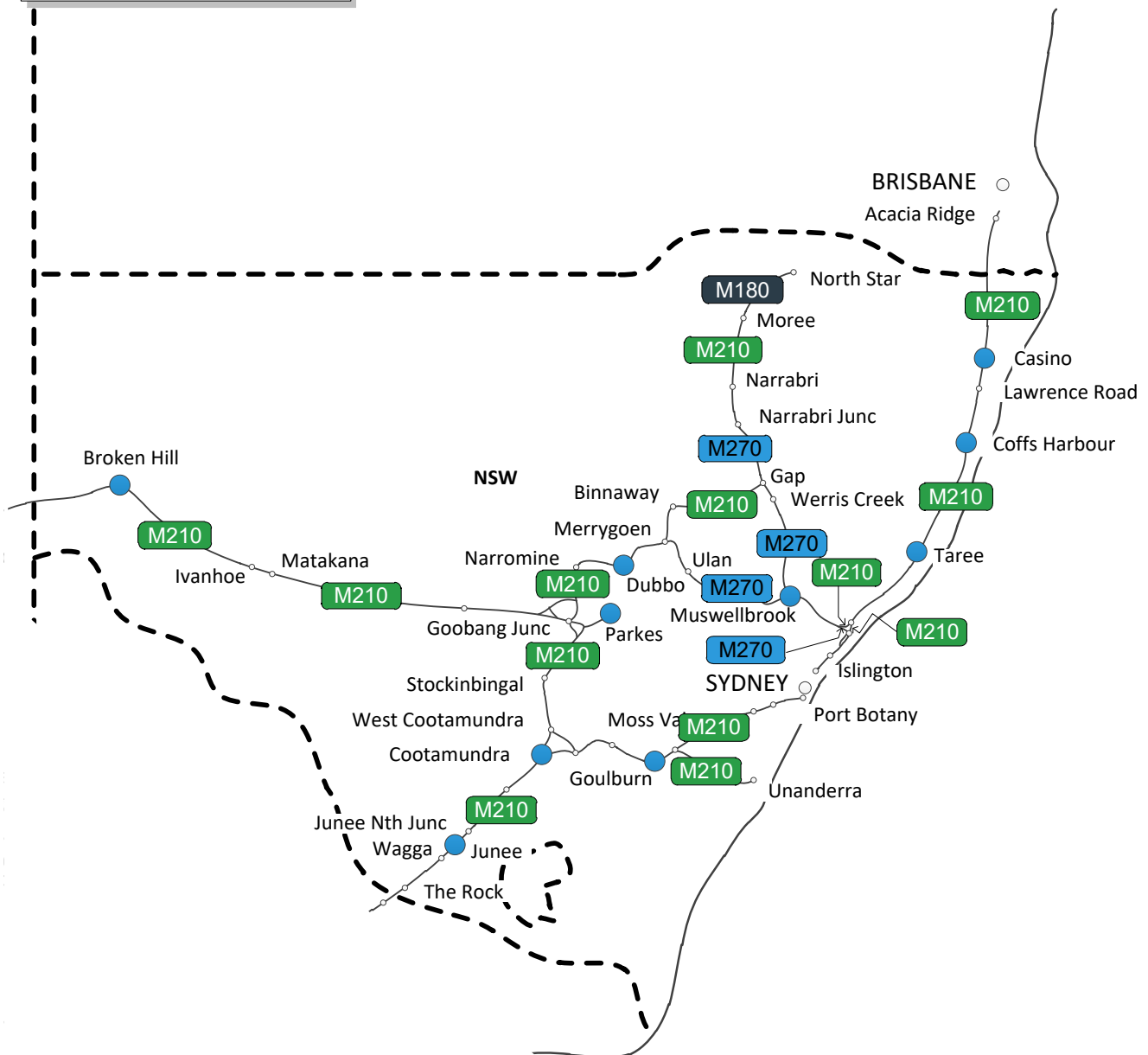
**Infrastructure Limits
VIC****M270** Coopers M Rating 270**M210** Coopers M Rating 210**M180** Coopers M Rating 180

Note: For wagon designers only (unique bridge rating information) For corridor speed and axle loads please refer to the Section Page



**Infrastructure Limits NSW/
QLD****M270** Coopers M Rating 270**M210** Coopers M Rating 210**M180** Coopers M Rating 180

Note: For wagon designers only (unique bridge rating information) For corridor speed and axle loads please refer to the Section Page



2.6 Train Height and Maximum Width

The following tables and accompanying diagrams specify standard train height and width maximums for various network routes. Refer to Section 5 for more detail.

Table 2.6.1 – Standard Train Height and Width for Container Loading

AREA OF OPERATION FOR CONTAINERS	WIDTH (MAXIMUM OVERALL) (mm)	HEIGHT (FROM RAIL) (mm)	LOADING DIAGRAM ¹
ARTC NSW NETWORK (UNRESTRICTED OPERATION THROUGHOUT THE ARTC NETWORK)	2500	3916	A2.3
TOTTENHAM (MELBOURNE) – ETTAMOGAH	2500	4150	A2.9
ADELAIDE – APPLETON DOCK (MELBOURNE)	2500	4250 [#] OR 4210 [#]	A2.10
MAROONA – PORTLAND			
ALBION – JACANA (BROAD GAUGE)	2500	4026 [#]	A2.11
BENALLA – OAKLANDS			
NARWONAH – GAP			
GAP – WERRIS CREEK (INCL. TO CRN INTERFACE) – ISLINGTON JUNCTION			
MERRYGOEN – ULAN – MUSWELLBROOK		4030	
GOOBANG JUNC– COOTAMUNDRA	2500	AND	A2.4
ALBURY – MACARTHUR			
MOSS VALE – UNANDERRA		4050 [#]	
MAITLAND – ACACIA RIDGE			
MACARTHUR – PORT BOTANY			
GOOBANG JUNC- NARWONAH	2500	4220	A2.8
ADELAIDE FREIGHT TERMINAL – PARKESTON & OUTER HARBOUR	3000	6500	A2.6
SPENCER JUNCTION – WHYALLA	3000	6000	A2.7

AREA OF OPERATION FOR CONTAINERS	WIDTH (MAXIMUM OVERALL) (mm)	HEIGHT (FROM RAIL) (mm)	LOADING DIAGRAM ¹
BROKEN HILL – GOOBANG JUNCTION			
BROKEN HILL – CRYSTAL BROOK	2500	6500	A2.5
GOOBANG JUNC – NARWONAH			

Notes:

1 - Refer to **Appendix A** Rolling Stock Outlines & Loading Requirements

For all loading diagrams refer to diagrams notes for specific loading configurations and applicable wagon dimensions

Table 2.6.2 – Standard Train Height and Width for Non-Container Loads

AREA OF OPERATION FOR NON-CONTAINER LOADS	ROLLING STOCK & LOADING DIAGRAM ¹
LOOSE LOADS	A2.1
MOTORAIL WAGONS	A2.2
STANDARD WAGONS WITH UNRESTRICTED OPERATION THROUGHOUT ARTC NSW NETWORK	A1.1, A1.11
NARROW SQUARE ROLLING STOCK	A1.13

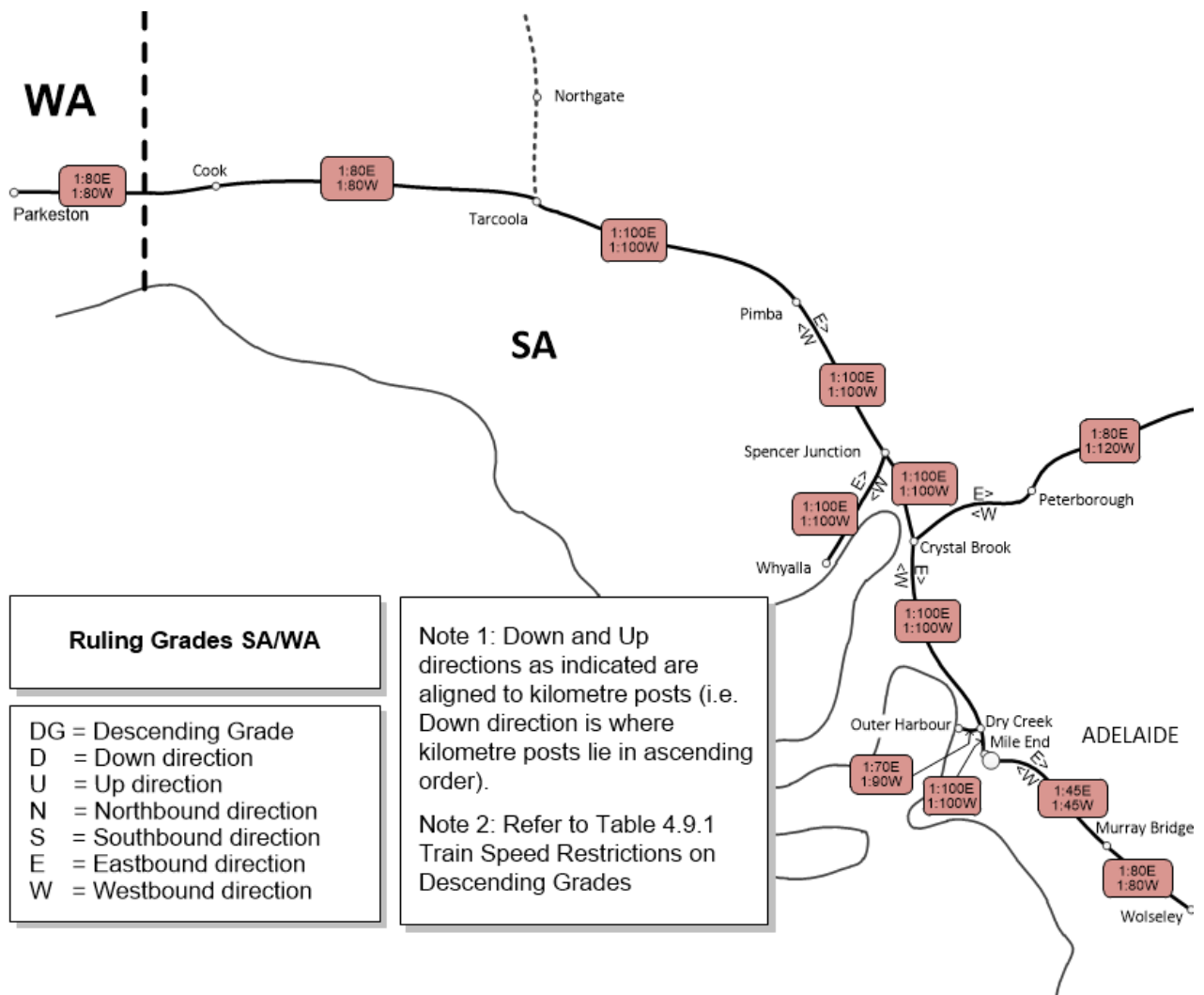
Note: ¹ Refer to **Appendix A** Rolling Stock outlines & loading requirement

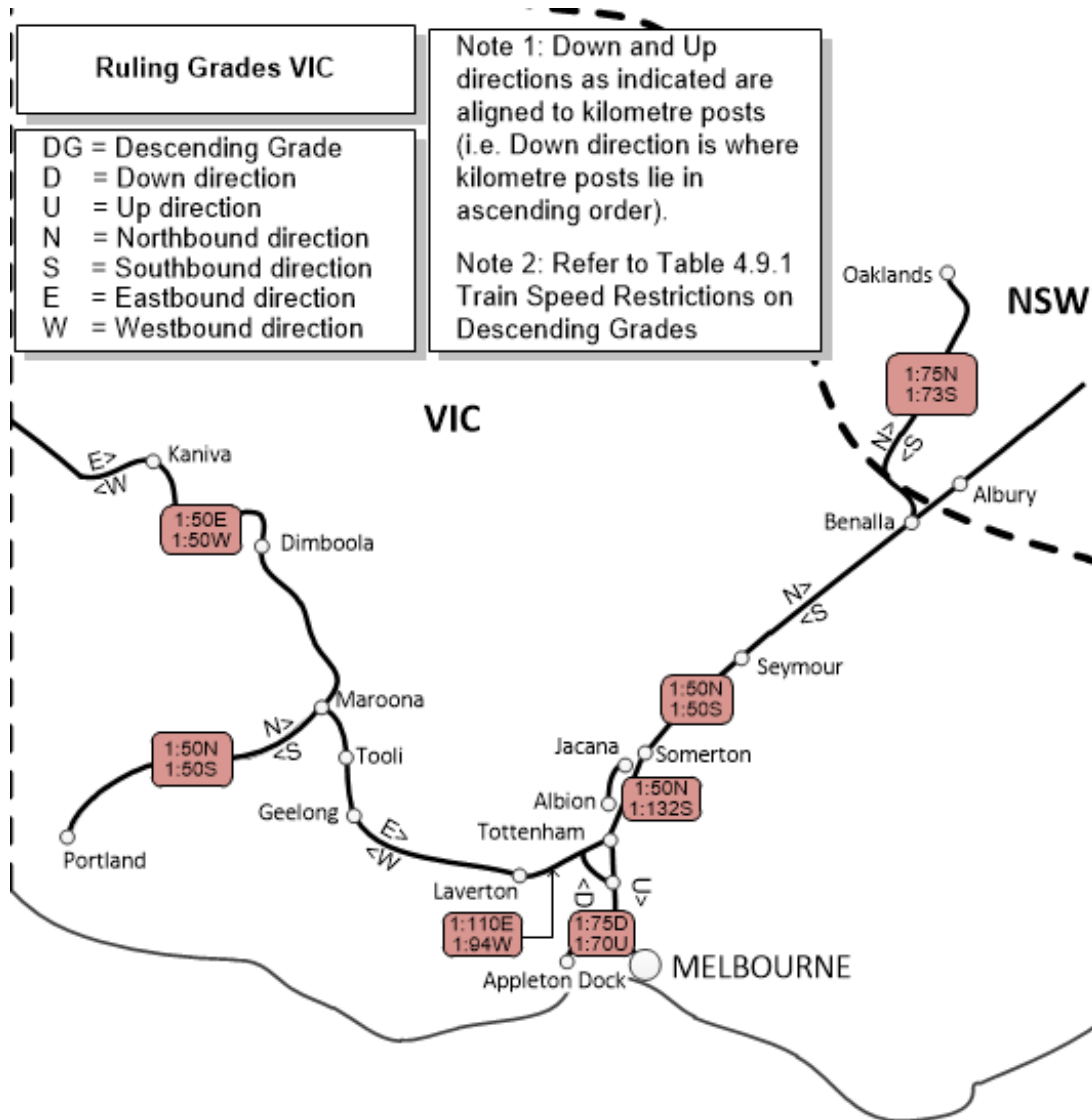
2.7 Ruling Grades

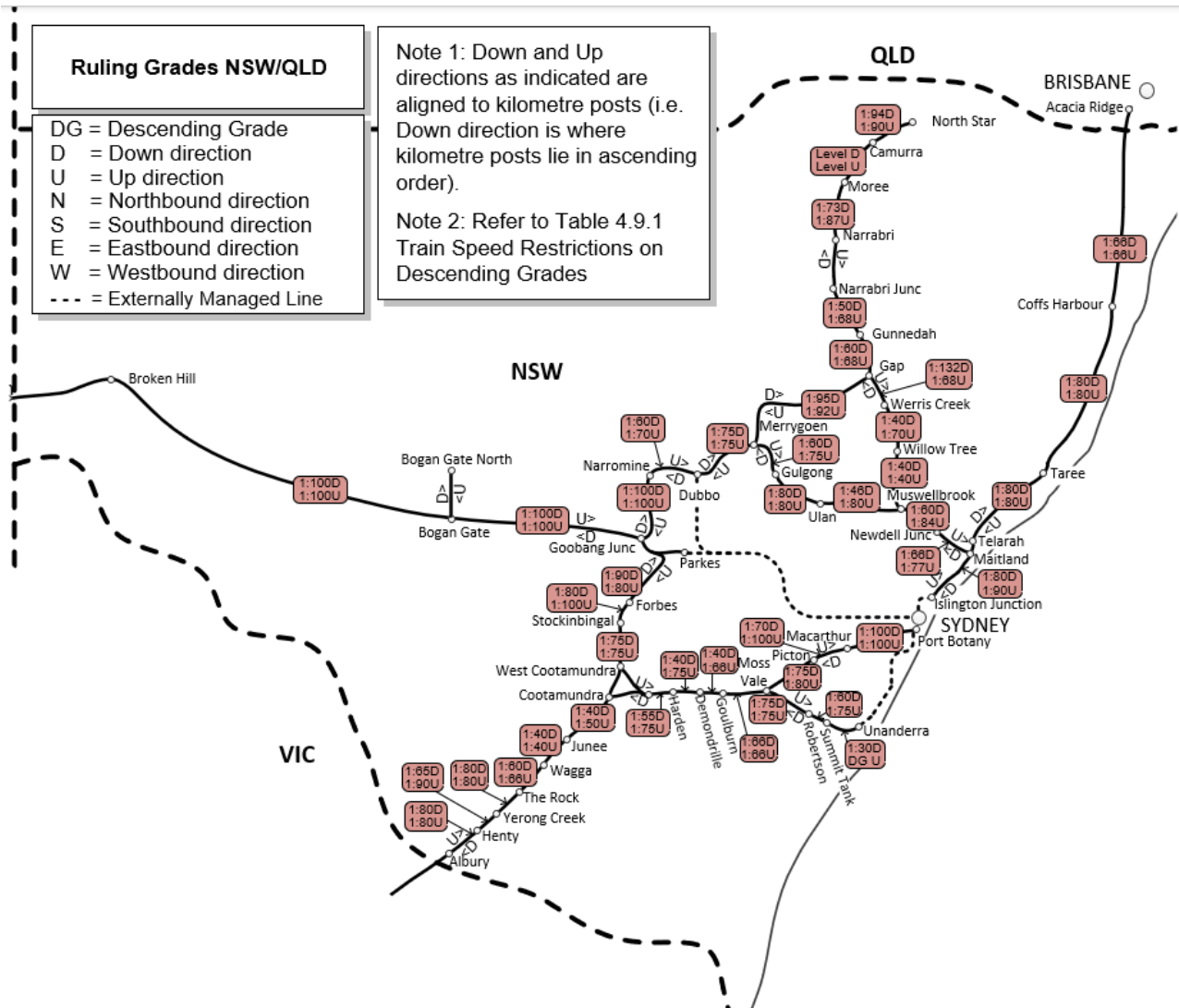
Ruling gradients presented are nominal values intended to assist in determining trailing load limits and provide guidance on the application of Route Access Standard requirements. The nominal Ruling Gradient is the sum of the gravitational and curving resistances over a nominal length of train. Operators may need to consider altering the Ruling Gradient for a specific train and route to consider:

