Performance Based Standards (PBS)

22 August 2019

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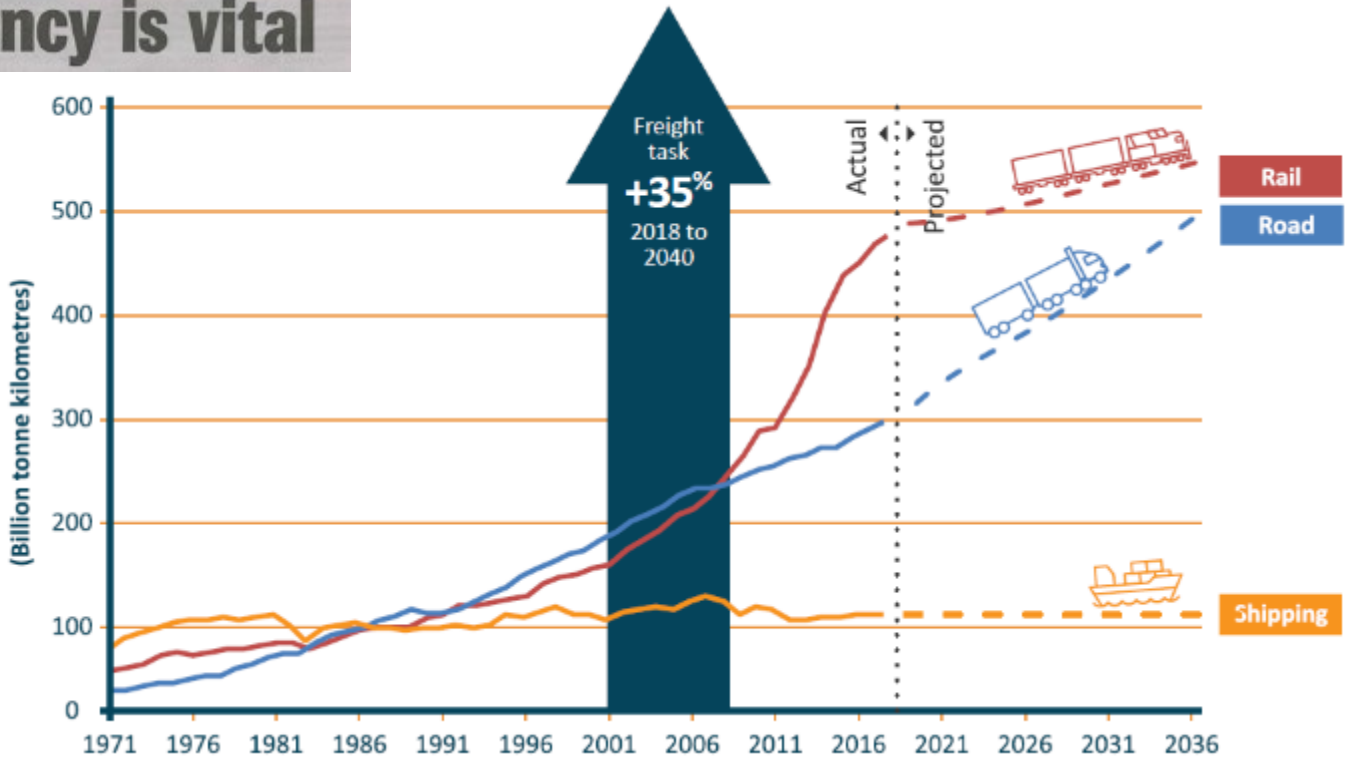
Background