- train length
- power to weight ratio
- starting trains mid-section

Figure 2.7.1 – Ruling Grades across the ARTC Network

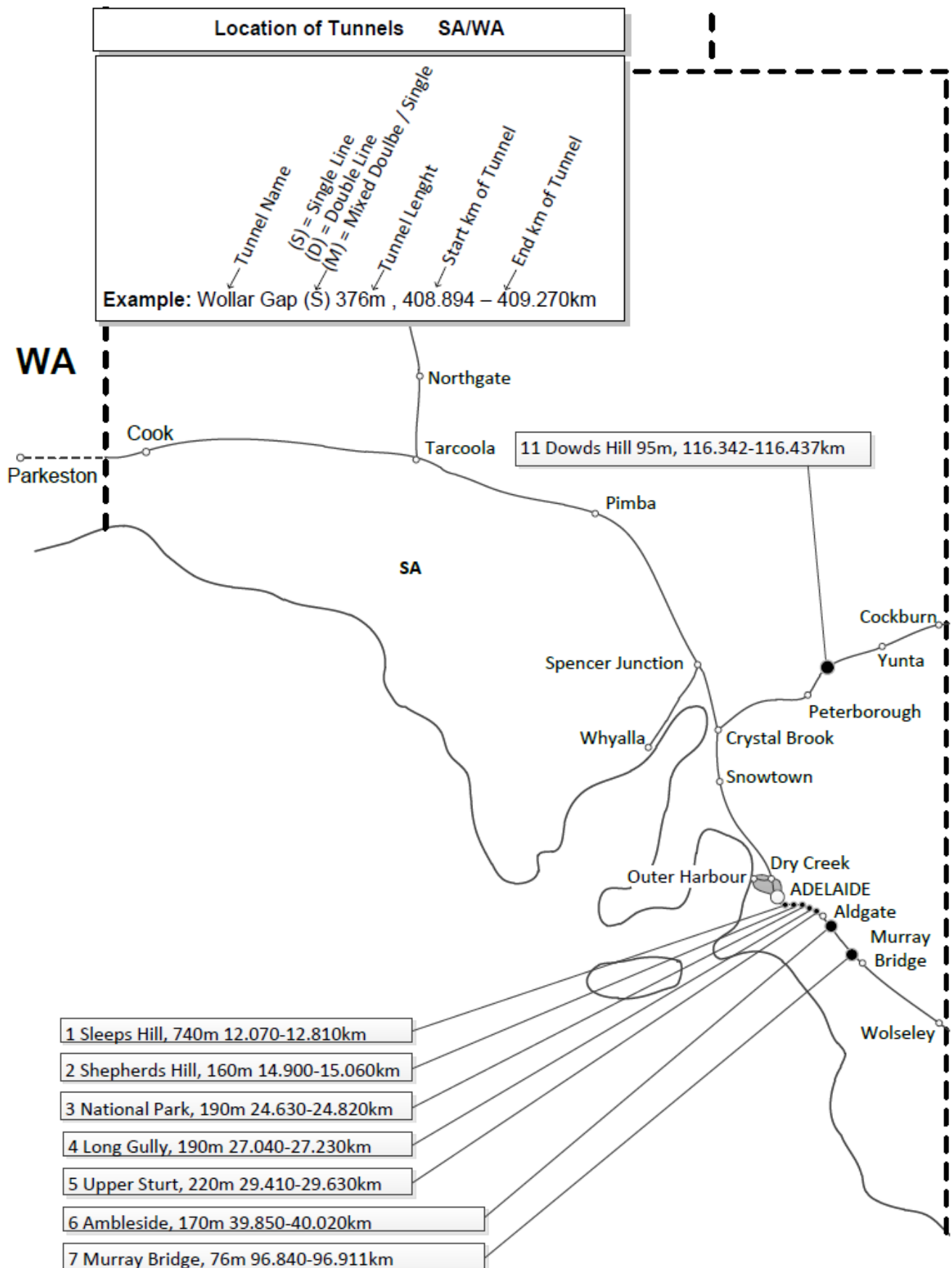




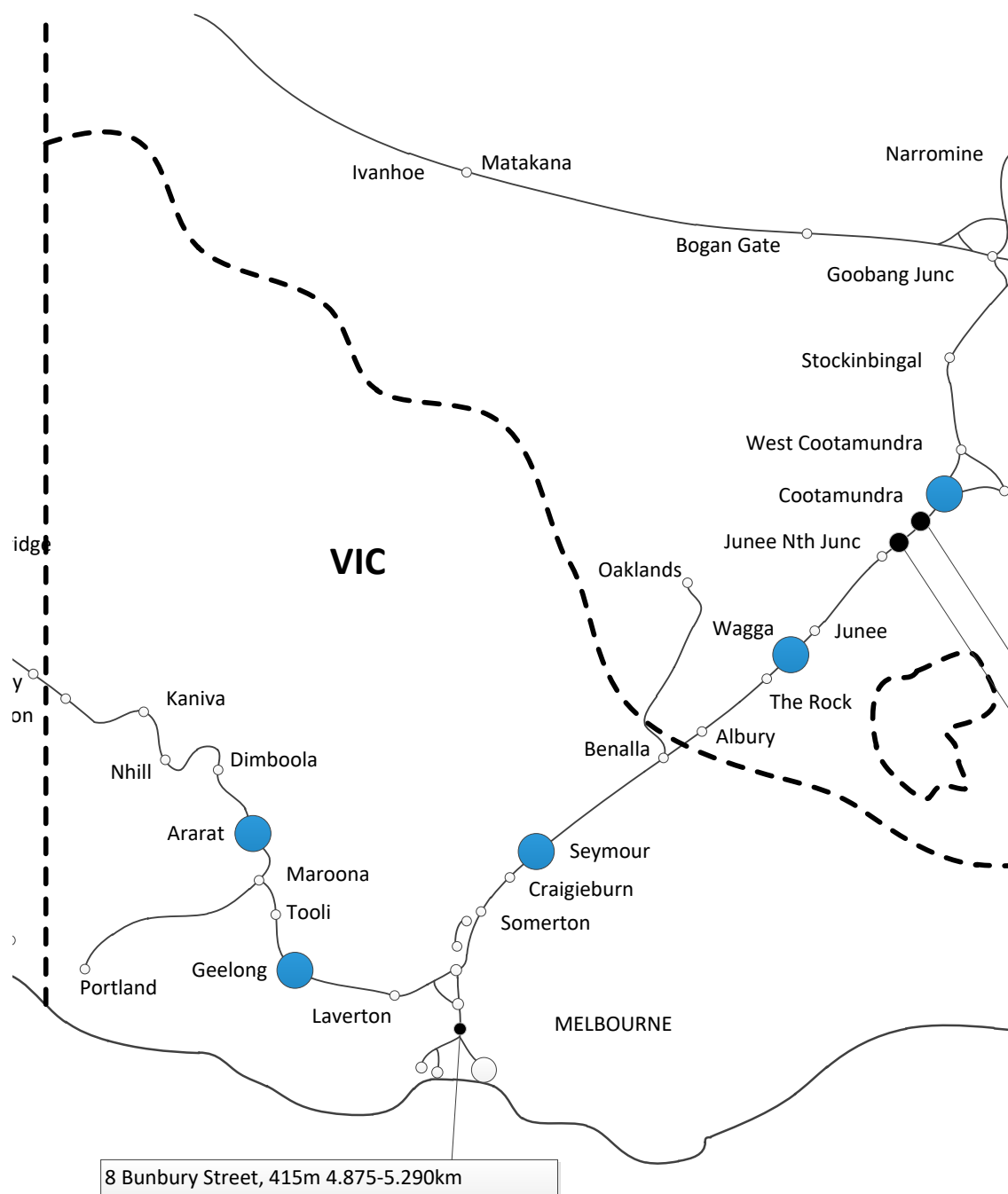


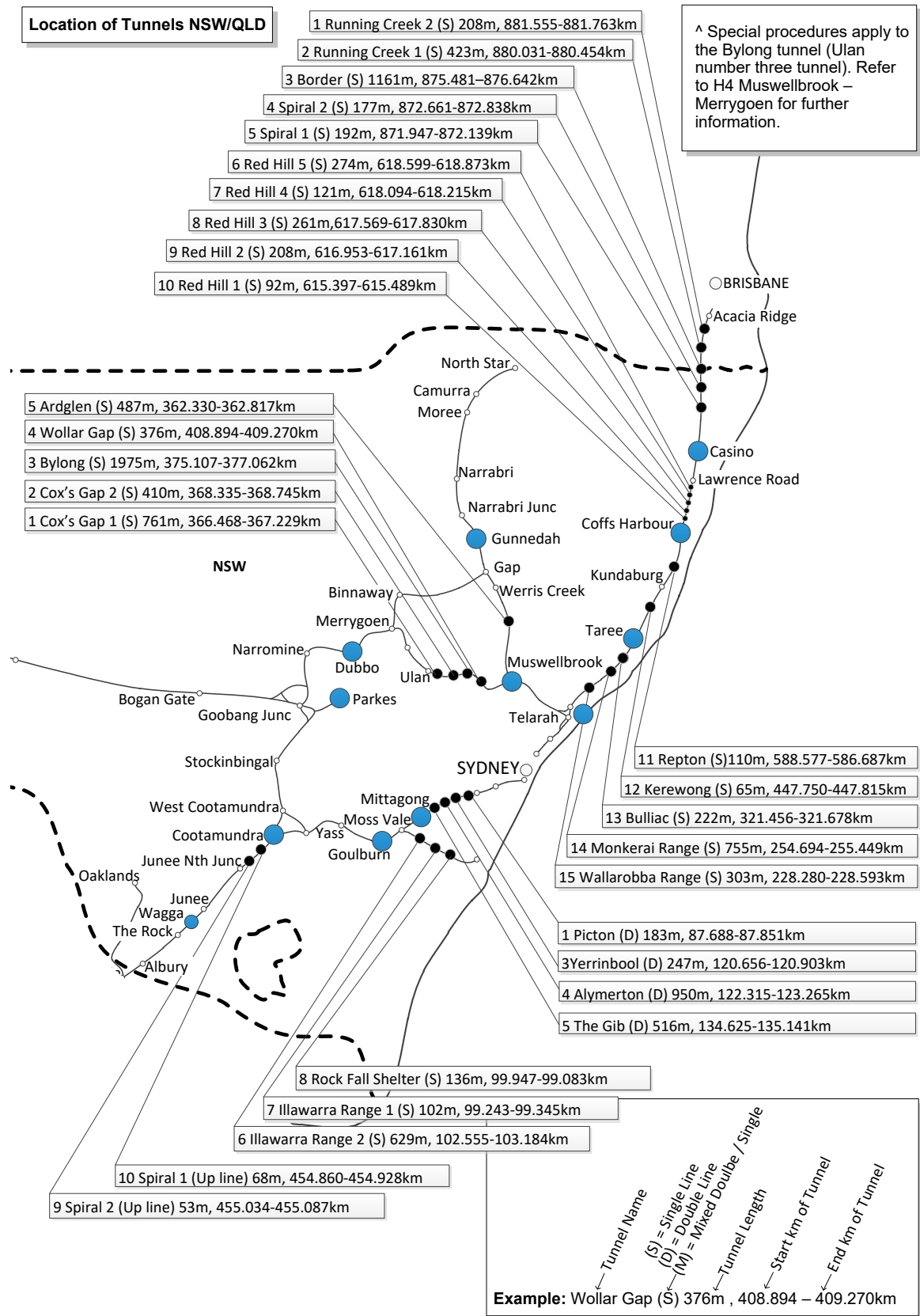
2.8 Tunnel Locations

Figure 2.8.1 - Tunnels Located on the ARTC Network



Location of Tunnels	VIC
<i>Tunnel Name</i> <i>(S) = Single Line</i> <i>(D) = Double Line</i> <i>(M) = Mixed Double / Single</i> <i>Tunnel Length</i> <i>Start km of Tunnel</i> <i>End km of Tunnel</i>	Example: Wollar Gap (S) 376m , 408.894 – 409.270km





2.9 Wayside Monitoring Devices

Several rolling stock and infrastructure wayside monitoring devices are installed on the ARTC Network. These devices have been implemented to provide a variety of performance statistics and where necessary, operational alarms.

Table 2.9.1 – Wayside Monitoring Devices

INFRASTRUCTURE DEVICES	
DEVICE	DESCRIPTION
EMBANKMENT ROCKFALL DETECTOR	A detector installed to detect large objects falling from a cliff or slope above the track and operated when trip wires between fixed points are broken or stretched. Used to raise alarms and/or place protecting signals to stop.
EMBANKMENT SLIP DETECTOR	A device capable of detecting track instability and operated when the distance over the ground increases between two fixed points being monitored. The detector is used to raise alarms and/or place protecting signals to stop.
GROUND FAULT DETECTOR	A detector similar to a slip detector but installed vertically to detect vertical displacement of the ground, including ground heave due to related ground movement.
RAINFALL MONITOR	A device that accurately and continuously measures the rainfall and produces alarms when a pre-set rainfall rate is exceeded.
ROLLING STOCK DEVICES	
DEVICE	DESCRIPTION
DED	DRAGGING EQUIPMENT DETECTORS Used to identify and report on vehicles with protrusions below the vehicle at or near the height of the rail head, typically a dragging brake hose or chain.
HBD	HOT BEARING DETECTORS. These devices accurately measure the temperature of bearings as they pass over this device under normal operating conditions. Hot bearings are traditionally referred to as “hot boxes”
HWD	HOT WHEEL DETECTORS. These devices accurately measure the temperature of wheels as they pass over this device under normal operating conditions.

DEVICE	DESCRIPTION
OHD	OVER HEIGHT DETECTOR Specifically monitors the height of intermodal traffic to ensure adequate bridge clearance, typically where double container stacking is practised.
WEIGHBRIDGES	Used to verify the declared weights of vehicles operating on the ARTC network, both for safety and billing purposes.
WCM	WHEEL CONDITION MONITOR Used to measure in KN terms the effect of wheel impacts on the rail surface under dynamic conditions. Note: Specific limits for WCM are set out in the following tables 2.9.2.
WHEEL PROFILE	WHEEL PROFILES MONITOR. This system records wheel profile information but does not notify alarms to the network controller or train transit manager.
RAILBAM	RAILWAY BEARING ACOUSTIC MONITOR. Used to detect trending rail wheel bearing faults and emergency withdrawals from service. This system does not notify alarms to the network controller or train transit manager.
RAILSQAD	RAILWAY SQUEAL ACOUSTIC DETECTION SYSTEM. Tracks trending individual wheels sets making excessive noise. Statistics are analysed against operating parameters, rolling stock conditions and environmental conditions. This system does not notify alarms to the network controller or train transit manager.
TBOGI	TRUCK BOGIE OPTICAL GEOMETRY INSPECTION (TBOGI) Records wheelset angle-of attack and tracking position parameters to evaluate the wheel-rail-interface, bogie performance and to detect hunting.
VISION MONITORING SYSTEM	VISION MONITORING SYSTEM Train imaging and inspection system consists of multiple scan cameras that provide images of the train and analyse against algorithms for specific rolling stock components. System is currently private.

Table 2.9.2 – Wheel Condition Monitor Limits

RESPONSE TO WCM IMPACT LOADS:	
EAST/WEST CORRIDOR (COCKBURN, LARA, PARKESTON, PORT GERMEIN)	
NORTH/SOUTH CORRIDOR (SEYMOUR, WINGELLO)	
WHEEL IMPACT LOAD	REQUIRED ACTION
UNTAGGED $\geq 325\text{KN}$ TO 400KN (NORMALISED)	Train slowed to the speed as advised in the email notification until the vehicle can be safely inspected by the train crew. If defect confirmed, vehicle to be detached at next suitable location. If there is no defect, then at the discretion of ARTC operations instruct the driver to recommence operations to track speed when it is established that the train can safely continue in service. Operator is notified and Event Report is raised.
HIGH LEVEL $\geq 400\text{KN}$ TO 500KN (NORMALISED)	Train slowed to the speed as advised in the email notification until the vehicle can be safely inspected by the train crew. If defect confirmed, vehicle to be detached at next suitable location. If there is no defect, then at the discretion of ARTC operations instruct the driver to recommence operations to track speed when it is established that the train can safely continue in service. Operator is notified and Event Report is raised.
EXTREME LEVEL $\geq 500\text{KN}$ (NORMALISED)	Train slowed to 60 km/h until the vehicle can be safely inspected by the train crew. If defect confirmed, vehicle to be detached at next suitable location. If there is no defect, then at the discretion of ARTC operations instruct the driver to recommence operations to track speed when it is established that the train can safely continue in service. Operator is notified and Event Report is raised.
RESPONSE TO WCM IMPACT LOADS:	
HUNTER VALLEY CORRIDOR (METFORD MAIN, METFORD COAL)	
WHEEL IMPACT LOAD	REQUIRED ACTION
UNTAGGED $\geq 325\text{KN}$ – 400KN (NORMALISED)	Train slowed to the speed as advised in the email notification until the vehicle can be safely inspected by the train crew. If defect confirmed, vehicle to be detached at next suitable location. If there is no defect, then at the discretion of ARTC operations instruct the driver to recommence operations to track speed when it is established that the train can safely continue in service. Operator is notified and Event Report is raised.
HIGH LEVEL $\geq 400\text{KN}$ (NORMALISED)	Train slowed to the speed as advised in the email notification until the vehicle can be safely inspected by the train crew. If defect confirmed, vehicle to be detached at next suitable location. If there is no defect, then at the discretion of ARTC operations instruct the driver to recommence operations to track speed when it is established that the train can safely continue in service. Operator is notified and Event Report is raised.

Note: Normalised refers to the process of normalising vehicle impacts by using 120kN normalisation offset as a fixed value.

- *Untagged alarms: Wayside equipment scans tagged vehicles for registration and tracking purposes. An alarm is raised if an un-tagged vehicle appears in a train consist.*

- When defects are confirmed the required remedial action shall be initiated by the train operator in conjunction with the Network Controller.

Table 2.9.3 – Wheel Profile Monitors

RESPONSE TO AUTOMATIC KLD WHEEL PROFILE MONITOR LEVELS:				
EAST/WEST CORRIDOR (PORT GERMAIN)				
NORTH/SOUTH CORRIDOR (EXETER)				
PROFILE	OPTIMAL	WARNING	CONDEMN	EXTREME
Flange Thickness	≤24mm, >21mm	≤21mm, >18.75mm	≤18.75mm, >17mm	≤17mm,
Flange Height	≥33mm, <34mm	≥34mm, <35.25mm	≥35.25mm, <37mm	≥37mm
Tread Hollowing	≥2mm, <2.5mm	≥2.5mm, <3.25mm	≥3.25mm, <4mm	≥4mm
Rim Thickness	≤24mm, >22mm	≤22mm, >19.75mm	≤19.75mm, >18mm	≤18mm

Table 2.9.4 – Hot Bearing Detector Alarms

RESPONSE TO HOT BEARING DETECTOR ALARMS:	
NORTH/SOUTH CORRIDOR (MENANGLE, BURRADOO)	
TEMPERATURE ALARMS	REQUIRED ACTION
HOT ALARM SST site 100°C	The temperature has passed the critical level and there is a possibility of bearing damage. Train to reduce speed to 25 km/h and vehicle inspected within 3 km. Operator notified and Event Report is raised.
WARM ALARM SST site 93°C at 20°C ambient and varies 0.5°C per 1°C change in the ambient temperature from 20°C.	The temperature is higher than normal, and the bearing may need attention. Train to reduce speed to 25 km/h and vehicle inspected within 6 km. Operator notified and Event Report is raised.
RESPONSE TO HOT BEARING DETECTOR ALARMS:	
HUNTER VALLEY CORRIDOR (BELFORD, BREEZA, BYLONG, COLLY CREEK, DENMAN, GRASSTREE, GUNNEDAH, METFORD COAL, WINGEN)	
TEMPERATURE ALARMS	REQUIRED ACTION
HOT ALARM SST site 110°C	The temperature has passed the critical level and there is a possibility of bearing damage. Train to be stopped immediately and vehicle inspected. Operator notified and Event Report is raised.

WARM ALARM	The temperature is higher than normal, and the bearing may need attention. Train to be stopped immediately and vehicle inspected. Operator notified and Event Report is raised.
SST site 90°C at 20°C ambient and varies 0.8°C per 1°C change in the ambient temperature from 20°C.	

Table 2.9.5 – Hot Wheel Detector Alarms

RESPONSE TO HOT WHEEL DETECTOR ALARMS:	
NORTH/SOUTH CORRIDOR (MENANGLE, BURRADOO)	
TEMPERATURE ALARMS	REQUIRED ACTION
HOT ALARM SST 300°C	The temperature has passed the critical level and there is a possibility of brake issues and wheel damage. Train to reduce speed to 25 km/h and vehicle inspected within 3 km. Operator notified and Event Report is raised.
WARM ALARM SST 270°C	The temperature is higher than normal, and the brakes and wheel may need attention. Train to reduce speed to 25 km/h and vehicle inspected within 6 km. Operator notified and Event Report is raised.
RESPONSE TO HOT WHEEL DETECTOR ALARMS:	
HUNTER VALLEY CORRIDOR (BELFORD, BREEZA, BYLONG, COLLY CREEK, DENMAN, GRASSTREE, GUNNEDAH, METFORD COAL, WINGEN)	
TEMPERATURE ALARMS	REQUIRED ACTION
HOT ALARM SST 300°C NOTE - 330°C at Wingen	The temperature has passed the critical level and there is a possibility of brake issues and wheel damage. Train to be stopped immediately and vehicle inspected. Operator notified and Event Report is raised
WARM ALARM SST 270°C NOTE - 300°C at Wingen	The temperature is higher than normal, and the brakes and wheel may need attention. Train to be stopped immediately and vehicle inspected. Operator notified and Event Report is raised.

Table 2.9.6 – Dragging Equipment Detector Alarms

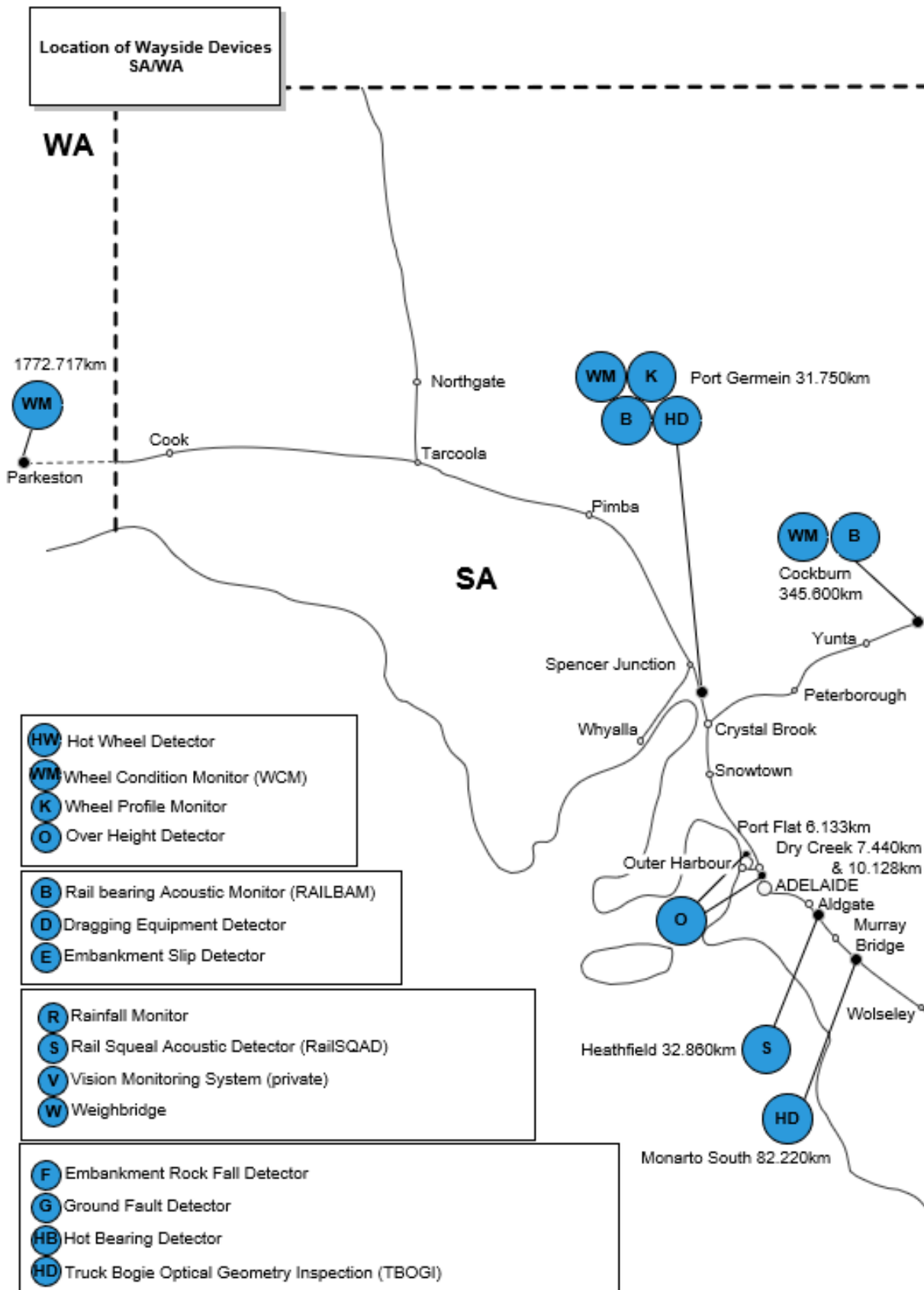
RESPONSE TO DRAGGING EQUIPMENT DETECTOR ALARMS:	
EAST/WEST CORRIDOR (BROKEN HILL)	
NORTH/SOUTH CORRIDOR (TELARAH, WAUCHOPE, MENANGLE, BURRANDOO, JINDALEE, JOPPA JCT, JUNEED)	
HUNTER VALLEY CORRIDOR (BELFORD, BYLONG, COLLY CREEK, GRASSTREE, GUNNEDAH, LOCHINVAR)	
ALARMS	REQUIRED ACTION
DRAGGING EQUIPMENT DETECTED	Train to be stopped immediately and vehicle inspected. Operator notified and Event Report is raised.

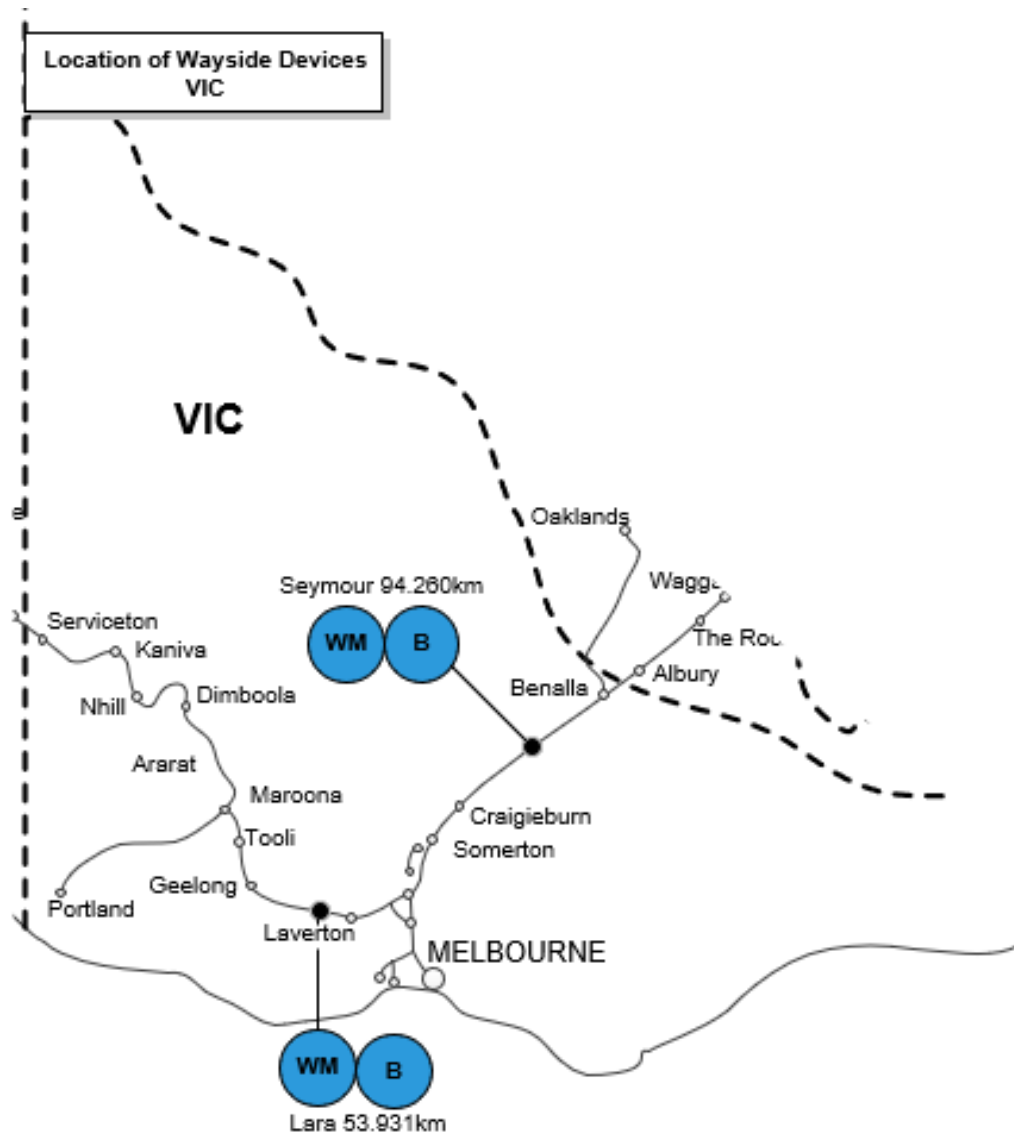
Table 2.9.7 - Truck Bogie Optical Geometry Inspection Hunting Detector Alarms

RESPONSE TO TBOGI ALARMS:**EAST/WEST CORRIDOR (MONARTO SOUTH, PORT GERMAIN)**

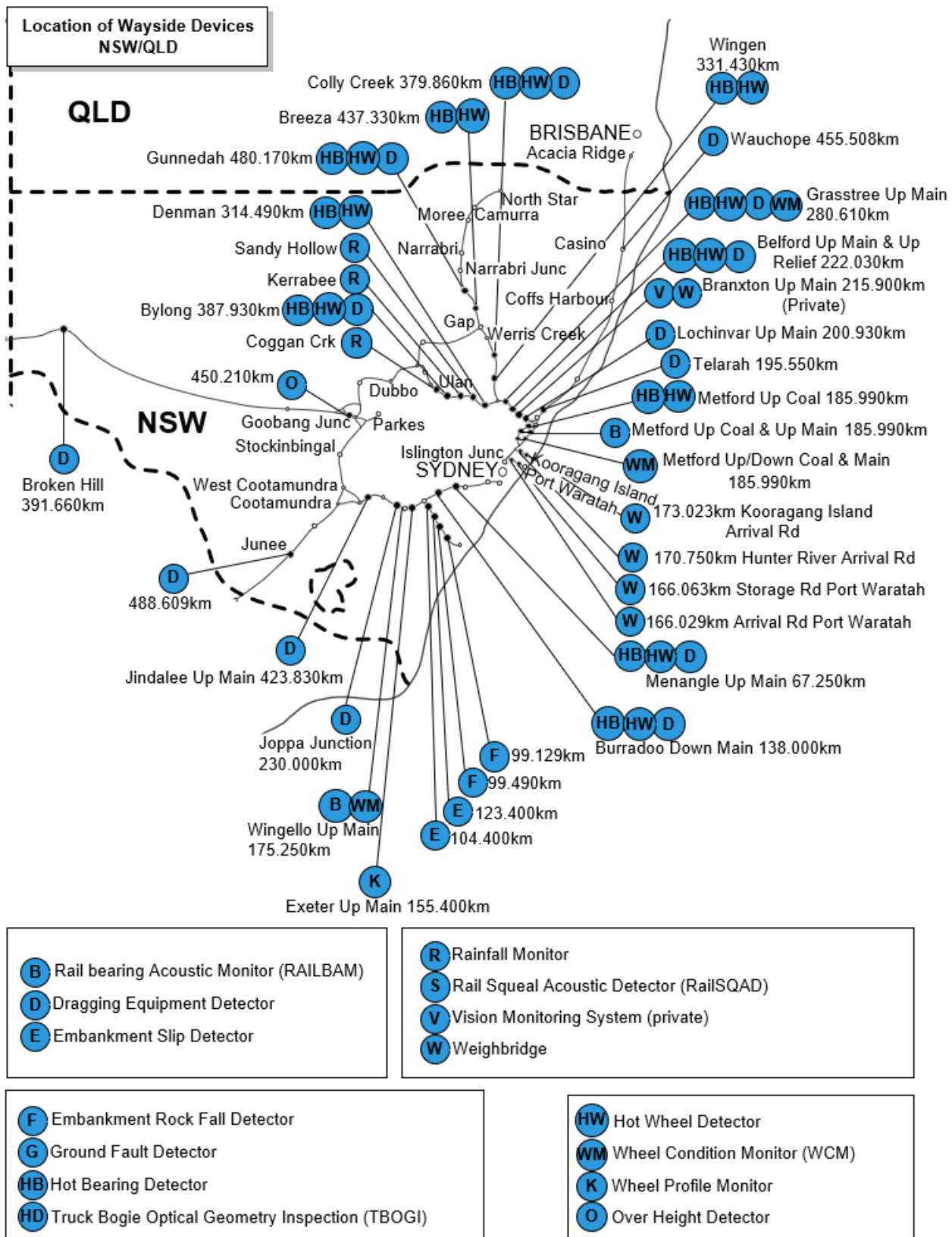
HUNTING	REQUIRED ACTION
Extreme >30mm	Train speed restricted (110km/h to 80km/h and 80km/h to 60km/h) until the vehicle can be safely inspected at a maintenance facility. TTM to prepare an Event Report and incorporate any inspection outcome/details into the report if available

Figure 2.9.1 – Wayside Monitoring Devices on the ARTC Network





B Rail bearing Acoustic Monitor (RAILBAM) D Dragging Equipment Detector E Embankment Slip Detector	R Rainfall Monitor S Rail Squeal Acoustic Detector (RailSQAD) V Vision Monitoring System (private) W Weighbridge
F Embankment Rock Fall Detector G Ground Fault Detector HB Hot Bearing Detector HD Truck Bogie Optical Geometry Inspection (TBOGI)	HW Hot Wheel Detector WM Wheel Condition Monitor (WCM) K Wheel Profile Monitor O Over Height Detector



2.10 Speed Restrictions During Hot Weather (High Temperature Speed Restrictions)

During hot weather conditions, some tracks may be susceptible to lateral instability that could lead to a track buckle. To reduce this risk, ARTC may need to implement High Temperature Speed Restrictions and other control measures, consistent with its Track Stability Management requirements: ETM-06-08 and ETM-06-09.

2.10.1 DIRN – HHN - IN New South Wales

Note: This section shall be read in conjunction with NSFG 210. Speed restrictions may be imposed when prescribed threshold temperatures are reached. When speed restrictions are imposed rail traffic shall travel no faster than:

- the speeds advised by ARTC Maintenance Personnel as communicated by the Network Controller, or
- as per Table 2.10.1.1

Table 2.10.1.1 – New South Wales Speed Restrictions During Hot Weather

TRAIN TYPE	RULING TRAIN SPEED ¹ (KM/H)	SPEED RESTRICTIONS DURING HOT WEATHER (KM/H)
Passenger trains (all types) and light locomotives.	100 or more	90
	95	85
	90	80
	85	75
	80	70
	75	65
	70 or less	Allowable track speed but not exceeding 60 km/h
Freight trains containing all loaded vehicles or Freight trains containing one or more empty platform, all of which shall have allowable, empty speed exceeding 80 km/h ² .	90 or more	80
	85	75
	80	70
	75	65
	70 or less	Allowable track speed but not exceeding 60 km/h
Freight trains containing one or more empty platform, which are restricted to an allowable, empty vehicle speed of 80 km/h or lower ² .	80	Allowable track speed but not exceeding 50 km/h
Track maintenance vehicles.		

Notes:

1 The ruling train speed shall be the allowable track speed or the allowable vehicle speed, as specified in the Section Pages, whichever is less.

2 For the purpose of this rule, a loaded platform is one with a loaded GVM of 30 tonne or more.

2.10.2 DIRN - IN Victoria

Note: This section shall be read in conjunction with TA20 ARTC Code of Practice for the Victorian main line network, Section 30 – Infrastructure Works.

Speed restrictions during hot weather are managed by imposing temporary speed restrictions. Speed restrictions may be imposed when prescribed threshold temperatures are reached.

Table 2.10.2.1 – Victorian Speed Restrictions During Hot Weather

DIRN INTERSTATE NETWORK		
TRAIN TYPE		SPEED RESTRICTIONS DURING HOT WEATHER (KM/H)
Passenger trains (all types) and light locomotives		90
Super freighters		80
Goods		65
All freight trains consisting of empty vehicles		50
Track maintenance vehicles		50
IN NETWORK I1 MAROONA – PORTLAND. SPEED RESTRICTIONS DURING HOT WEATHER		
FREIGHT		PASSENGER
Maroona - Portland	50	N/A*
IN NETWORK I2 BENALLA – OAKLAND. SPEED RESTRICTIONS DURING HOT WEATHER		
FREIGHT		PASSENGER
Benalla - Oaklands	Refer RAS Section Page I2 Special Access Conditions	N/A
IN NETWORK I3 ALBION – JACANA (Broad Gauge). SPEED RESTRICTIONS DURING HOT WEATHER		
FREIGHT		PASSENGER
Albion - Jacana	20	N/A

*Note: * Operational Restrictions: The Benalla to Oaklands or the Maroona to Portland route is a designated freight line and as such no heritage and/or passenger services are permitted to operate on this line without prior permission from the ARTC Interstate Business Unit General Manager Operations Services.*

2.10.3 DIRN South Australia and Western Australia

Note: This section shall be read in conjunction with **NSFW 350 Track Working Rules**.

Speed restrictions during hot weather are managed by imposing temporary speed restrictions.

2.11 ARTC Safeworking Systems

The Network Controller oversees the day-to-day operational control of Safeworking systems. Network Controllers operate from Network Control Centres located at Mile End, Broadmeadow and Junee.