1

Australia's freight challenge

Improved efficiency is vital



Source: Transport Infrastructure Council 2019

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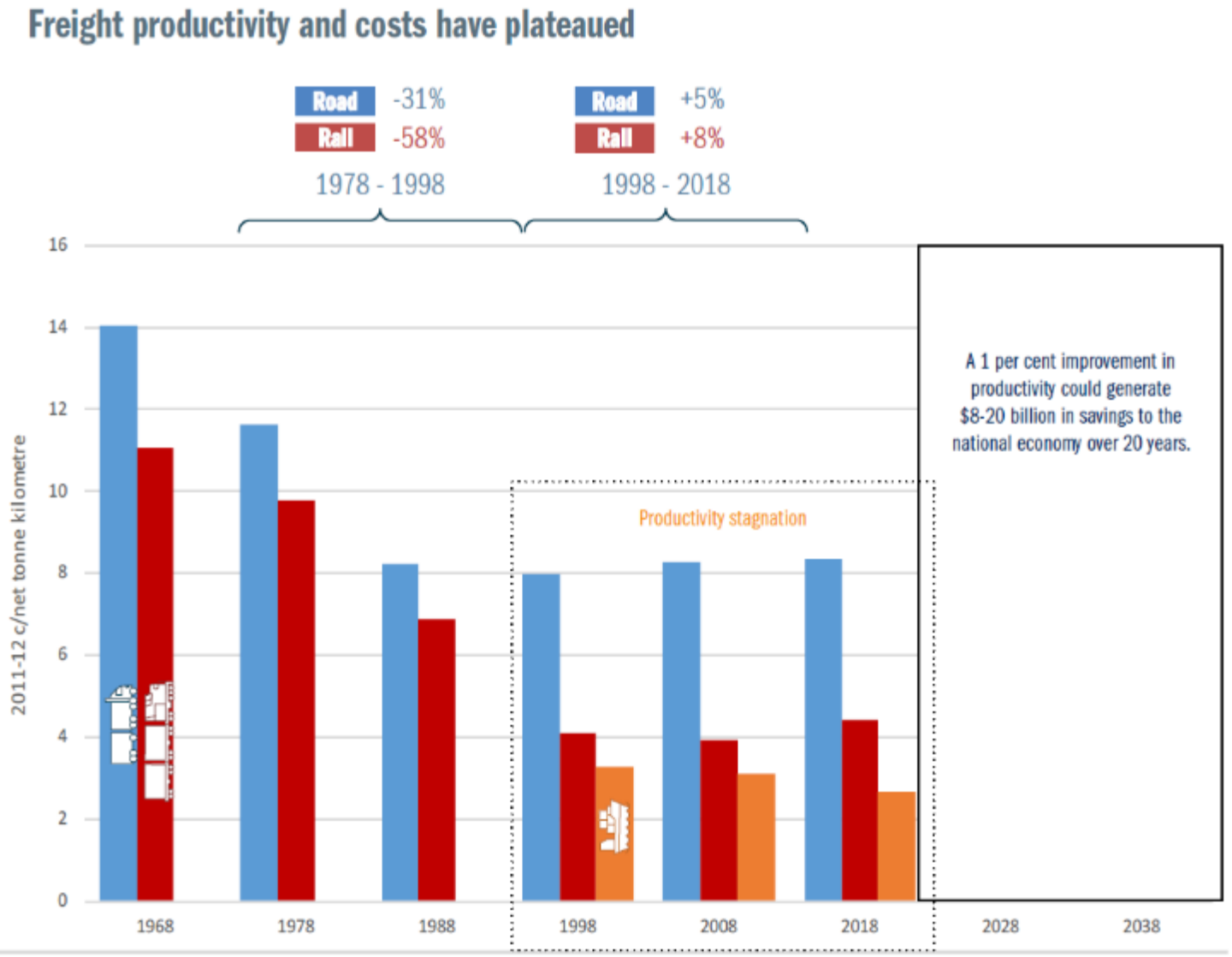
Freight productivity has plateaued



Source: Transport Infrastructure Council 2019

PBS Marketplace (NTC) findings

SAFETY

46% less major crashes per km travelled

ROAD WEAR

Reduced number of trips has saved an estimated $65 million in road maintenance in 2016

PRODUCTIVITY

Range from 15% to 30% compared to conventional vehicles

ENVIRONMENTAL

In 2016, 94 million litres of fuel saved which equates to 250,000 tonnes of CO2

Year	Rigid vehicles	Articulated vehicles
2010	5.4	25.4
2012	5.6	24.8
2014	5.7	24.7
2016	5.5	25.8
2018	6.1	27.4