2.11.1 Network Control Centre North

Table 2.11.1.1 Safeworking Systems Operated from Network Control Centre North

Area of Control	Safeworking System
ISLINGTON (inclusive) – THORNTON (inclusive)	Rail Vehicle Detection (RVD)
BLOOMFIELD branch line	Staff and Ticket (S+T)
THORNTON (exclusive) – SINGLETON (inclusive) and TELARAH MT THORLEY – BULGA – WAMBO branch lines	Rail Vehicle Detection (RVD)
SINGLETON (exclusive) – MANGOOLA (exclusive) and ABERDEEN (exclusive)	Rail Vehicle Detection (RVD)
ABERDEEN (inclusive) – WERRIS CREEK (inclusive) and BREEZA (exclusive) MANGOOLA (inclusive) – GULGONG (exclusive) (including balloon loops)	Rail Vehicle Detection (RVD)
WERRIS CREEK (Gap) (inclusive) – TURRAWAN (inclusive)	Rail Vehicle Detection (RVD)
DUBBO / TROY JUNCTION (exclusive) – MERRYGOEN (inclusive)	Train Management and Control System (TMACS)
DUBBO / TROY JUNCTION	Rail Vehicle Detection (RVD)
MERRYGOEN (inclusive) – GULGONG (exclusive)	Train Management and Control System (TMACS)
PORT WARATAH and KOORAGANG Terminal Areas KOORAGANG Terminal Area	Rail Vehicle Detection, Yard working (RVD)
TURRAWAN (exclusive) - MOREE	Train Management and Control System (TMACS)
GOOBANG JUNCTION (PARKES) (exclusive) – NARROMINE (exclusive) - DUBBO (exclusive)	Train Management and Control System (TMACS)
NARROMINE	Rail Vehicle Detection, Yard working (RVD)
MERRYGOEN (inclusive) – WERRIS CREEK (Gap)(exclusive)	Train Management and Control System (TMACS)
MOREE – NORTH STAR	Train Management and Control System (TMACS)
CAMURRA – CAMURRA WEST	Train Management and Control System (TMACS)

2.11.2 Network Control Centre South

Table 2.11.2.1 – Safeworking Systems Operated from Network Control Centre South

Area of Control	Safeworking System
ACACIA RIDGE (exclusive) – TELARAH (exclusive)	Rail Vehicle Detection (RVD)
FLEMINGTON SOUTH JUNCTION (exclusive) – COOKS RIVER – PORT BOTANY (inclusive)	Rail Vehicle Detection (RVD)
CHULLORA JUNCTION (inclusive) – SEFTON JUNCTION (exclusive) – MACARTHUR SOUTH JUNCTION (inclusive)	Rail Vehicle Detection (RVD)
MACARTHUR (exclusive) – ALBURY (inclusive)	Rail Vehicle Detection (RVD)
MOSS VALE (inclusive) - UNANDERRA (exclusive)	Rail Vehicle Detection (RVD)
MITTAGONG JUNCTION – BRAEMAR	Staff & Ticket System (S&T)
ALBURY (exclusive) - SOMERTON (inclusive)	Centralised Traffic Control (CTC)
BENALLA (inclusive) – OAKLANDS (inclusive)	Phoenix Train Order System (PTOS)
COOTAMUNDRA WEST (inclusive) – STOCKINBINGAL (inclusive)	Rail Vehicle Detection (RVD)
STOCKINBINGAL (exclusive) - GOOBANG JUNCTION (exclusive)	Train Management and Control System (TMACS)
GOOBANG JUNCTION	Rail Vehicle Detection (RVD)
GOOBANG JUNCTION (exclusive) - BROKEN HILL (exclusive)	Train Management and Control System (TMACS)
BROKEN HILL	Rail Vehicle Detection (RVD)

2.11.3 Network Control Centre West

Table 2.11.3.1 Safe Working Systems Operated from Network Control Centre West

Area of Control	Safeworking System
TOTTENHAM (exclusive) – NEWPORT (dual gauge) (BROOKLYN – NEWPORT, broad gauge, controlled by V-Line)	Automatic Block Signalling (ABS)
NEWPORT (standard gauge) – LAVERTON LOOP (inclusive)	Automatic Block Signalling (ABS)
GHERINGHAP (exclusive) – MAROONA (exclusive)	Centralised Traffic Control (CTC)
MAROONA – PYRENEES (inclusive)	Centralised Traffic Control (CTC)
MOONEE PONDS (ARTC interface) & APPLETON / SWANSTON DOCKS - SIMS ST JUNCTION - WEST FOOTSCRAY JUNCTION – TOTTENHAM	Automatic Block Signalling (ABS)
TOTTENHAM – SOMERTON (exclusive)	Centralised Traffic Control (CTC)
TARCOOLA (exclusive) – COOK – WEST KALGOORLIE (exclusive)	Train Order Working (TOW Manual SA) (ARTC Code of Practice)
SPENCER JUNCTION (exclusive) – TARCOOLA	Centralised Traffic Control (CTC)
TARCOOLA - NORTHGATE	Train Order Working (TOW Manual SA) (ARTC Code of Practice)
DRY CREEK NORTH JUNCTION – CRYSTAL BROOK	Centralised Traffic Control (CTC)
CRYSTAL BROOK (exclusive) – COONAMIA	Centralised Traffic Control (CTC)

Area of Control	Safeworking System
COONAMIA – STIRLING NORTH (exclusive)	Centralised Traffic Control (CTC)
STIRLING NORTH – SPENCER JUNCTION	Centralised Traffic Control (CTC)
SPENCER JUNCTION - WHYALLA	Advanced Train Management System (ATMS) (ARTC Code of Practice)
CRYSTAL BROOK - GLADSTONE	Centralised Traffic Control (CTC)
GLADSTONE – BROKEN HILL (exclusive)	Automatic Block Signalling (ABS)
MILE END – DRY CREEK NORTH DRY CREEK JUNCTION – PELICAN POINT	Centralised Traffic Control (CTC)
WOLSELEY – MILE END (exclusive)	Centralised Traffic Control (CTC)
MAROONA – PYRENEES LOOP (exclusive)	Centralised Traffic Control (CTC)
PYRENEES LOOP – DIMBOOLA LOOP (inclusive)	Centralised Traffic Control (CTC)
DIMBOOLA LOOP (exclusive) - WOLSELEY	Centralised Traffic Control (CTC)
ALBION (inclusive) – TULLAMARINE (dual gauge) - JACANA (inclusive) (broad gauge)	Centralised Traffic Control (CTC)
MAROONA – PORTLAND (inclusive)	Train Order Working (TOW Manual Vic) (TA20 Rule Book)

2.12 Curve Data and Gradient

For curve, gradient, transition and cant details please refer to the ARTC website at the following:

http://extranet.artc.com.au/eng_network-config_cd.html

2.13 Train Diversions

There is a risk of train incompatibility with track and other infrastructure when trains are to be diverted from their normal route. Train diversions shall not be permitted until train compatibility risks are identified and resolved between each affected Operator and ARTC.

ARTC shall issue an **RACN** where changes to the access conditions for the ARTC Network are required during the diversion period.

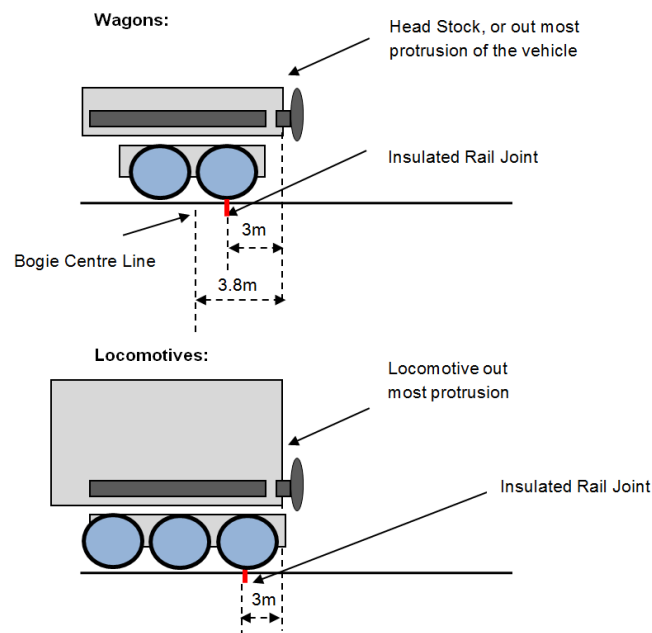
2.14 Signalling and Train Detection Interface

2.14.1 General

Other than locomotive sand, operators shall ensure their trains do not deposit insulating materials on the rails as it may interfere with the ability of the train to be detected by the signalling system.

To ensure train safety at converging tracks and at clearance points, Operators shall ensure the distance from the front or end of a train (draw gear/headstock) to the nearest axle centre does not exceed 3 metres. All rolling stock shall comply with Signalling Rolling Stock interface ESS-32-01. This

document defines the signalling infrastructure compatibility requirements for rolling stock to be operated on the ARTC Network. The standard covers the technical requirements for compatibility of rolling stock with signalling track circuits, position of signals, general electromagnetic interference, and train braking. The standard also covers the process for confirming compliance of rolling stock by the Train Operator. The document also considers those aspects of interfaces to the track and the electrical traction supply system which relate to the operation of the signalling system.



2.14.2 Track Circuit Assistors (TCAs)

Vehicles fitted with a Track Circuit Assistor (TCA) to assist in operating track circuits reliably will be required to meet the following conditions for normal operation on the ARTC Network:

1. All consists of these types of vehicles shall be fitted with at least two (2) operational TCAs – one at each end of the consist. Where consists of these types of vehicles are joined together to form a longer consist, both TCA's on each consist shall be operational at the commencement of a service. Train is not approved to enter the ARTC Network unless the above conditions are met.
2. If whilst in service, one TCA is found to be offline, failed or inoperative the consist may continue until it is able to return to the service depot to be repaired and the TCA certified as operational prior to its next service on the ARTC Network
3. Should both TCAs found to be offline, failed, or inoperative ARTC Network Control is to be notified immediately and appropriate actions shall be undertaken as follows:

Safeworking System ^a	Required actions
Train Order Working, Staff & Ticket, Yard Working	Report failure as required by ARTC processes Train Crew are to apply conditions of ANGE218 for "Rail traffic that may not activate track-circuits". Continue with normal Safeworking system

Safeworking System ^a	Required actions
Rail Vehicle Detection	Report failure as required by ARTC processes Train Crew are to apply "Rail traffic that may not activate track-circuits" conditions from ARTC ANGE218. Continue under the "Manual Block Working" system of Safeworking per ARTC ANSY512
Centralised Traffic Control	Report failure as required by ARTC processes ARTC to apply requirements from OPE-PR-049 - Track Circuit Assistor (TCA) Failure (VLocity)
Automatic Block Signalling	Report failure as required by ARTC processes ARTC to apply requirements from OPE-PR-049 - Track Circuit Assistor (TCA) Failure (VLocity)

Note:

Refer to section 2.11 for Safeworking Systems and where they are applied

4. The Operator shall certify that the operation of the TCAs fitted to each consist are operational following each scheduled maintenance intervention.
5. When splitting a train service in two consists:
 - Both TCA's shall be working on each train set when split.
 - If one TCA is found to be offline, failed or inoperative the consist may continue in accordance with Item 2 above.
 - If either train set has no operational TCA equipment that train shall be manually block worked in accordance with Item 3 above.

3 Safe Working Operations

3.1 Rail Safety / Competent Workers

3.1.1 General

Organisations shall put into place systems to ensure that workers engaged in activities affecting safety on the Network have:

- a) An adequate sense of responsibility to be entrusted with the work.
- b) The necessary capacity, including communication, technical skills and knowledge, to perform the work.
- c) Rail Safety Workers affected by fatigue, or do not comply with zero drug and alcohol requirements, are not permitted to engage in activities on the Network.

3.1.2 Worker Safeworking Competence

Organisations shall maintain their own Rail Safety Worker competency records.

3.2 Rulebooks

ARTC is transitioning to a National Safeworking Framework of Rules and Procedures. Rulebooks are available to Operators via the ARTC website, currently broken down into the following areas of applicability on the ARTC Network:

- **NSW:** These Network Rules and Procedures apply to the ARTC Network up to and including, Acacia Ridge, Albury, Broken Hill, Port Botany and Unanderra, but excluding Oaklands.
- **VIC:** These Network Rules and Procedures apply to the ARTC Network in Victoria, up to and including Dimboola Loop, Benalla to Oaklands, Portland to Maroona and Albion to Jacana.
- **SA / WA / Western VIC:** These Network Rules and Procedures apply to the ARTC Network in South Australia. They also apply in Victoria west of Dimboola Loop, in New South Wales west of Broken Hill and in Western Australia East of Parkeston.

Operators may also provide their staff with Operator specific procedures. These shall support and not conflict with ARTC rulebooks or the Route Access Standard.

3.3 Safeworking Forms and Safety Equipment

Operators shall establish systems and manage the supply, maintenance and provision of Safeworking forms and safety equipment for use by rail safety workers. This includes, but is not limited to Safeworking forms and safety equipment:

- issued directly to rail safety workers
- provided on locomotives, rolling stock or track maintenance vehicles for their use.

Systems established by ARTC, Operators and Maintainers for Safeworking forms shall include, but not be limited to:

- supply and provision
- collection and internal audit
- retention for a minimum of four weeks for access by ARTC where there has been an incident
- archiving within the organisation for seven years.

3.3.1 Safety / Emergency Equipment

Operators shall carry the following safety / Emergency equipment which includes but is not limited to:

- A device displaying the time
- Safeworking keys
- Radios and telephones (fixed or mobile)
- A spare operable end of train monitor or marker
- Chocks
- Emergency equipment for train protection including enough detonators / audible warning devices (Railway track signals), red and green flags, hand lamps / torches (multi-colour where Safeworking activities are required), a minimum 3 approved track circuit shorting clips
- Fire extinguisher
- Continuity tester (where required)
- Personal protective equipment for normal and emergency use for all conditions of the Network
- First aid kit.

Systems established by ARTC, Operators and Maintainers for safety equipment shall include, but not be limited to:

- security for issue, storage and withdrawal from rail safety workers
- provision and security of fixed equipment on locomotives, rolling stock or track maintenance vehicles for the use of rail safety workers
- internal records and audit

ARTC shall ensure Safeworking keys are available to Operators and Maintainers at their cost to enable access to Safeworking equipment for operations.

Accredited Operators may request details about the types of Safeworking keys required directly from ARTC.

3.3.2 Safeworking keys used on the ARTC Network

As required, competent workers shall have access to Safeworking keys applicable to their area of work.

For use of keys, refer to the Network Information Books and Network Rules and Procedures.

- NSW - SL, XL and operator locks
- VIC – V5PSW key
- SA / WA / Western VIC – S key

3.4 Operational Notices

Operational notices advertise important information for ARTC and Operators. Operators shall provide qualified workers with a relevant notice if it affects their work duties and responsibilities. Operational Notices are available to Operators via the ARTC website.

Table 3.4.1 – Operational Notices

Operational Notices	Valid In	Description	Media Source
Route Access Condition Notice	ARTC Network	Outline the conditions by which a temporary deviation from the Route Access Standard (RAS) is permitted on the ARTC Network. Inclusive of train and vehicle testing.	ARTC website
Train Operating Conditions Waiver	NSW / QLD	Detail all changes to the General Instructions of the ARTC TOC Manual, operation of new and modified rolling stock and plant and equipment, and any non-standard working on the NSW/QLD network. Inclusive of train and vehicle testing. <i>Note: The ARTC TOC Manual is in the process of being withdrawn, having been superseded by the RAS and Rolling Stock Standards. Existing TOC Waivers remain in effect until expired or published in the RAS.</i>	ARTC website
National Notice	ARTC Network	An authorised notice distributed to give advice in addition to that provided in the published ARTC Network Rules, ARTC Network Procedure or Network Information Books (NIBs). <i>Note: National Notices supersede SAFE, Train and Standing Train Notices however existing notices remain in effect until expired or transferred to a National Notice.</i>	ARTC website
Timetable Alteration Advice	NSW	Used to advertise alterations to a timetable	ARTC website
Speed Restriction Notice	NSW / QLD	Used to advertise temporary speed restriction information	Sydney Trains website

Operational Notices	Valid In	Description	Media Source
Temporary Speed Restriction Advice	Vic, SA, WA	A TSR overrides any existing higher permanent speed on a section of track for a period of time due to infrastructure conditions, or risks to track workers or weather conditions. (Accessed through WebRAMS (SA & Vic) and TrackSpeed (NSW)).	WebRAMS
Track Warnings	Vic, SA, WA	Track warnings are information messages for train personnel, notifying them of any hazards or action being carried out near the tracks.	WebRAMS

3.5 Time

All operations on the ARTC Network operate on 24-hour time.

3.5.1 Time Zones

The ARTC Network operates in three time zones.

Eastern Standard Time shall be observed in Queensland and New South Wales except at Broken Hill where westbound arrival and eastbound train departures observe Eastern Standard Time and westbound departures and eastbound arrivals observe Central Standard Time.

Eastern Standard Time shall also be observed in Victoria up to, but not including Wolseley.

Central Standard Time shall be observed in South Australia and in Western Australia except to the west of Cook. At Cook, westbound arrivals and eastbound departures observe Central Standard Time, eastbound arrivals and westbound departures observe Western Standard Time.

Changes to and from daylight saving time shall be observed at the times and dates promulgated in each state of operation. In Queensland, train operations will be managed using New South Wales daylight saving time.

4 Train Service Planning and Operations

4.1 General Requirements

Operators shall establish systems and manage all requirements associated with train service planning including building and operating trains within the requirements of the Route Access Standard for the train path for each train in respect of:

- any planned shunting en-route and their effect on train parameters
 - Including resting or watering requirements for livestock trains governed by Animal Welfare regulators
- axle load maximum, for locomotives and rolling stock
- braking requirements, including assurance/validation actions such as but not limited to those required by ARTC in Section 8 of this document
- dangerous goods
- passenger management
- rolling stock (including locomotives) allocation
 - including full continuity of all brake pipes that are required for operational train integrity
- train compatibility for possible train diversions
- train crewing arrangements
- train documentation
- train fuelling and provisioning (including inline fuelling)
- train height, width and length limits
- train loading and security
- train marshalling requirements (including for locomotives marshalled together, for braking or distributed)
- train schedule adherence (sectional running times)
 - Including specific train speed limitation due to regulated payloads such as livestock
- train speed maximums
- train amalgamations as part of a normal train service.

Operators shall conduct train operations to meet the terms and conditions of their rail safety accreditation.

4.2 Section Run Times

All indicative section run times are listed on the ARTC website at this location:

<http://www.artc.com.au/Content.aspx?p=102>

4.3 Locomotive Allocation

Operators shall establish systems and manage all requirements associated with locomotive allocation as follows:

4.3.1 Environmental Requirements

- All rolling stock shall comply with any applicable state legislation.

4.3.2 Locomotive Performance & Operation

- The speed & axle load limits of the route capacity table published in the ARTC Route Access Standard Section Pages and capable of meeting the schedule to which the train is allocated
 - Locomotives with variable fuel shut-off limits shall be set to comply with all route capacity tables that apply to the service
- fit for use on the ARTC Network in terms of
 - compatibility of the multiple unit control, train braking, coupling and driver safety systems
Note: The independent release on A7-EL brake valves should not be relied upon to release the independent brake in consists with three or more locomotives.
 - mechanical and electrical condition
 - the task to be performed
- provisioned with enough supplies of fuel, sand, coolant lubricants as well as safety, emergency, Safeworking and communications equipment
- locomotive headlights are tested on high and low beam and, where fitted, “ditch lights” are checked and are fully operational
- the locomotive warning device is fully operational

4.3.3 Managing dead attached or off-line locomotives

- managed for train integrity when attached dead or offline including consideration of:
 - Ensuring continuity of all available brake pipes
 - Ability for the locomotive to respond to brake commands (application & full release) from the lead locomotive. Where not marshalled at the head of the train, it should be considered if the locomotive complies with the sensitivity test requirements in its current state. E.g. single car air test (SCAT)
 - Where applicable, any potential impact to the propagation of the pneumatic brake signal through the train brake pipe.
 - Where applicable, locomotives with WDP-ECP systems may have the “offline” locomotive in an “isolated” or “idle” state to assure connectivity of the ECP braking system via the WDP control system. Where the only powering locomotives are position at the head of the consist then these trains are not considered to be a Distributed Power configuration.
 - Where applicable, the benefits of planning a train crew member to monitor the dead-engine locomotives and prevent dragging brakes/wheel skids occurring

4.3.4 Operators shall provide the ARTC Network Control Centre with:

- Advice of locomotive allocations at least fifteen minutes prior to the service commencing use of the ARTC Network
- Timely advice of subsequent changes due to operational reasons.

4.4 Maximum Train Speed

The Operator shall establish systems and manage all requirements associated with ensuring the train consist is comprised of locomotives and vehicles rated and loaded to travel at the speeds required in the train schedule.

The speed of any train shall not exceed any maximum speed that applies to each vehicle within the train or a speed restriction that is based on the configuration of the train. Thus the lowest of the following speeds shall govern the maximum train speed:

- the speed noted within the applicable Route Access Standard documentation which includes:
 - Any applicable speed limits advised by this document
 - The speed advised for the relevant train type and axle load in the Route Capacity table that applies to the section the train is on, refer to RAS Section Pages for the Route Capacity tables (this may be multiple for the journey)
 - Any speed limitations advised by ARTC RACNs or National Notices
- the lowest registered speed for any locomotive or vehicle in the train
- permanent or temporary speed signs displayed trackside
- the speed needed to comply with signal indications or braking curve, or
- temporary speed restrictions notified by network control

4.4.1 Cant Deficiency / Enhanced Performance Speeds

Cant (superelevation) is the lift applied to the outside rail of a curve to balance the lateral forces experienced by trains, passenger and freight, while travelling around a curve at speed.

Equilibrium cant is calculated for a given curve radius and a given speed. Trains travelling at speeds above equilibrium speeds are said to be operating with a cant deficiency (CD). Usually specifically approved self-propelled passenger trains operate at up to 110mm CD while locomotive hauled freight & passenger trains operate at up to 80mm CD.

Where the track is maintained to a higher geometry standard, certain freight trains can operate at Enhanced Performance speeds (EP). The actual cant hasn't changed, the train simply travels faster around curves so has higher CD.

- 'EP' Enhanced Performance speed boards are erected in the corridor and listed in the relevant section pages of RAS for operation by compliant locomotives and wagons.
- All rolling stock (including locomotives) within the train consist shall be 110mm CD compliant.

WARNING: Failure to ensure all rolling stock is 110mm CD compliant can result in wheel unloading and potential derailment.

- The train operator shall have systems in place to assure in advance that all rolling stock within the consist is 110mm CD compliant prior to commencement and;
- The train operator shall have systems in place to detect non-compliant rolling stock and have processes to either remove the non-compliant rolling stock from the train consist or comply with the 'Normal' freight speeds as listed in the RAS section pages.

4.4.2 Speed of Trains on Crossing Loops

- Network Rules and Procedures may be applicable when considering the maximum crossing speeds for turnouts with no posted crossing speed limit. Note: NSFR 604 may limit train speeds to 25km/h for applicable turnouts.
- When entering or leaving a loop the train shall not exceed the defined turnout speed until the whole of the train has cleared the turnout.

- The maximum speed of an in-clear train on a loop is limited to the speed allowed through the turnout or speed signalling indicated.
 - Where the turnout speeds differ at opposite ends of a loop and there are no other applicable speed limitations, the maximum in-clear train speed shall be the higher of the turnout speeds.

4.5 Train Hauling and Holding Capacity

Operators shall establish systems and manage all requirements associated with train hauling and holding capacity by individual and multiple locomotives in any combination or arrangement. This shall include, but not be limited to:

- managing the allocation of rolling stock (including locomotives)
- train hauling capacity to maintain the train schedule running
- train holding capacity when stationary on all conditions and grades for the intended journey.

4.6 Locomotive De-Sanding Equipment

All Locomotives working as a single unit or as the last unit in a multiple unit (MU) group shall have functioning de-sanding equipment. Where a locomotive subject to the previous requirement has no available de-sanding equipment or the equipment fails enroute, apply requirements of section 10.2.

To reduce the risk of the signalling system becoming compromised by excessive sanding, Operators should allocate locomotives with functioning sanding and de-sanding equipment.

4.7 Train Braking Requirements

Operators shall establish systems and manage all requirements associated with train braking including, but not limited to ensuring that:

- the train brake table (Table 4.7.1) applies to the train characteristics and ARTC Network area
- All vehicles in the train are marshalled to maintain continuity of inter-vehicle brake connection required to operate the train.
 - All trains shall have full brake pipe continuity
 - All ECP trains shall have full continuity of the train control wire
 - Trains may also require full or partial continuity of the Main Reservoir (MR) or Control (CP) pipes.
- brakes are repaired or vehicles remarshalled or detached, and brakes cut out as detailed below
- passenger trains are composed of rolling stock fully equipped with automatic train brake cut in and operating at the time of departure from the commencement location
- trains other than passenger trains shall be responsible for ensuring compliance with the following:
 - one conventional two bogie vehicle for every ten may have the automatic train brake cut out (or be a piped vehicle) providing the total unbraked mass of any train does not exceed 10% of the total mass of the load being hauled (excluding the mass of the hauling locomotives)
 - one bogie for every ten in a train where individual bogies can be isolated, or the isolation of triple valve control units affects more than two bogies. This only applies on the proviso that the total unbraked mass of the train shall not exceed ten per cent of the total train mass (excluding the mass of the hauling locomotives)

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- no more than 10% of all wagons or 10% of all bogies where individual bogies can be isolated. This only applies on the proviso that the total unbraked mass of the train shall not exceed 10% of the total train mass (excluding the mass of the hauling locomotives)
- not more than two unbraked vehicles may be coupled together at any point in any train
- where two unbraked vehicles are coupled together, a minimum of two braked vehicles shall be marshalled on either side of the unbraked vehicles
- in all cases, the last three vehicles of a train shall have the automatic train brake and park brake operational and have passed the brake holding test.
- the qualified worker conducting the brake test shall inform the train crew of any vehicle on which the automatic train brake does not operate, and its position in the train consist. The train crew is responsible for obtaining this information, which shall be set out on a brake test certificate, before starting the train
- any vehicles with brakes cut out are identified (tagged or defect carded).

Train Braking Table details can be found on the ARTC website at the following location ESS-32-01 Signalling Rolling Stock Interface Section 15:

<http://extranet.artc.com.au/docs/eng/signal/procedures/design/ESS-32-01.pdf>

Trains with stopping distances exceeding these limits shall be driven at reduced speeds to provide the ability to stop within the nominated braking distances. Adjustments to ARTC train pathing to account for reduced speeds shall be reflected in scheduling.

At some locations, 'advisory speed signs' have been displayed for XPT/Xplorer/Endeavour trains, express trains and freight trains exceeding nominated sizes. This is to ensure that these trains have sufficient distance to enable them to stop within the required signal spacing.

Table 4.7.1 – Train Brakes and the Type of Train to Which They Apply

TRAIN BRAKE CURVE	TYPE OF TRAIN
GW40	DEFINED INTERSTATE RAIL NETWORK
GW30	SUPER FREIGHTER
GW16	SUPER FREIGHTER
GW10	LOADED COAL TRAIN
GW11	EMPTY COAL TRAIN
HSP160	HIGH SPEED PASSENGER TRAIN TO 160 KM/H
MSP120	SELF-PROPELLED PASSENGER TRAIN TO 120 KM/H

Table 4.7.2 – The Lines in which Train Brakes Tables Apply

LINE	TRAIN BRAKE CURVE
DEFINED INTERSTATE RAIL NETWORK*	GW40, HSP160, MSP120
*EXCEPT COOTAMUNDRA TO PARKES	
COOTAMUNDRA – STOCKINBINGAL	GW16
STOCKINBINGAL – PARKES	GW30

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HEAVY HAUL NETWORK – ISLINGTON TO TURRAWAN AND MUSWELLBROOK TO ULAN	GW40, HSP160, MSP120 GW10(UP), GW11(DOWN)
ULAN TO MERRYGOEN TO NARWONAH	GW30
ALL OTHER INTRASTATE LINES	GW16
OTHER LINES WITH XPT SERVICES	HSP160

Note: Where more than one table is referenced, each of the respective tables applies to the respective lines.

4.7.1 Electronically Controlled Pneumatic (ECP) Trains

Operators are to take action appropriate to minimise 'noisy' ECP systems and connection to prevent crosstalk type failures.

Operators of Electronically Controlled Pneumatic brake trains shall have recovery procedures to manage all situations in event of train failure.

4.8 Operation of Trains on Steep Descending Grades

Operators shall establish systems and manage all requirements associated with the operation of trains (including light locomotives) on steep descending grades including, but not limited to:

- additional train handling requirements by the train crew
- additional requirements due to locomotive configurations or arrangements
- additional braking requirements or operations
- additional or special train inspections
- appropriate provision and management of rolling stock equipment including, but not limited to:
 - grade control valves
 - fixed exhaust chokes
 - train brakes
 - park brakes
- limiting the maximum train speed.

4.9 Train Speed Restrictions on Steep Descending Grades

Table 4.9.1 Speed Restrictions When Operating on a Steep Descending Grade

CIRCUMSTANCE	TRAIN SPEED (KM/H)
FREIGHT TRAINS DESCENDING 1 IN 30 GRADES OR STEEPER	UP TO 30
LIGHT LOCOMOTIVES DESCENDING 1 IN 30 GRADES OR STEEPER	UP TO 30

Refer to relevant section pages for additional advice this includes:

D52 Moss Vale – Unanderra, for maximum speeds on graded sections.

4.10 On-Train Communication

The National Train Communications System (NTCS) is the Primary communications system for the ARTC controlled rail network and is mandatory for all operators to operate their locomotives using an NTCS ICE (In-Cabin Equipment) Unit as the primary communications device. A standard ICE unit is installed with the following components:

- Telstra 4G transceiver
- Iridium satellite transceiver
- UHF Radio
- GPS

The ICE unit primary communications is via the Telstra 4G transceiver and backup communications is provided via the Iridium Satellite network. The ICE unit will automatically call the appropriate Network Control Centre based on GPS location when the routine and emergency buttons are pressed. Alternate communication is by mobile or satellite phone.

Before any train, light engine or on track maintenance machine (track maintenance machine equipped with ICE radio) commences on the ARTC network, this includes for shunt purposes, they shall have an operational, logged on and successfully tested ICE radio unit with Network Control.

Table 4.10.1 – On-Train Communication Requirements for ARTC Network Areas

ARTC Network Area	On-Train Communication Requirement
NSW	*NTCS / ICE radio to provide the primary means of voice communications between the Train Crew and Network Controller. Working backup communications, which may include mobile or satellite phone, to be used in the event of a failure of the primary voice radio system. Local Train Radio (LTR) (UHF 450.050 MHz) for local communications with other Train Crews, track workers and wayside equipment. ICAPS capable radio for the remote operation of points by the Train Crew from the locomotive between Goobang Junction and Broken Hill & Stockinbingal and Goobang Junction.
VIC	*NTCS / ICE radio to provide the primary means of voice communications between the Train Crew and Network Controller. Working backup communications, which may include mobile or satellite phone, to be used in the event of a failure of the primary voice radio system. Local Train Radio (LTR) (UHF 450.050 MHz) for local communications with other Train Crews, track workers and wayside equipment.
SA/WA	*NTCS / ICE radio to provide the primary means of voice communications between the Train Crew and Network Controller. Working backup communications, which may include mobile or satellite phone, to be used in the event of a failure of the primary voice radio system. Local Train Radio (LTR) (UHF 418.425 MHz) for local communications with other Train Crews, track workers and wayside equipment. ICAPS capable radio for the remote operation of points by the Train Crew from the locomotive between Tent Hill and Parkeston.

**Note: Train crews shall ensure that ICE radio units in all trailing locomotives are turned off when NOT in use*

4.11 Train Crewing

Operators shall establish systems and manage all requirements associated with crewing trains. The systems established by Operators shall ensure that:

- train crews are medically fit and capable of undertaking their duties
- train crews are certified and have current competency in relevant route knowledge, train handling and Safeworking rules and procedures
- train crews are competent in the operational and practical requirements relating to train preparation, testing and management for the types of locomotives and rolling stock to be operated
- train crew communications are compliant with ARTC Network Rules and Procedures. This may include communications with Network Controls, Train Crews of other trains and Train Crews working from another vehicle within the train

Before a train enters the ARTC Network, advice shall be provided to the Network Controller about any planned train crew change requirements that may affect the train's path.

After entering the network, train crews should continue to communicate with Network Control about changing train crews en-route so that pathing of trains is not unduly affected.

Train crew changes should not be planned to take place part way through a section.

Where a train is composed of more than one crewed locomotive, the drivers shall have effective radio communications with each other, and the driver of the leading locomotive shall have full control of train braking.

4.12 Train Visibility, Identification and Markers

Operators shall establish systems and manage all requirements associated with train identification and markers.

Visibility Lights, Headlights and taillights

The leading end of all trains shall have an illuminated headlight and marker lights when operating on the running lines, to ensure the train can be recognised by an approaching train and for visibility on the approach to level crossing interfaces. Where visibility lights are fitted, they shall be fully operational, and illuminated on the lead locomotive and used in accordance with Rules and Procedures. Where locomotives or DMU (including rail motors) are the last vehicle in a train, the rear-end tail lights shall be illuminated. Locomotives in all other positions shall not have any headlight, marker or tail lights illuminated.

For all track maintenance vehicles head and taillights shall be fitted and switched on while on rail.

Use of headlights and taillights on the ARTC Network shall comply with rules

- NSW and Qld: ANTR 406 Using Train Lights
- Vic: TA20 – Section 11 Train Signals
- SA, WA & Western Victoria: NSFW 364 Track Vehicles and Machines

Visibility and Livery

Locomotives and the lead power car of a passenger train shall have compliant livery that has areas of high visibility colour applied to the ends and sides of the vehicle.

Infrastructure maintenance rolling stock shall have livery applied that has high visibility colour applied to at least 50% of the available area on the front and sides of the vehicle.

Refer to “AS7531 – Lighting and Visibility” for areas of application and high visibility colour listings.

Cleaning of the high visibility colour areas should be part of maintenance and inspection routines to maintain functionality.

Heritage and tourist vehicles that do not comply with livery requirements shall have alternative means of controlling the risks agreed with ARTC.

Reflective Delineators

Reflective delineators or reflectors are mandatory equipment on new and existing locomotives, freight and passenger vehicles and track maintenance vehicles to facilitate recognition at night by motorists and other road users.

The dimensions, fitment location and properties of reflective delineators shall comply with AS7531 – Lighting and Visibility.

The presence, integrity and light reflective properties of reflective delineators are critical to their function as safety devices and therefore shall be replaced if defective or missing and shall be cleaned as part of routine inspection and maintenance functions.

Reflective delineators shall not be damaged or obscured by graffiti, contamination, loading, restraining equipment or other accessories.

Vehicle Identification

Trains and light locomotives operating as a train shall also be identifiable by the unique identification displayed on the leading locomotive.

End of Train Markers

The end of a train shall be identifiable by an approved end of train marker, or device as defined in AS7531 Tail and Marker Lights. The device shall be as follows:

- Victoria, South Australia and Western Australia:
 - The device shall consist of a white disc if travelling in daylight hours or a white disc with an operating red flashing light when travelling during hours of darkness or low visibility,
 - the tail lights of a locomotive displaying red lights when marshalled at the rear of train.
- New South Wales:
 - At least one approved red tail light, or an approved end-of-train marker, at the rear of the last vehicle. The tail lights of a locomotive displaying red lights when marshalled at the rear of train.

An end of train marker shall only be fitted to the last vehicle on the train or the locomotive shall only illuminate red tail lights when marshalled as the last vehicle of the train.

Marker lights and tail lights shall be:

- lit during travel, and
- if defective, this shall be reported to Network Control, and the vehicle shall be worked out of service and repaired or replaced before its next operation.

The train with the defective end of train marker shall not continue until the problem is further investigated and rectified.

All rail movements are not permitted to enter Train Order Working or ATMS Territory unless equipped with a fully functioning end of train marker.

If the train is equipped with a Sense and Brake Unit (SBU), the unit shall have a red flashing light while operating in transit. The red flashing light unit is to be regularly maintained to ensure that the unit will continue flashing during loss of air events and that the battery is sufficiently charged to ensure such operation for the duration of the journey.

For ECP Trains, all jumper cables shall be connected and the EOT is in place and connected pneumatically and electrically.

4.13 Fuelling Trains on the ARTC Network

Operators shall establish systems and manage all requirements associated with the fuelling of trains, including operation of in-line fuelling equipment where applicable.

Fuelling from mobile tankers while a train is standing on the ARTC Network is prohibited unless the fuelling site has been approved by ARTC.

In an emergency, if fuelling from a mobile tanker is required on the ARTC Network at a site that has not been approved, the Operator shall, prior to refuelling, obtain permission from ARTC via the Network Controller.

4.14 Holding a Train Stationary on a Grade

The automatic air brake shall not be relied upon to hold an attended train stationary on a grade for periods exceeding ten (10) minutes unless the lead locomotive is fitted with a pressure maintaining brake valve.

If the park brakes are required to hold a freight train with locomotive(s) attached on a grade or freight vehicles with locomotive(s) detached, the minimum number of park brakes to be applied is as in the following table:

Table 4.14 Park brake applications required on grades

Majority of the train on a gradient of	Minimum number of park brakes *
Level to 1 in 100	3 in 10 (30%)
1 in 99 to 1 in 50	5 in 10 (50%)
1 in 49 to 1 in 33	8 in 10 (80%)
1 in 32 to 1 in 25	All (100%)

* When calculating park brake requirements for multipack vehicles, all platforms shall be treated as an individual wagon.

When the train is on an **ascending grade**, the park brakes shall always be applied to the vehicles on the **rear** portion of the train. When the train is on a **descending grade**, the park brakes shall always be applied to the vehicles at the **front** of the train.

On locomotive hauled passenger trains, light train and light locomotives, the park brakes shall be applied on **all vehicles** before the locomotives are detached.

Where ARTC has given specific location waivers to the above requirements, these conditions shall be listed in the Route Access Standard Section Pages.

4.14.1 Holding requirements for unattended trains

Trains that are to be held stationary and left unattended are considered to be stowed or stabled. Additional park brakes may be required to mitigate the risk of a runaway occurring based on variables such as:

- Expansion and contraction of brake equipment and wheels due to thermal effects
- 3rd Parties tampering with braking equipment
- Security of the stowing/stabling site
- Ensure protection of the mainline against uncommanded movements

Where a train is to be stowed or stabled, the operator shall develop procedures such that train crew ensure that all park brakes have been released prior to commencing operations again.