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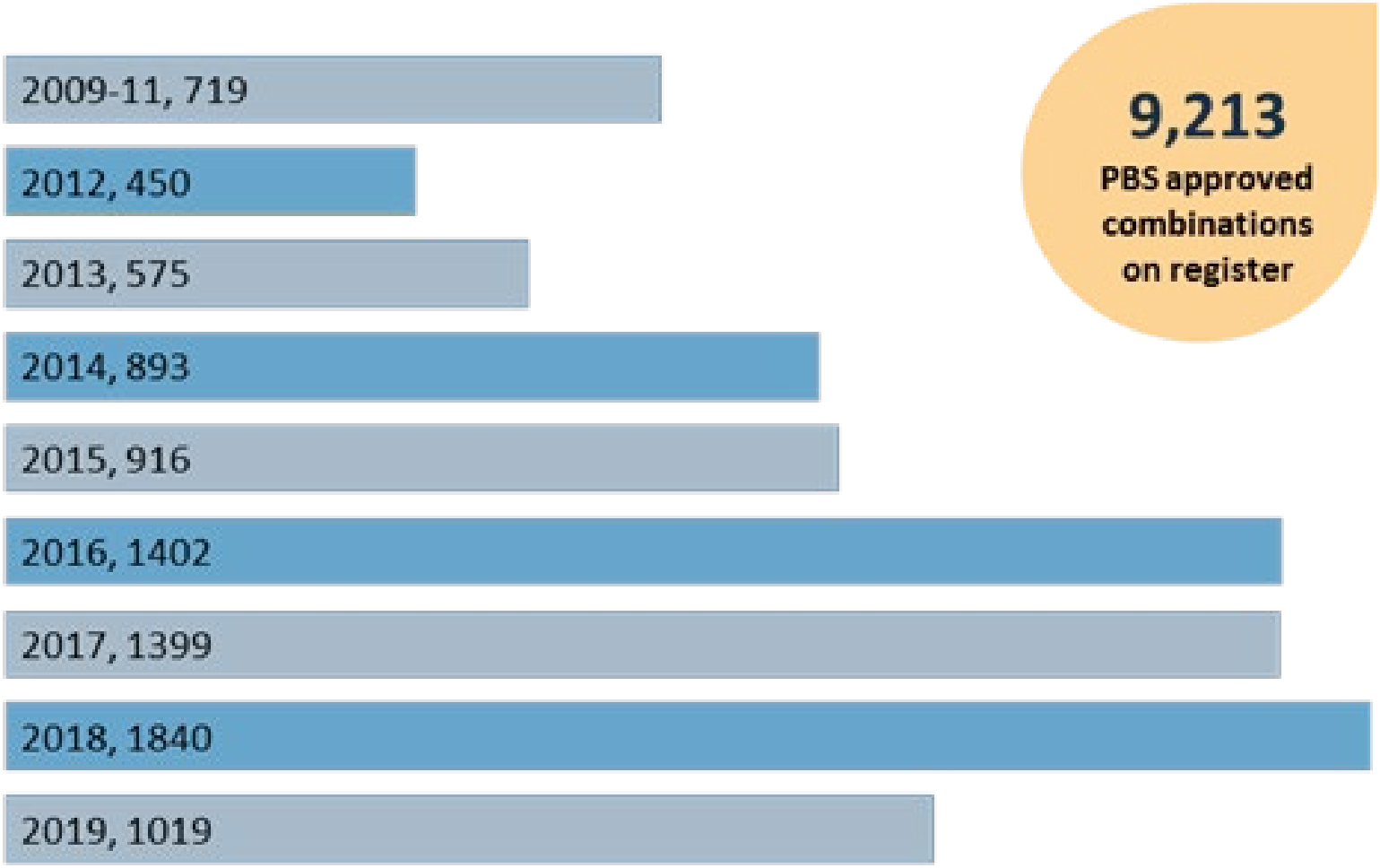
PBS combinations



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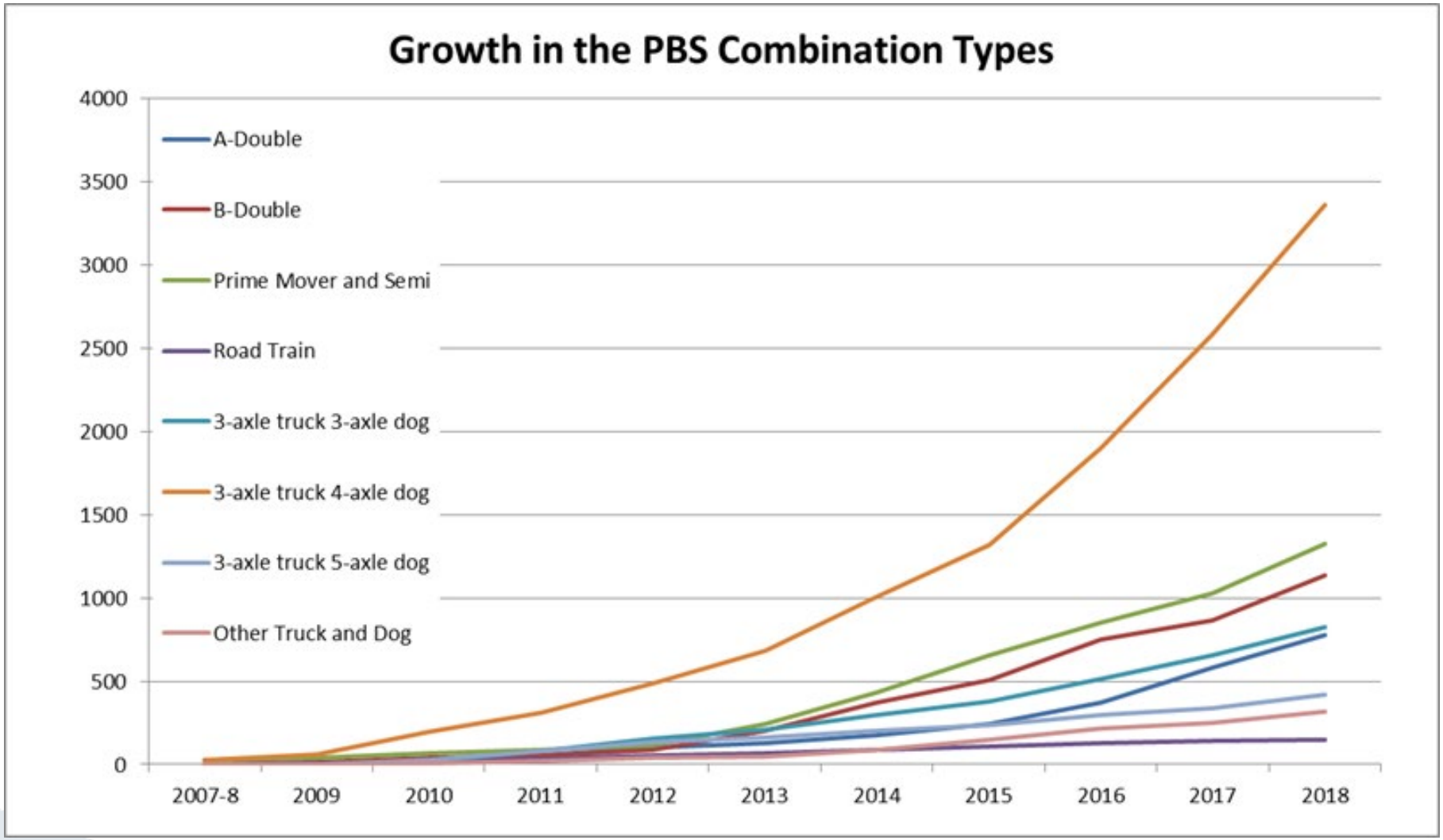