5 Rolling Stock Outlines

Operators shall establish systems and manage all requirements associated with compliance to ARTC Network rolling stock outlines for the route of operation outlined in Table 5.1, Table 5.2 and Figure 5.1. Detailed Rolling stock outline requirements are published separately in *Appendix A Rolling Stock Outlines & Loading requirements*

Table 5.1 – Permitted Rolling Stock Outline on the ARTC Network

Diagram	Rolling Stock Static Outlines	RISSB Ref Vehicle #
A1.1	Rolling Stock Interstate Outline Plate, A	RV1
A1.2	Rolling Stock Interstate Outline Plate B	RV2
A1.3	Rolling Stock Interstate Outline Plate C	RV3
A1.4	Rolling Stock Interstate Outline Plate D	RV4
A1.5	Rolling Stock Interstate Outline Plate E1	Note 1
A1.6	Rolling Stock Interstate Outline Plate F1	Note 1
A1.7	Rolling Stock Interstate Outline Plate F2	Note 1
A1.8	Rolling Stock Interstate Outline Plate H	Note 1
A1.9	Rolling Stock Outline Plate CY4150	RV7
A1.10	Rolling Stock Outline Plate CZ	RV8
A1.11	Rolling Stock Outline Plate Narrow Non-Electric (NNE)	RV21
A1.12	Rolling Stock Outline Plate NSW Narrow Container (NC)	RV23
A1.13	Rolling Stock Outline Plate NSW Narrow Square (NS)	RV24
A1.14	Rolling Stock Outline Plate NSW Inter System (IS)	RV25
A1.15	Rolling Stock Outline Plate NSW Narrow Hopper (NH)	RV26
A1.16	Rolling Stock Outline Plate NSW Double Stacking (DS)	RV9

Notes:

“RV#” – RISSB Reference Vehicle number as per AS7507 as published in 2017

1: These plates are currently not published in RISSB AS7507 as published in 2017

Table 5.2.1 – **DEFINED INTERSTATE NETWORK** Allowable Maximum Rolling Stock Outlines

INTERSTATE ROUTE		ROLLING STOCK OUTLINE															
		ROA A	ROA B	ROA C	ROA D	ARTC E1	ARTC F1	ARTC F2	ARTC H	ARTC CY 4150	ARTC CZ	NSW NNE	NSW NC	NSW NS	NSW IS	NSW NH	NSW DS
D5-7	AFT ISLINGTON – CRYSTAL BROOK – PARKESTON	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D4	AFT ISLINGTON – DRY CREEK – OUTER HARBOUR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D21	WHYALLA LINE	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
D15	CRYSTAL BROOK – BROKEN HILL	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D14	BROKEN HILL - GOOBANG JUNC	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D12	GOOBANG JUNC - NARWONAH	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
D4	MILE END - AFT ISLINGTON	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✗
D1-3	MILE END – TOTTENHAM JUNCTION – DYNON	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✗
D53	MELBOURNE (TOTTENHAM) – WODONGA – RIVER MURRAY BRIDGE – ALBURY	✓	✓	✓	✓	✗	✗	✗	✗	✓	✗	✓	✓	✓	✓	✓	✗
D51	MACARTHUR - ALBURY	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✗
D33	MAITLAND – ACACIA RIDGE (NSW NTH COAST)	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✗
D11	COOTAMUNDRA – GOOBANG JUNC	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✗
D52	MOSS VALE – UNANDERRA	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✗	✓	✗	✓	✗
D45	PORT BOTANY – MACARTHUR	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✗
		PLATE V1	PLATE V2	PLATE V3	PLATE V4					PLATE V7	PLATE V8	PLATE V21	PLATE V23	PLATE V24	PLATE V25	PLATE V26	PLATE V9
		RISSB ROLLING STOCK OUTLINE															

✓	Allowed
✗	Not Allowed
✓	Governing plate

Note: Full ROA plates E & F do not apply on the ARTC network, refer to figure 5.1 for details about modified ROA plates E & F and their applicability.

Governing plate may also be referred to as "Ruling Plate" – the largest width profile shall be used for designing infrastructure clearances. Where 2 ruling plates are shown both plates shall be assessed for clearances.

Table 5.2.2 – **HEAVY HAUL NETWORK** Allowable Maximum Rolling Stock Outlines

HEAVY HAUL ROUTE		ROLLING STOCK OUTLINE															
		ROA A	ROA B	ROA C	ROA D	ARTC E1	ARTC F1	ARTC F2	ARTC H	ARTC CY 4150	ARTC CZ	NSW NNE	NSW NC	NSW NS	NSW IS	NSW NH	NSW DS
H1	ISLINGTON JUNCTION – MUSWELLBROOK	✓	✓	✓	✓	x	x	x	x	x	x	✓	✓	✓	✓	✓	x
H2	MUSWELLBROOK – WERRIS CREEK	✓	✓	✓	✓	x	x	x	x	x	x	✓	✓	✓	✓	✓	x
H3	WERRIS CREEK – NARRABRI	✓	✓	x	x	x	x	x	x	x	x	✓	x	x	x	✓	x
H4	MUSWELLBROOK – ULAN	✓	✓	✓	✓	x	x	x	x	x	x	✓	✓	✓	x	✓	x
		PLATE V1	PLATE V2	PLATE V3	PLATE V4					PLATE V7	PLATE V8	PLATE V21	PLATE V23	PLATE V24	PLATE V25	PLATE V26	PLATE V9
		RISSB ROLLING STOCK OUTLINE															

✓	Allowed
x	Not Allowed
✓	Governing plate

Governing plate may also be referred to as “Ruling Plate” – the largest width profile shall be used for designing infrastructure clearances.

Table 5.2.3 – **INTRASTATE NETWORK** Allowable Maximum Rolling Stock Outlines

INTRASTATE ROUTE		ROLLING STOCK OUTLINE															
		ROA A	ROA B	ROA C	ROA D	ARTC E1	ARTC F1	ARTC F2	ARTC H	ARTC CY 4150	ARTC CZ	NSW NNE	NSW NC	NSW NS	NSW IS	NSW NH	NSW DS
I1	PORTLAND – MAROONA	✓	✓	x	x	x	x	x	x	x	x	✓	x	x	x	✓	x
I2	BENALLA – OAKLANDS	✓	✓	x	x	x	x	x	x	x	x	✓	x	x	x	✓	x
I3	ALBION – JACANA (NOT CONNECTED TO DIRN)	✓	✓	x	x	x	x	x	x	x	x	✓	x	x	x	✓	x
I4	GAP – BINNAWAY - MERRYGOEN	✓	✓	x	x	x	x	x	x	x	x	✓	x	x	x	✓	x
I4	MERRYGOEN – NARROMINE - NARWONAH	✓	✓	✓	✓	x	x	x	x	x	x	✓	✓	✓	x	✓	x
I7	ULAN – GULGONG – MERRYGOEN	✓	✓	x	x	x	x	x	x	x	x	✓	x	✓	x	✓	x
I6	NARRABRI – NORTH STAR	✓	✓	✓	✓	x	x	x	x	x	x	✓	✓	✓	x	✓	x
		PLATE V1	PLATE V2	PLATE V3	PLATE V4					PLATE V7	PLATE V8	PLATE V21	PLATE V23	PLATE V24	PLATE V25	PLATE V26	PLATE V9
		RISSB ROLLING STOCK OUTLINE															

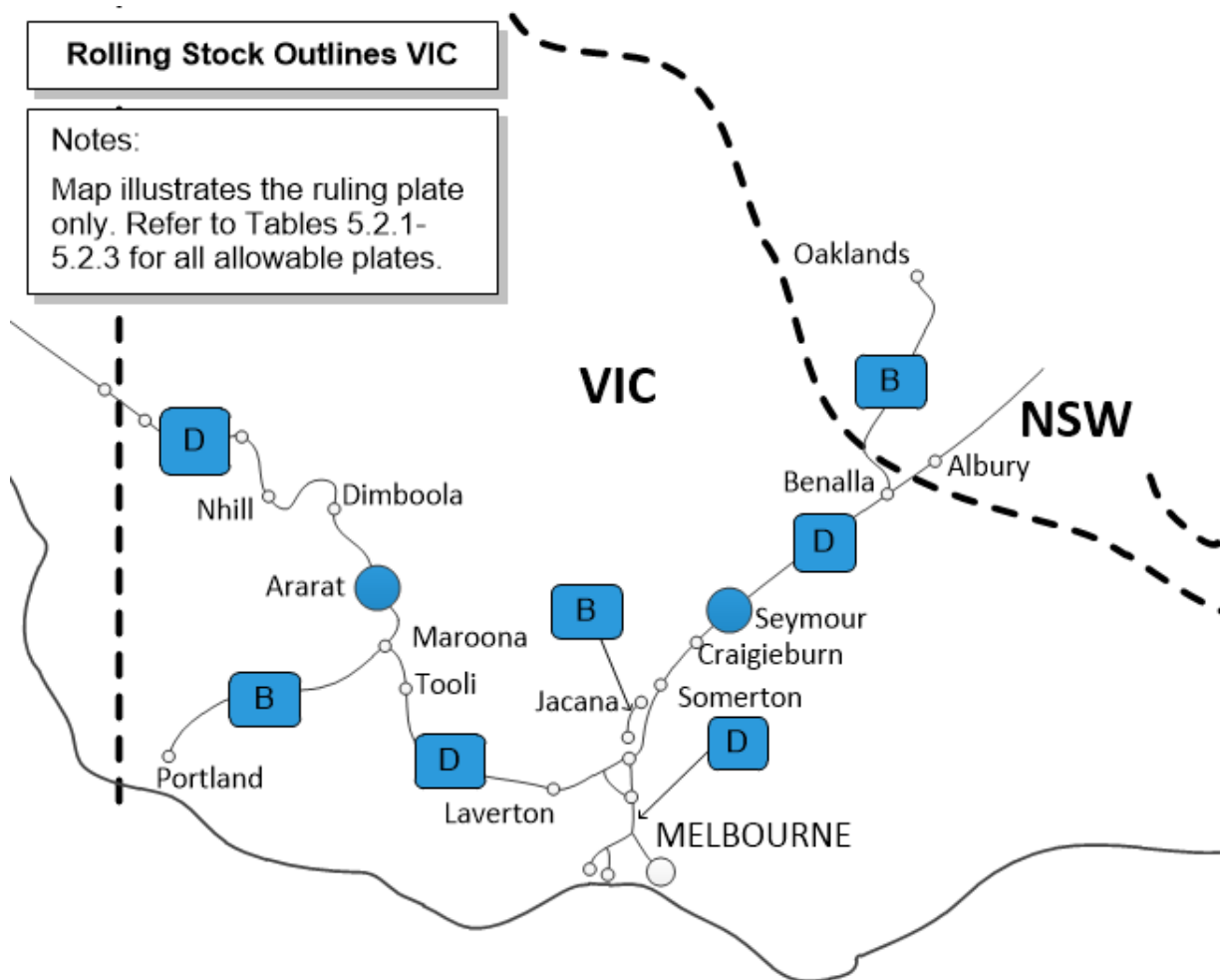
✓	Allowed
x	Not Allowed
✓	Governing plate

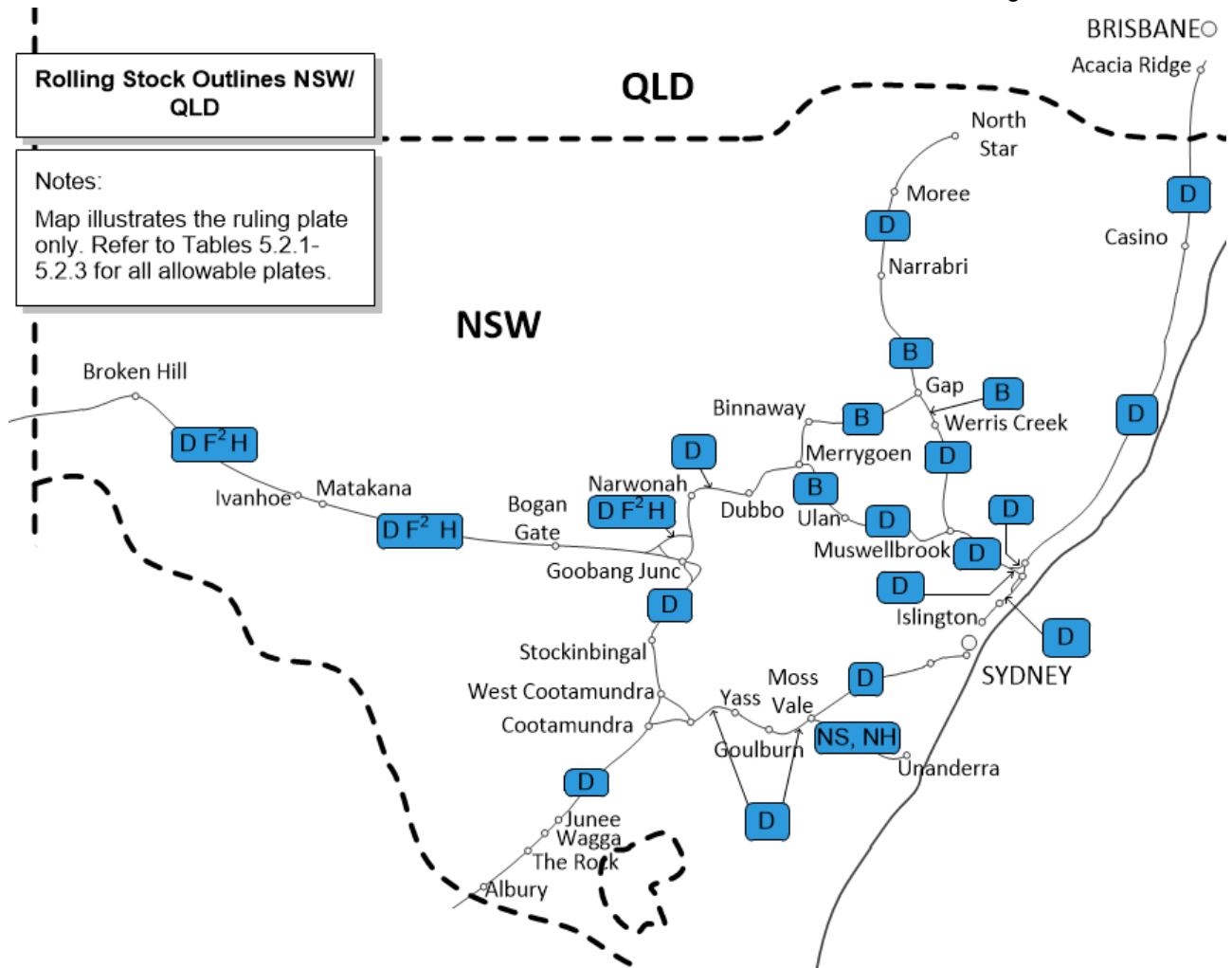
Governing plate may also be referred to as “Ruling Plate” – the largest width profile shall be used for designing infrastructure clearances.

Rolling Stock Outlines SA/WA

Map illustrates the ruling plate only. Refer to Tables 5.2.1-5.2.3 for all allowable plates.







6 Load Restrictions

Operators shall comply with the loading restrictions specified in **Appendix A Rolling Stock Outlines & Loading Requirements** including the appropriate loading diagram and corresponding area of operation map.

Note: If there is any doubt about the safe transit of loads, the train shall not be permitted to enter or continue to proceed through the ARTC Network. The Operator shall arrange for re-examination and certification of the train before continuing.

6.1 Out of Gauge Train Paths

ARTC may consider Operator requests for out of gauge loads on a train path in accordance with procedure **OPE-PR-029 Application for Out of Gauge Train Notice** and as follows:

- For non-divisible loads that cannot be reasonably reduced within the loading outline dimensions to conform to the ARTC structure gauge
- ARTC shall not consider out of gauge loading requests for divisible items only to increase vehicle capacity
- If there is any doubt regarding out of gauge loading, it will not be approved by ARTC
- Out of gauge loads shall not operate without authorisation from ARTC
- Out of gauge loading and train path arrangements include acceptability by the receiving system and is to be arranged by the Operator.

6.2 Out of Gauge Trains

In considering requests for out of gauge train service subject to published approval conditions, ARTC may impose and advertise special restrictions including, but not limited to:

- train path and route restrictions
- restricted train length
- restricted train speed for grade conditions
- additional Operator inspections en-route
- special arrangements for crossing or passing other trains
- special arrangements for crossing other out of gauge loads
- special arrangements for managing interactions with adjacent lines
- special arrangements including piloting and speed restrictions for passing work on track
- out of gauge train arrangements include acceptability by the receiving system
- special arrangements for temporary configuration changes to infrastructure.

6.3 Dangerous Goods on Trains

Operators shall establish systems and manage all requirements associated with the transport and carriage of dangerous goods including, but not limited to:

- compliance with the Australian Dangerous Goods Code (ADG Code)
- separation between dangerous goods on rail vehicles and marshalling of rolling stock containing dangerous goods shall comply with the provisions of Division 9.2 and Table 9.3 of the ADG Code and any regulations, provisions or exemptions to that code as approved by the Competent Authority
- compliance with exemption number EXEM2000/65 issued on 29 January 2001 by the NSW Environment Protection Authority on behalf of the Competent Authorities Panel.
- Note: This exemption covers acceptable alternate methods of working. Any Operator not wishing to use this exemption shall comply with the existing provisions of the ADG Code.

6.4 Unbalanced Loads in Bulk Wagons

Operators of bulk wagons shall establish systems to prevent excessive load imbalance, particularly where uneven discharge through multiple doors may occur. Bulk wagons shall not enter main line track with excessive load imbalance.

Under exceptional circumstances, a wagon with excessive load imbalance may be moved to a near siding for detachment from the train. If this movement is authorised, the following conditions apply:

- The unbalanced wagon is not to exceed a maximum speed of 25 km/h.
- The unbalanced wagon shall not pass another unbalanced wagon (whether stationary or in motion), on parallel lines where the load imbalance causes both wagons to lean toward one another.
- The driver of the train conveying the unbalanced wagon shall be informed of the load imbalance.
- Personnel on or about the track shall remain a safe distance from the unbalanced wagon during its movement, and they shall be warned that there is a danger of derailment.
- The unbalanced wagon is not to travel further than the nearest practical location to clear the section.

7 Train Marshalling and Locomotive Allocation

Operators shall establish systems and manage all requirements associated with the marshalling of trains, which involves making up the train consist, including locomotives.

7.1 Train Marshalling Principles

Operators shall establish systems and apply train marshalling principles to ensure safe and reliable operation including, but not limited to:

- Loaded vehicles should generally be marshalled to the front of the train, immediately behind the locomotive(s), where possible
- Lightly loaded and empty vehicles should generally be marshalled to the rear of the train
- The marshalling of a vehicle within a train shall also be determined by:
 - draw capacity (the weakest of the coupling, draftgear and vehicle structure)
 - brake equipment type
 - type of rolling stock (e.g. wooden body)
 - dangerous goods loading and segregation
 - length difference between adjacent vehicles
 - passenger requirements
- Vehicle or loading destination shall not be used to determine marshalling sequence until safety factors have been fully considered
- Operators are to have processes and procedures develop to manage implications of in-service train amalgamation in terms of:
 - Selection of Train Configuration type (Head end hauled or distributed power)
 - Where applicable, approvals to operate the required distributed power configuration(s)
 - Give operating instructions for abnormal vehicles such as empty wagon, in-train (dead-engine, isolated or hauling) locomotives as well as passenger vehicles in freight trains or freight vehicles in a passenger train
 - Management of potential vehicle interoperability issues such as:
 - Brake equipment compatibility (mix of distributor and triple valve types, vent valve compatibility with braking equipment)
 - Ability to engage the Dynamic Brake and operate the Independent Release function to prevent Power knock-out isolations of traction systems
 - Continuity of all required Brake Pipes or Control Lines including MR Pipes, CP/No 3 Pipes or ECP Control Wires
 - Locomotive traction systems
 - Train Crew allocation and training to ensure all safe working duties are able to be efficiently and effectively performed from a locomotive cab that is compliant with sighting requirement. Ref: ESS-32-01
 - Ensure compliance with applicable ARTC requirements

7.2 General Train Marshalling Requirements

The lateral forces exerted to a track from a moving train, contribute to track shifting forces. If the track shifting forces are significant enough the track can become unstable. The likelihood that unsafe conditions will arise is dependent upon the track grade and curvature of the area, as well as the train locomotive adhesion levels and its trailing load.