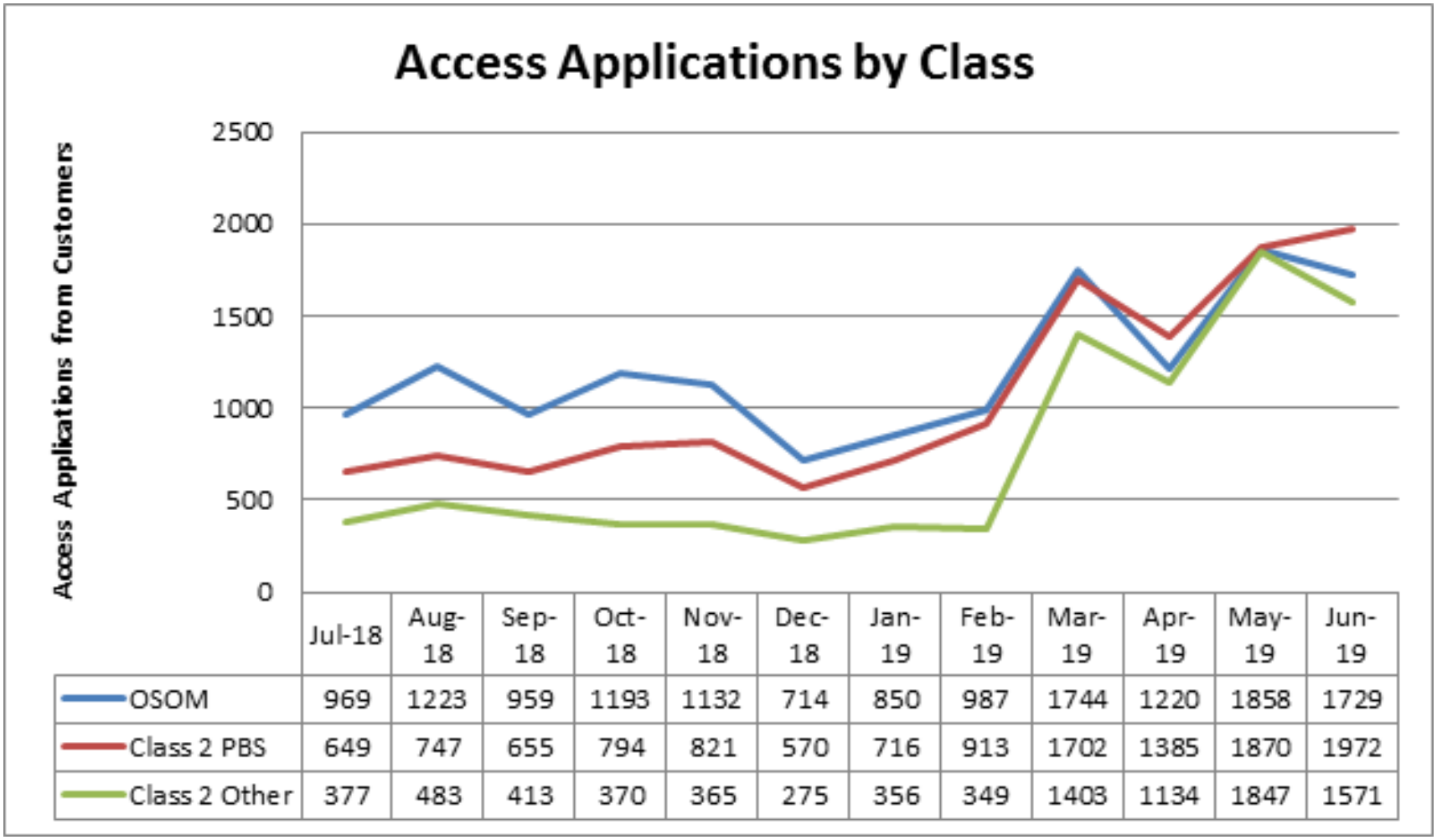
PBS Combination types



Access applications

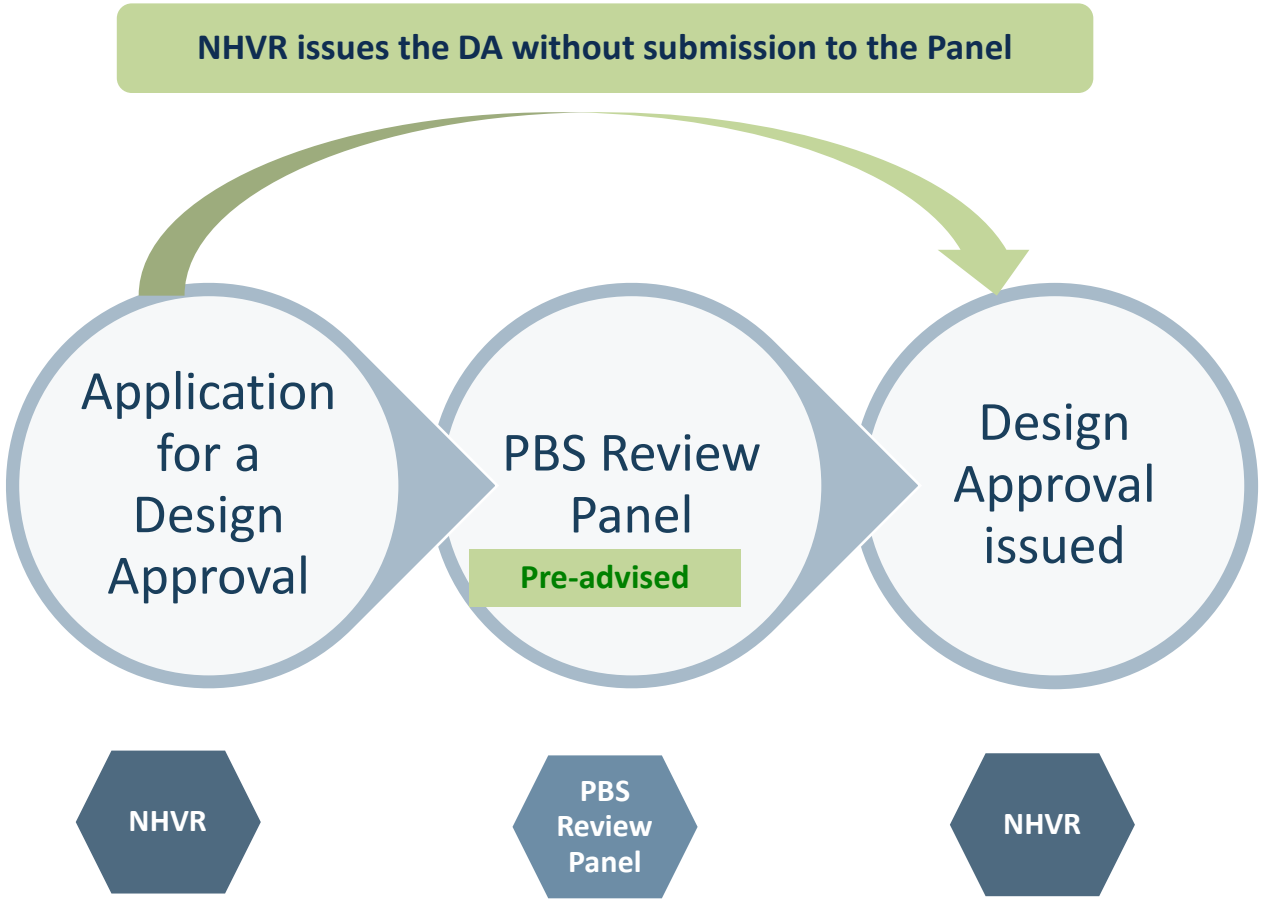


	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19
OSOM	969	1223	959	1193	1132	714	850	987	1744	1220	1858	1729
Class 2 PBS	649	747	655	794	821	570	716	913	1702	1385	1870	1972
Class 2 Other	377	483	413	370	365	275	356	349	1403	1134	1847	1571

PBS process improvements in the last 2 years

2

PBS Approval Process - Pre-Advised designs



DA turnaround time

5 calendar weeks

3 business days

for pre-advised designs

Pre-Advised designs

The following types of PBS combinations are currently eligible to access the pre-advised design approval process:

- **Truck and dog trailer**
- **Prime mover and semitrailer**
- **B-double**
- **A-double**

90% of design applications qualify for pre-advised process

Pre-advised designs exclude designs with innovative features and designs requiring exemptions from PBS standards.

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Specified PBS vehicle

General access for specified PBS vehicle (approved as PBS Level 1)

From 1 October 2018, an amendment to the Heavy Vehicle National Law (HVNL) allows a specified PBS vehicle to have general access.

A specified PBS vehicle:

- has a current PBS Level 1 Vehicle Approval
- is no longer than 20m
- is not a bus, road train, A-double or B-double
- is loaded to GML masses as per Schedule 1 of the Heavy Vehicle (Mass, Dimension and Loading) National Regulation (MDL)

- Must comply with the axle and axle group mass limits in Table 1 of Schedule 1 of the MDL Regulation (axle spacing tables)
- Combinations towing a dog or pig trailer must ensure the trailer mass is not more than the mass of the towing vehicle (1:1 towing ratio)

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Specified PBS vehicle - Mass limits

Must be loaded to GML limits as per Schedule 1 of MDL

- ✓ **43t** for a complying steer axle vehicle that is neither a B-double nor a road train
- ✓ **46.5t** for a prime mover with a twinsteer axle group towing a tri-axle semitrailer
- ✓ **42.5t** for a vehicle that is not mentioned above and that is neither a B-double nor a road train

The following mass exception limits do not apply:

- concessional mass limits (CML)
- higher mass limits (HML)
- quad axle mass exception limits (QML)
- one tonne triaxle mass transfer allowance