7.2.1 Maximum Trailing loads

The table below sets the maximum trailing loads for various parts of the ARTC Network

Table 7.2.1 – Maximum Trailing Loads (both Directions)

	MILE END TO TAILEM BEND	MOSS VALE (SUMMIT TANK TO UNANDERRA)	MUSWELLBROOK TO WERRIS CREEK (ARDGLEN BANK)
LOADED COAL TRAINS ONLY	N/A	Refer to Section Page D52	9,840 TONNE ¹
ALL OTHER TRAIN TYPES	5000 TONNE (BEHIND ANY LOCOMOTIVE SET)	Refer to Section Page D52	5,200 TONNE

Notes:

Any listed train in RAS HG may exceed this limit to the maximum limit derived by the aggregate of the wagon gross masses.

7.2.2 Maximum number of locomotives

The table below sets out the maximum parameters for the locomotives that are hauling any train that is operating to the prescribed scenarios. Unless otherwise specified, all locomotives are to be marshalled at the head-end of the train full continuity of all four brake pipes and the MU control cable ensuring all locomotives are under the direct control of one driver per 4.11 “Train Crewing”.

Table 7.2.2 – Maximum number of locomotives head end per corridor

ROUTE	DIRECTION OF TRAVEL	MAXIMUM NUMBER OF LOCOMOTIVES	HAULING LOCOMOTIVE & AGGREGATED POWER LIMITS *
D52 Moss Vale to Unanderra	UP & DOWN	5 LOCOS	4 LOCOS
D33 Telarah to Acacia Ridge	UP & DOWN	5 LOCOS	4 LOCOS
All other DIRN routes and I6 up to Moree	UP & DOWN	8 LOCOS ¹	5 LOCOS with up to 16000hp
H2 Pages River to Willow Tree	UP	5 LOCOS ¹ 8 LOCOS ¹	4 LOCOS ² 8 LOCOS with up to max 14000hp ²
H2 Pages River to Willow Tree	DOWN	5 LOCOS ¹ 8 LOCOS ¹	4 LOCOS ² 5 LOCOS with up to max 14000hp ²
H1 Islington Jct to Muswellbrook	UP & DOWN	5 LOCOS ¹ 8 LOCOS ¹	4 LOCOS ² 5 LOCOS with up to max 14000hp ²
H2 Muswellbrook to Pages River			
H2 Willow Tree to Werris Creek			

Train Marshalling and Locomotive Allocation

ROUTE	DIRECTION OF TRAVEL	MAXIMUM NUMBER OF LOCOMOTIVES	HAULING LOCOMOTIVE & AGGREGATED POWER LIMITS *
H3 Werris Creek to Narrabri			
H4 Muswellbrook to Ulan			
All other Intrastate Routes including I6 Moree to North Star	UP & DOWN	5 LOCOS	4 LOCOS

General Notes:

* "Aggregated power" is the total power of the locomotives that are hauling the train at any point of the journey.

Referenced Notes:

1. *Special conditions for selected routes:*
 - a. *Up to 8 locomotives may be marshalled head end if all locomotives are under 134 tonne.*
 - b. *If any of the locomotives marshalled at the head end exceed 134 tonne, the maximum number of locomotives is five*
 - c. *The Train Transit Manager (TTM) is permitted to authorise additional locomotives up to 6 locomotives head end as long as the maximum hauling power is adhered to.*
2. *For trains where "note 1b" applies, the maximum number of hauling locomotives is four (4) with no aggregated power limit.*

7.3 Distributed Power

In freight rail operations, the term 'distributed power' (DP) refers to the practice of placing locomotives at more than one location within the train. Such practice is differentiated from conventional freight train practice where all the locomotives are marshalled at the front of the train, a configuration known as 'head end power'. If all powering locomotives are in a "head-end power" but there is a DP communications link present, this train is not to be considered as a DP configuration on the ARTC network and shall comply with normal RAS requirements. Such trains may have all locomotive in the lead position and the DP control system is being used for testing and/or training. Other circumstances may also require a locomotive that has its power isolated at the "RUN" switch to be connected via the DP control software to act as an end of train monitor or ECP terminator, typically this is done for training, testing or specific movements such as 'out of service', maintenance, remarshalling or movements that shall be preceded by a lookout.

7.3.1 General

Applications for new and altered distributed power consist configurations shall be supported with a risk assessment, test plan and analysis as detailed in the RISSB Code of Practice – Distributed Power Freight Trains. New and altered distributed power consist configurations may require trials prior to being accepted by ARTC.

The RISSB Code of Practice – Distributed Power Freight Trains categorises DP Configurations into four distinct operating modes:

- Bank Locomotive (BLDP) – Which is typically where additional locomotives are attached to assist the train for part of the journey and are operated manually by train crew under real-time verbal direction from the lead driver.
- Manual (MDP) – Which is typically where a second group of locomotives are attached for the whole journey and are operated manually by train crew under real-time verbal direction from the lead driver.
- Wired (WDP) – Which is typically where one or more remote locomotives are controlled using encoded messages via an ECP trainline. Implementations where the lead locomotive does not have full ECP control of the train brake and/or full remote control of the brake rack(s) of the remote locomotive(s) are considered MDP trains.
- Radio Frequency (RFDP) – Which is typically where one or more remote locomotives are controlled using encoded radio messages via a dedicated DP radio system. Implementations where the lead locomotive does not have full ECP control of the train brake and/or full remote control of the brake rack(s) of the remote locomotive(s) are considered MDP trains.

Typically, Radio-Frequency Distributed Power (RFDP) and Wired Distributed Power (WDP) are assessed to operate in a synchronous-only operation, where all locomotives are controlled from the same controls in the lead locomotive. This is known as synchronous control. Where locomotives are controlled independently, such as trains with rear locomotives controlled by additional train crew or trains that utilise "the fencing" feature of the RFDP/WDP control system.

7.3.2 Assessment requirements

Operators of Distributed Power trains are responsible for safety, reliability and performance of all their above rail activities, including the configuration of trains on the network.

Above rail operations shall be compatible with interface requirements in RAS (and performance requirements of Access Agreement).

The train operator shall be responsible for ensuring:

- That adequate communication and control is maintained between distributed power locomotives within a train, including full control of the train brake throughout the train.
- That the train does not emit or receive Electro-Magnetic Frequencies which may interfere with the operation of their train, other trains (including those on adjacent networks) or the railway signalling and communication system.
- The placement of distributed power locomotive assures that in-train forces are managed appropriately. Consideration should be given to ensuring that the tractive forces do not compound with topological and/or dynamic forces to generate forces that may contribute to damaging or derailing any vehicles within the train.
- Any use of Asynchronous control is assessed and prescriptive procedures are to be developed to ensure that the additional workload of the Train Crew does not negatively impact the safe operation of the train and to minimise adverse in-train force conditions that may occur due to mishandling or communication interruptions.
- Refer to RISSB Code of Practice for Distributed Power Freight Trains for additional information on in-train force assessment methodologies.

7.3.3 Marshalling requirements

The train operator shall be responsible for ensuring:

- When distributed power locomotive(s) are marshalled at the rear of the train, the Operator shall have marshalling procedures in place for minimum allowable vehicle mass for those vehicles in the trailing 1/3 of the train.
 - It is recommended that wagons within the trailing 1/3 of the train maintain a ratio of Power: Axle Load Mass of 800hp: 1 tonne axle load
 - Where possible, low mass vehicles should be marshalled towards the centre of the train consist.
- Operators are to assess and develop limitations appropriate for managing light wagons in heavily loaded trains
- The two red lights on the rear locomotive shall be exhibited as taillights to indicate the rear of the train. Alternatively, a flashing taillight (end of train marker) can be used.
- Four wheel (Two axle) vehicles and wagons with non-automatic couplers shall not be marshalled in a position that leads any locomotive in the train consist.

7.3.4 List of approved Distributed Power train configurations

The following Distributed Power consists are approved to operate with listed rolling stock and defined route.

Approvals for specific operators & configurations are contingent on adherence to the Operator's Configuration Management processes. The processes shall not supersede ARTC requirements however may supplement ARTC requirements. Operators shall issue to ARTC any declared changes to the relevant controls associated with the listed train configurations.

Train Marshalling and Locomotive Allocation

Note: listed distributed power trains in RAS Section Pages D52 and HG supplement this list, and trains that are under trial will be managed by an **RACN** until integrated into the list of approved DP Trains:

ROUTE	OPERATOR	DP OPERATING MODE	TRAIN CONFIGURATION
H2 - Chilcotts Creek to Ardglan	Aurizon & PN	BLDP	Per limits of RAS H2
H2 - Werris Creek to Parkville	Various	MDP	Per limits of RAS H2
D51 – between Macarthur and Marulan D45 – all locations	Pacific National	WDP	1×NR loco - 36×RHKY - 1×NR or TT loco 1×TT loco - 36×RHKY - 1×TT loco
D45 – all locations D51 – between Tahmoor and Moss Vale	Aurizon	WDP	2×Locomotives ^{note 1} + up to 46×120t Hoppers (short loaded to 100t max) + 1×Locomotives ^{note 1} 1×Locomotives ^{note 1} + up to 46×120t Hoppers (short loaded to 100t max) + 2×Locomotives ^{note 1} 1×Locomotives ^{note 1} + up to 44×120t Hoppers (short loaded to 100t max) + 1×Locomotives ^{note 1}
D51 – between Macarthur and Tahmoor	Aurizon	WDP	2×Locomotives ^{note 1} + up to 46×120t Hoppers (short loaded to 98.9t max) + 1×Locomotives ^{note 1} 1×Locomotives ^{note 1} + up to 46×120t Hoppers (short loaded to 98.9t max) + 2×Locomotives ^{note 1} 1×Locomotives ^{note 1} + up to 44×120t Hoppers (short loaded to 98.9t max) + 1×Locomotives ^{note 1}

Notes:

All DP Operations are limited to the conditions within this document and the applicable RAS section pages.

1. Locomotives may include 6000, 6020, ACD & CF class locomotives

7.4 Dynamic Braking

Dynamic braking shall not be used for the control of train speed (i.e. the dynamic brake shall be used in conjunction with the automatic train brake) in the following instances:

- When more than three locomotives are marshalled on the front of the train and powering.
- Irrespective of the number of locomotives marshalled on the front of the train, if any empty vehicle or empty platform (in the case of multipack vehicles) is marshalled with more than 2000 tonne trailing that empty vehicle.

7.5 Wooden-Bodied Vehicles

Trains with wooden-bodied vehicles marshalled at either end of a locomotive hauled train, or within the train consist of a self-propelled train, shall be block worked.

The Operator shall marshal and operate wooden-bodied vehicles in compliance with their Rail Safety Accreditation Working including, but not limited to, ensuring that:

- On a locomotive hauled train, only steel strengthened wooden-bodied vehicles are marshalled at either end of the train consist, or they remain unoccupied for the duration of the journey
- On self-propelled trains that contain wooden-bodied vehicles, approved hazard warning lights shall be fitted at each terminal end and impact resistant barriers are provided on the front and rear windows.

8 Train Inspection

8.1 General

The principal function of a vehicle inspection is to confirm that the condition and loading of each vehicle in the train are acceptable for travel over the intended routes.

This section articulates mandatory requirements that apply to relevant trains operating on the ARTC Network. Additional recommendations and guidance is provided in ***RAS Appendix E – Guidelines for Operations***.

Operators should develop detailed train examination documentation and schedules appropriate to manage the risk of operation, reliability and operability of each rolling stock class.

8.1.1 Locomotive Hauled Train Inspections

A *general train inspection* must be performed by the train crew. This train inspection includes:

- general mechanical inspection,
- brake pipe leakage test,
- air brake inspection and test,
- brake holding test,
- full continuity test.

A *full train inspection* must be performed by a qualified worker. This inspection includes:

- full mechanical inspection,
- brake pipe leakage test,
- air brake inspection and test,
- brake holding test,
- full continuity test.

A partial train inspection must be carried out after the train consist has been altered in any way, such as changing or attaching locomotives, attaching or detaching vehicles, amending loading, amalgamating trains, attaching assisting locomotives or running locomotives around to the other end of a train (refer to Section 8.5 Table 8.2 for details of required partial train inspections).

8.1.2 Multiple Unit Trains and Self-Propelled Vehicles

Multiple Unit Trains typically include Self-propelled passenger and freight vehicles. There are various levels of inspections for *Multiple Unit Trains* i.e. general, pantograph, reservoir and brake inspections. *Multiple Unit Trains* also undergo daily preparation by train crews.

8.2 General Mechanical Inspection

A *general mechanical inspection* comprises a visual inspection of each vehicle in respect to the adjustment, condition and/or security of the following items, where fitted, as a minimum:

- a) relevant coupling hoses are correctly coupled and appropriate coupling cocks open
- b) brake block/disc pad thickness
- c) brake blocks are correctly aligned, that is, not permanently overhanging the edge of the wheel

- d) brake rigging (levers, rods, pins, cotters, bogie safety loops, etc) is secure
- e) all load compensating and grade control equipment is correctly set
- f) automatic couplers are secured and the difference in height of connected coupler knuckles does not exceed half the depth of the knuckle
- g) doors, container securement, trailer hitches, and wheel chocks
- h) securing of loads and loading within gauge
- i) for work trains / vehicles, all extendable equipment is secured in travel position
- j) centre casting engagement
- k) wheel profiles and tread condition
- l) side bearer clearance
- m) handbrake assemblies and linkages
- n) axle box plugs, bearing end caps, adaptors
- o) bogie springs and damping devices

8.3 Full Mechanical Inspection

A *full mechanical inspection* comprises the *general mechanical inspection* detailed above plus a condition check of additional items, where these are not subject to frequent scheduled maintenance and an inspection is considered necessary by the RSO:

- a) Hi-visibility livery, reflectors and lighting are not inhibited by dirt/debris;
- b) relevant coupling hoses are correctly coupled and appropriate coupling cocks open,
- c) brake block/disc pad thickness,
- d) brake blocks are correctly aligned, that is, not permanently overhanging the edge of the wheel,
- e) brake rigging (levers, rods, pins, cotters, bogie safety loops, and so on) is secure,
- f) all load compensating and grade control equipment is correctly set,
- g) air pipes, pipe fittings, and securing clips,
- h) reservoirs, variable volume device and safety valves,
- i) slack adjusters and fittings,
- j) brake cylinder leaks or over extension,
- k) grade control valve or other additional valve assemblies, securing brackets and bolts,
- l) release valve and operating chain or wire,
- m) automatic couplers are secured and locked
- n) the difference in height of connected coupler knuckles does not exceed half the depth of the knuckle, this may indicate the presence of defects such as “excessive coupler droop”
- o) knuckle pins, knuckles, drawgear carrier plates, murray keys, yolks, draftgear, uncoupling rods, and associated brackets,
- p) doors, container securement, trailer hitches and wheel chocks,
- q) securing of loads and loading within gauge,

- r) centre sills, side sills, end sills, transoms, and stanchions,
- s) steps, handrails, and ladders,
- t) doors and twistlocks,
- u) gangway beams and diaphragms,
- v) correct centre casting engagement,
- w) wheel profiles and tread condition,
- x) handbrake assemblies and linkages,
- y) bogie springs and damping devices,
- z) side bearers and side bearer clearances,
- aa) Wagon and bogie bolsters,
- bb) bogie springs, ride control equipment (that is, friction wedges and other damping devices), and specialised bogie equipment,
- cc) roller bearing end caps, seals, backing rings, axle box plugs, adapters and horn stays (con straps),
- dd) loose axle box liners or loose horn cheek wear liners,
- ee) trip assembly,
- ff) air ride suspension

8.4 Brake Tests

8.4.1 Brake Pipe Leakage Test

The brake pipe leakage test determines whether there are excessive air leaks in the train which may interfere with the operation of the air brake system and confirms that only one brake valve controls the train brake.

With a full-service brake pipe reduction and the brake pipe isolated, the maximum allowable leakage in the brake pipe shall not exceed 35 kPa per minute.

8.4.2 Air Brake Inspection & Test

The following items must be checked with the brakes fully applied.

- That the brakes on vehicles (within the limits for allowable cut-outs) are applied, that is, brake cylinder pistons are extended and brake blocks are against the wheels.
- The brake block thickness is not less than 10 mm at any point and is sufficient till the next train inspection.
- All load compensating equipment are correctly set.

The following items must be checked with the brake pipe fully charged to nominally 500 kPa:

- Air brake released on each vehicle.
- Handbrakes released on each vehicle.
- Repair, if possible, any air leaks.

8.4.3 Brake Holding (Retention) Test

The brake holding test only applies to locomotive hauled trains.

The brake holding test must be conducted with the brake pipe fully exhausted.

Reason for test

The brake holding test proves that the brakes on the rear 3 vehicles, and any other vehicles tested, will remain applied for a long enough time period in the event of a break-away, to allow the train crew to reach these vehicles and to apply the handbrakes, in order to secure the train.

The brake holding time is determined by the length of the train.

At all times, a valid brake holding test must apply to the last 3 vehicles of the train for the entire journey. For locomotive hauled trains with less than 3 vehicles, all vehicles must be tested.

If one of the last 3 vehicles on the train fails the brake holding test, the defective vehicle must be remarshalled and the new last 3 vehicles brake holding tested.

Extended holding test

If it is known that additional vehicles will be added to the train, an extended brake holding time takes account of the increased train length with these additional vehicles.

It is permissible to conduct a brake holding test on more than 3 vehicles where it is known that some of the vehicles will be detached enroute.

Run-around movements

The brake holding test may also be conducted on the front 3 vehicles when it is known the train will require a run-around movement (train reverses).

Minimum brake holding times

The minimum standard brake holding time is ten minutes plus 3 minutes for every 100 metres (or part thereof) of train length.

Length of train including locomotives (metres)	Minimum brake holding time (minutes)
Up to 100	13
101 to 200	16
201 to 300	19
301 to 400	22
401 to 500	25
501 to 600	28
601 to 700	31
701 to 800	34
801 to 900	37
901 to 1000	40
1001 to 1100	43
1101 to 1200	46
1201 to 1300	49

1301 to 1400	52
1401 to 1500	55
1501 to 1600	58
1601 to 1700	61
1701 to 1800	64
1801 to 1900	67
1901 to 2000	70
Over 2000	70 minutes plus 3 minutes for every additional 100 metres

Up to 3 *additional locomotives* may be added to a train without the need for an additional brake holding test.

If *articulated vehicles* or permanently coupled vehicles are marshalled at the rear of a freight train, the brake holding test is carried out by observing that all brake cylinders controlled by the rear 3 control valves are extended.

Vehicles fitted with automatic “apply and hold type” park brakes do not require a brake holding test. These brakes are applied once air pressure is lost and will remain applied indefinitely.

Where a *locomotive is unmanned* and is marshalled in the last 3 vehicles on a train, it must undergo a brake holding test.

Where *driver only operation* trains are employed, ten minutes shall be added to the minimum standard brake holding times.

8.4.4 Full Continuity Test

The full brake pipe continuity test must be carried out on a train to prove that the brake pipe air pressure is continuous throughout the train, and the driver has control of the brakes on the train.

Multiple unit passenger and freight trains

A continuity test is carried out after a train has been prepared, after amalgamation or division of trains, and if the brake pipe continuity has been affected.

Locomotive hauled trains

The full continuity test is the standard test. This shall be conducted at the rear of the train and requires that the brakes apply and release on the rear vehicle and the brake pipe pressure is no less than 425 kPa with the brakes released.

Alternately devices may be used to conduct the continuity test if they have the capacity to indicate brake pipe pressure at the rear of the train, without altering the BP pressure provided a Brake Holding Test has successfully been conducted on the last 3 vehicles:

- trains fitted with an end of train monitor,
- an equivalent remotely controlled locomotive* marshalled as the last vehicle in the train

Note: Where these are in approved RFDP or WDP configurations

Light locomotive continuity test

A light locomotive continuity test is required for light multiple locomotive consists to ensure that Brake Pipe (BP), Main Reservoir (MR) Pipe, Control Pipe (CP) and Independent Release (IR) Pipe are continuous through the consist and that all brake cylinders are functioning correctly.