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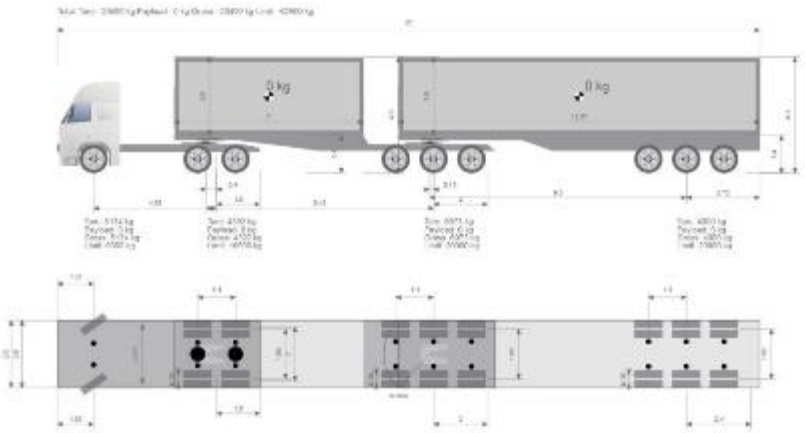
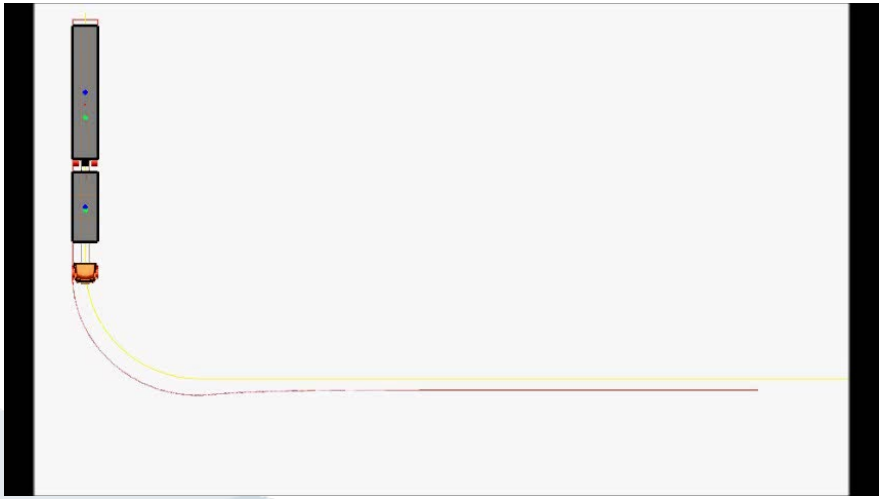
PBS Standards and Technology