8.4.5 Modified Continuity Test

When attaching or detaching locomotives or wagons from a train which interferes with the continuity of the brake pipe, a modified continuity test must be carried out before the train departs to ensure that the brakes apply and release on the 3 vehicles behind the position where the interference with the brake pipe has occurred.

If one or more of the 3 vehicles behind the position where the brake pipe was interfered with has inoperative air brakes, then the first 3 vehicles with operative air brake beyond the point of interference shall be tested.

8.5 Roll-By Inspection

A roll by inspection involves the observation of a moving train for visible and audible defects. The standard Roll-By Inspection may constitute a "Train Safety Inspection" in PPM schedules. Enroute Roll-by Inspections are not typically considered as part of the PPM schedule.

The extent of the defects detected shall depend on the environmental lighting and noise level at the inspection location, the speed of the train and the competency level of the observer. Inspection staff shall perform this action in a position of safety. Where possible the inspection location should have:

- Adequate lighting provided by sunlight, locomotive headlight, yard lighting or other visibility/work lighting,
- Low background noise for easy detection of audible defects.

The purpose of conducting a roll-by inspection is to identify load or equipment defects or failures such as stuck/sticking/dragging brakes, skidded or flat wheels, faulty bearings, dragging equipment, vehicle damage, load shifts and improper securing of loads and doors while the train is moving.

A roll-by inspection shall be conducted as a train departs from its originating location, or from any other intermediate location where the consist is altered.

Note: Additional vigilance shall be taken on days of high fire risk for defects that may result in spark emissions such as stuck/sticking/dragging brakes, skidded or flat wheels, faulty bearings or dragging equipment.

8.5.1 Enroute Roll-By Inspections

A roll-by inspection may also be required in abnormal locations with non-compliant lighting or noise level conditions. Due to the reduced control of the lighting conditions and background noise, these Enroute Roll-by Inspections performed in these instances do not often meet the requirements of a "Train Safety Inspection" as required in PPM schedules and thus are performed to:

- Identify if the train is complete as indicated by the end of train marker or end of train marking lights (at this time the end of train marker operation should be checked)
- identify load or equipment defects or failures such as stuck/sticking/dragging brakes, skidded or flat wheels, faulty bearings, dragging equipment, vehicle damage, load shifts and improper securing of loads and doors as limited by the environmental conditions of the inspection location

Enroute Roll-by Inspections shall be conducted in following instances:

- a) when trains cross at intermediate locations, see section 8.9.8

Enroute Roll-by Inspections should be conducted in following instances:

- b) any staffed station or signal box,
- c) as a train passes track-side staff at any location, and
- d) crew change locations.

8.6 Visual Inspection

Train Crews shall observe trains/vehicles, for visually identifiable defects such as incorrectly positioned or oriented equipment, damage to the vehicle or components, load shifts and improper securing of loads and doors. Where possible the inspection location should have adequate lighting provided by:

- sunlight,
- locomotive headlight,
- yard lighting; or,
- other visibility/work lighting,
- train is complete as indicated by the end of train marker or end of train marking lights

8.7 HP grade inspection

A HP grade inspection may be specified in the appropriate RAS Section pages, covering trains with grade control valves travelling on specific grades.

A HP grade inspection shall be carried out by a qualified employee and may be performed during any stationary inspection of the full train. In this test, the grade control valves are tested to ensure that brake cylinder release is retarded when in the 'IP' position.

8.8 Programmed Preventative Maintenance (PPM) Trains

PPM Trains are typically trains that operate in continual Programmed Preventative Maintenance (PPM) cycles and do not require remarshalling between PPM intervals. Examples of PPM Trains are unit coal trains, unit/block grain trains and shuttle trains (generally containers).

Note: Programmed Preventative Maintenance (PPM) is regular train maintenance based on a fixed interval, to ensure that the vehicle will remain fit for purpose for the duration of the PPM cycle. Refer to ***RAS Appendix E – Guidelines for Operations for Programmed Preventative Maintenance guidelines***.

8.8.1 Eligibility

Train that are eligible to operate with altered requirements for *PPM Train* shall be comprised of vehicles that meet the following criteria:

- All vehicles within the train maintained per the Operator's SMS permits.
- Have documented Programmed Preventative Maintenance (PPM) procedures with common PPM intervals
- Appropriately detailed maintenance history logged, recorded and preserved in a records management system
- Tracking system in place to manage the maintenance of the train as a whole unit or a manageable number of vehicle blocks/rakes

Note: *This is to ensure that the nominated train units and/or vehicle blocks/rakes receive their due maintenance within the nominated maintenance cycle.*

- The Operator's Maintenance Representatives and Operations Representatives shall co-ordinate to ensure that inspections and other maintenance activities occur per the approved PPM schedule
- Where PPM vehicles are added to a PPM Train, they shall be of the same or better maintenance standard

When a PPM vehicle exceeds the PPM period for the PPM Train:

- the train may complete its loading cycle and shall return to its maintenance location to retain its PPM status
- the train shall operate as a to the normal train inspection requirements until the PPM standard is restored.

8.8.2 Minimum Inspection Requirements

As PPM Trains are not regularly remmarshalled the normal Inspection and Testing circumstances are not applicable, however all PPM Trains shall:

- have vehicles that are scheduled for PPM Trains are permitted to operate with consecutive general train inspections. However, a *Full Train Inspection* shall be scheduled for a period not exceeding 14 days.
- have locomotive(s) run-around, Brake Holding Test shall be performed and noted on the brake certificate for the last 3 brake control valves on each end of the train
- have a roll-by inspection (or higher inspection, such as FX/GX) performed at least once per train journey cycle.
- Where fitted, ensure that manual empty/load valves are set correctly immediately after loading and unloading.

8.9 Summary of Inspections Requirements

The minimum inspection requirements for trains, all trains operating on the ARTC Network shall comply.

8.9.1 General Train Inspection Requirements

All trains shall be appropriately inspected prior to each trip. However, some trains/vehicles are under an approved programmed preventative maintenance regime (PPM) and may be allowed to operate for a number of trips without being inspected each trip.

Notes:

- Unless a train is under programmed preventative maintenance cycle, two (2) consecutive general train inspections are not permitted.
- Where the Operator's SMS permits, a train may operate for a round trip between general train inspections.
- Where the Operator's SMS permits, a train may operate for specified periods between general train inspections.

8.9.2 Changing of attaching locomotives

When locomotives are detached, the time of detachment must be noted on the train documentation delivered to the outgoing driver, lodged with an operations employee or placed in the appropriate receptacle provided at certain locations.

After attaching the locomotives, the crew must check the train inspection certificate to ensure that the last three vehicles (and if appropriate, the front three vehicles) are the same as those listed on the train documentation. The train crew must ascertain from operations staff the time of detachment and confirmation that the train has not been altered since detachment:

SITUATION	APPROPRIATE ACTION
After a train has been standing with locomotives attached provided the brake pipe is maintained fully charged and effective security of the train has been maintained.	Nil
After detaching locomotives from a train so they can be changed or the same locomotives re-coupled to the train within 2 hours and effective security of the train has been maintained.	Brake Pipe Leakage Test Modified Continuity Test
After detaching locomotives from a train so they can be changed or the same locomotives re-coupled to the train within 2 hours and effective security of the train has NOT been maintained.	Visual Inspection of each vehicle Brake Pipe Leakage Test Full Continuity Test
After detaching locomotives from a train so the locomotives can be changed or the same locomotives re-coupled to the train within 2 to 24 hours and effective security of the train has been maintained.	Visual Inspection of each vehicle Brake Pipe Leakage Test Full Continuity Test
After a train has been standing with or without locomotives for more than 24 hours.	Full Train Inspection or General Train Inspection #

Refer to section 8.8.1, "General Train Inspection Requirements" regarding consecutive general train inspections.

When attaching locomotives to a pre-inspected train and the train consist has not changed from that indicated in the train documentation.

SITUATION	APPROPRIATE ACTION
and the time elapsed since the inspection is less than 24 hours in a secured yard OR	Visual Inspection of each vehicle Brake Pipe Leakage Test Full Continuity Test

and the time elapsed since the inspection is less than 24 hours in an unsecured yard	Full Train Inspection or General Train Inspection #
OR	
If the time elapsed since the train was inspected is 24 hours or more	Full Train Inspection or General Train Inspection #

Refer to section 8.8.1, "General Train Inspection Requirements" regarding consecutive general train inspections.

8.9.3 LOCOMOTIVE RUN AROUND MOVEMENTS

Locomotive run-around movements are where the locomotives are moved from the leading position to the trailing position on the train to facilitate the direction of travel being reversed. After the movement the first three (3) vehicles will become the last three (3) once the direction is reversed.

- A *modified continuity test* is always required prior to the next movement
- If the last three (3) vehicles in the train after the run around movement have not passed a *brake holding test* with a valid brake certificate then a *brake holding test* is required.

8.9.4 ATTACHING PRE-INSPECTED VEHICLES

A rake of pre-inspected vehicles may be attached anywhere within a train consist enroute at an intermediate location (except as provided by regulations for the transport of dangerous goods).

In this case, if the consist of the pre-inspected vehicles has not changed from that indicated in the train documentation and less than 24 hours has elapsed since the vehicles were inspected and:

SITUATION	APPROPRIATE ACTION
3 or less vehicles are attached in front of the last 3 vehicles,	Visual Inspection of each vehicle being attached
OR	Brake pipe leakage test
More than 3 vehicles are attached in front of the last 3 vehicles and an extended brake holding test has been carried out.	Modified continuity test
More than 3 vehicles are attached in front of the last 3 vehicles and an extended brake holding test has NOT been carried out or if any number of vehicles are attached to the train rear of the last 3 vehicles	Visual inspection of each vehicle being attached Brake pipe leakage test Brake holding test Full continuity test

If the consist containing the attached vehicles has changed from that indicated in the documentation for the attached vehicles, or the time elapsed since the inspection of the pre-inspected vehicles is 24 hours or more, then a full or general train inspection must be carried out on the attached vehicles.

8.9.5 ATTACHING UNINSPECTED VEHICLES

One or more rakes of uninspected vehicles may be attached anywhere within a train consist, enroute, at intermediate locations (except as provided by the regulations for the transport of dangerous goods).

In this case when the vehicles are attached, the uninspected vehicles must be given a general mechanical inspection and if:

SITUATION	APPROPRIATE ACTION
Three (3) or less vehicles are attached in front of the last three (3) vehicles.	Brake pipe leakage test Modified continuity test
More than three (3) vehicles are attached in front of the last three (3) vehicles and an extended brake holding test has been carried out.	Brake pipe leakage test Modified continuity test
More than three (3) vehicles are attached in front of the last three (3) vehicles and an extended brake holding test has NOT been carried out.	Brake pipe leakage test, Brake holding test, Full continuity test
If any number of vehicles are attached to the train in rear of the last three (3) vehicles or within the last three (3) vehicles.	Brake pipe leakage test, Brake holding test, Full continuity test

8.9.6 ATTACHING OR DETACHING ASSISTING LOCOMOTIVES

When attaching or detaching assisting locomotives, the requirements in Section 7 of this document shall be considered as there are limits that apply to the number of locomotives that can be marshalled adjacently and other limits that apply to the number of locomotives that are permitted to haul/work while adjacently marshalled. If this action is occurring as part of a recovery, supplemental requirements may be found in ARTC's RAS Appendix D.

SITUATION	APPROPRIATE ACTION
After attaching assisting locomotives to the front of a train.	Brake Pipe Leakage Test Modified Continuity Test
After detaching assisting locomotives from the front of the train.	restore the brake pipe pressure, and apply and release the brakes at least twice to overcome any potential overcharge. No further inspection is required.

After attaching bank locomotives to the rear of a train with brake pipe coupled.	Brake Pipe Leakage Test Full Continuity Test
After detaching bank locomotives from the rear of a train with brake pipe coupled	No further inspection is required.
After attaching/detaching bank locomotives to the rear of a train with brake pipe NOT coupled.	No further inspection is required.

8.9.7 DETACHING VEHICLES

Vehicles may be detached from anywhere within a freight train consist enroute at intermediate locations provided that the altered train does not contravene the requirements for the transport of dangerous goods.

The vehicles that become the last three (3) vehicles of the train consist must have had a brake holding test.

If any of the last three (3) vehicles are detached, and additional vehicles have not had a brake holding test, then a holding test must be carried out on the vehicles which are now the last vehicles on the train. A full continuity test is then conducted in place of the modified continuity test.

SITUATION	APPROPRIATE ACTION
After detaching vehicles from a locomotive hauled freight train then:	Modified Continuity Test Brake Pipe Leakage Test
After detaching vehicles from a locomotive hauled passenger train then:	Full Continuity Test Brake Pipe Leakage Test

8.9.8 Train Crossing/Passing Movements

Where two trains are performing a crossing or passing movement the train crew of each train shall perform the following inspections

SITUATION	APPROPRIATE ACTION
The observed train is moving	Enroute Roll-by Inspection Identify end of train marking device on last vehicle
The observed train is stationary	Visual Inspection Identify end of train marking device on last vehicle

9 Train Documentation

Operators shall establish systems and manage all requirements associated with train documentation.

Note: Documents may be in electronic format.

9.1 Requirements Prior to Network Entry

Not less than fifteen minutes prior to the service commencing use of the ARTC Network, the train consist shall be documented and provided to ARTC and accurately include:

- train number and date for identification
- identity of each locomotive working or being hauled
- total number of vehicles on the train
- gross mass of train in tonne
- trailing mass of train in tonne (excluding mass of working locomotives)
- length of the train in metres
- vehicles with dangerous goods
- the identity and sequence of vehicles
- the gross mass of each vehicle (in the case of multi pack wagons total mass of all wagons)
- vehicles with approved out of gauge loading
- the origin and destination of each vehicle.

In addition, the Operator shall provide to the ARTC Network Control Centre the location and details of vehicles to be attached/detached en-route.

9.2 Requirements On-Train

Documentation that is required on-train, in the possession of the working train crew shall include:

- the train manifest
- a train inspection certificate warranting the following:
 - correct braking function
 - details of rolling stock with brakes cut out
 - brake pipe leakage test results
 - the identity of rolling stock used in brake holding tests
- applicable dangerous goods documentation
- applicable notices and circulars
- applicable Safeworking forms
- location and details of vehicles to be attached/detached en-route
- Operator specific documentation.

9.3 Requirements Following Network Entry

Where on-train documentation is amended to reflect changes to the train consist during its trip, these changes shall be advised to the ARTC Network Controller.

9.4 ARTC Requested Documentation

Upon request from ARTC, the Operator shall provide a copy of any documentation detailed in this section that affects the integrity of the train.

9.5 Discrepancies Affecting Operational Safety

Where the Operator or ARTC becomes aware of a documentation discrepancy, the other party shall be advised.

Where, in the opinion of either ARTC or the Operator, the discrepancy may impact on the safe integrity of the train:

- The ARTC Network Controller shall arrange for the train to be stopped at the first available location
- The Operator shall arrange for the on-train documentation to be compared with the actual composition of the train
- The Operator shall provide details of the discrepancies found to the ARTC Network Controller
- The Operator shall rectify any train integrity problems.

Documentation discrepancies that may impact the safe integrity of the train include, but are not limited to:

- the actual train length exceeds the documented length
- the actual train mass exceeds documented mass
- the actual axle load exceeds documented load
- the actual lead locomotive is not the documented lead locomotive
- omissions (e.g. locomotives or vehicles missed from the train consist).

When the Operator assures safe train integrity, the ARTC Network Controller may resume normal operations.

10 Train Failures and Defective Vehicles

10.1 General

Detailed train failure and defective vehicle requirements are published separately in ***RAS Appendix D – Defective Vehicles and Disabled Train Requirements***.

11 Track Maintenance Vehicles

11.1 Types of Track Maintenance Vehicles

When operating on rail, track maintenance vehicles are used to carry out work on, or about the infrastructure. There are many types of track maintenance vehicles. Table 11.1.1 outlines the categories applied to track maintenance vehicles.

Table 11.1.1 – Track Maintenance Vehicle Categories

CATEGORY	DESCRIPTION
CLASSIFIED HEAVY WEIGHT RAIL BOUND VEHICLES	VEHICLES THAT ARE CERTIFIED TO OPERATE UNDER THE CONTROL OF SIGNALS.
HEAVY WEIGHT RAIL BOUND VEHICLES	VEHICLES THAT ARE NOT CERTIFIED FOR OPERATION UNDER THE CONTROL OF SIGNALS.
HEAVY WEIGHT ROAD/RAIL VEHICLES	VEHICLES WEIGHING 5 TONNE OR MORE THAT CAN BE REMOVED FROM THE TRACK AT SOME LOCATIONS.
LIGHT WEIGHT ROAD/RAIL VEHICLES	VEHICLES WEIGHING LESS THAN 5 TONNE THAT CAN BE REMOVED FROM THE TRACK AT MOST LOCATIONS.
WORKSITE ONLY VEHICLES	VEHICLES AND EQUIPMENT LIMITED FOR USE ONLY WITHIN A PROTECTED WORKSITE AND NOT FOR TRAVEL OR TRANSFER.
TROLLEYS AND TRAILERS	SMALL NON-POWERED VEHICLES USED FOR CONVEYING TOOLS AND EQUIPMENT THAT ARE EASILY REMOVED FROM THE TRACK.

11.2 Registration and Warranty

ARTC maintains a register of track maintenance vehicles that are registered for operation on the ARTC Network.

Vehicle Owners/Operators intending to operate track maintenance vehicles on the ARTC Network shall register each vehicle with ARTC.

For registration to occur, the vehicle Owner/Operator shall warrant vehicles for compliance to relevant standards, in accordance with EPP-32-01 Track Maintenance Vehicle Registration and Operation and verify interface compliance to WOS 01 – ARTC Minimum Operating Standards as amended by the EPP Series of standards.

11.3 Vehicles Requiring Registration

A vehicle that travels or may need to travel or be transferred on the ARTC Network shall be registered by the owner/operator of the vehicle. Vehicles requiring registering are detailed in EPP-32-01 Track Maintenance Vehicle Registration and Operation.

11.4 Operation of Track Maintenance Vehicles

General requirements for operation of track maintenance vehicles shall comply with **EPP-32-01 Track Maintenance Vehicle Registration and Operation**.

Track maintenance vehicle operation shall be conducted in compliance with the relevant rules and procedures for the area of operation. These include:

- NSW Rules and Procedures, ANWT 316 Track Vehicles
- SA, WA & Western Victoria: **NSFW 364 Track Vehicles and Machines**
- TA20 - ARTC Code of Practice for the Victorian Main Line Network, Section 30, Infrastructure Works.

Track maintenance vehicles shall operate and comply with the following:

- a hazard light shall be fitted, unobstructed and switched on for all-round visibility
- head and tail lights shall be fitted and switched on
- audible warning detection (aka detonators) shall be available, and whistle signals used for safety at and within worksites
- the maximum allowable vehicle operating speed shall be permanently displayed in the vehicle for Operator compliance; or as permitted and registered with ARTC's Electronic Track Maintenance Vehicle Register "Aquipa", otherwise the vehicle shall be operated at a maximum speed of 15 km/h
- any other speed restrictions shall be adhered to that relate to the nature and characteristics of the vehicle as determined by the Constructor, Maintainer or vehicle manufacturer.
- Data Loggers also called event recorders shall be fitted for use in Western Australia.
- Vigilance systems shall be fitted for use in Western Australia.