3

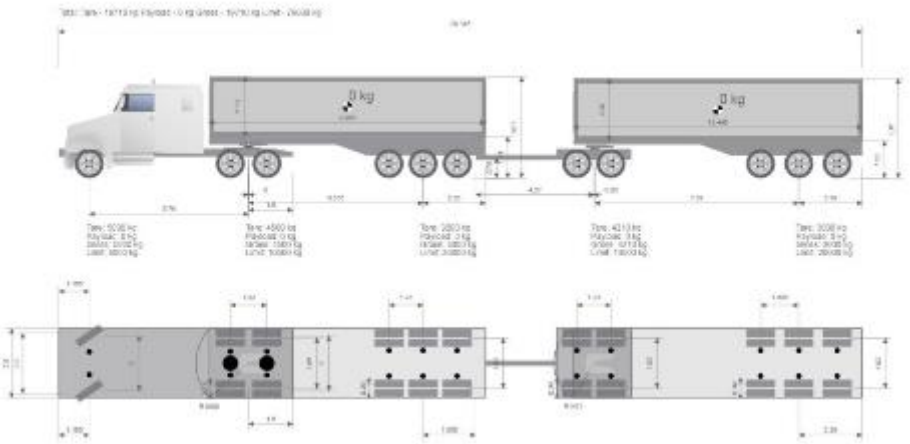
Swept path

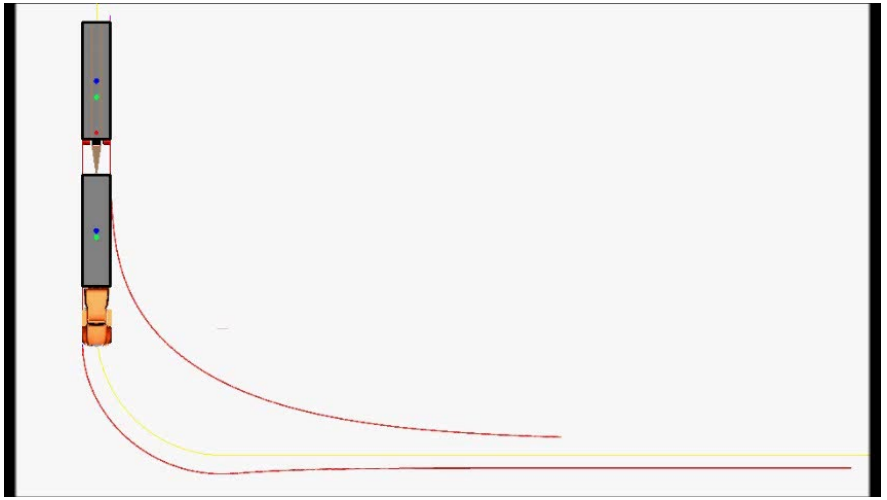
26m long B-double





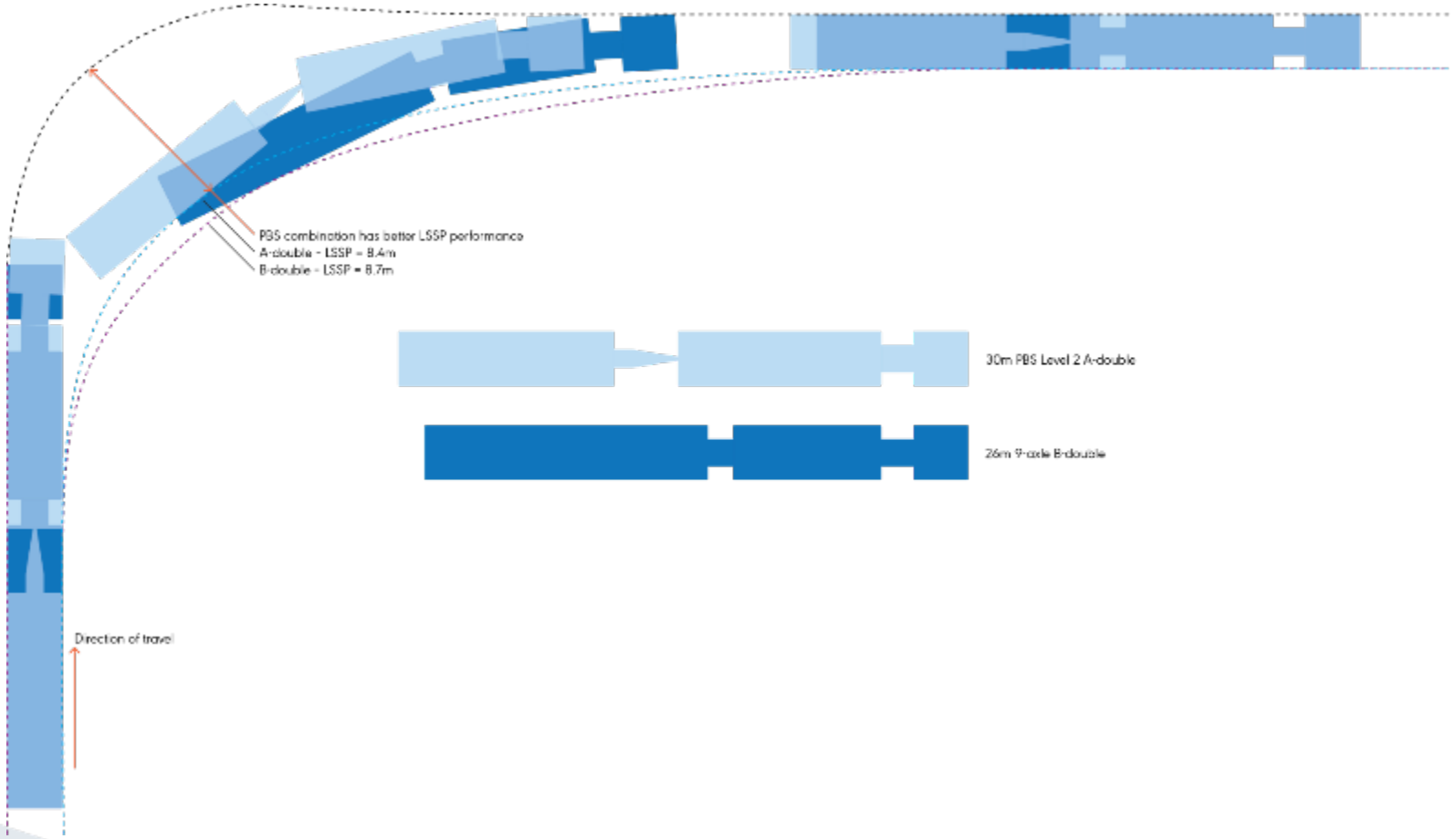
30m long A-double





Low Speed Swept Path

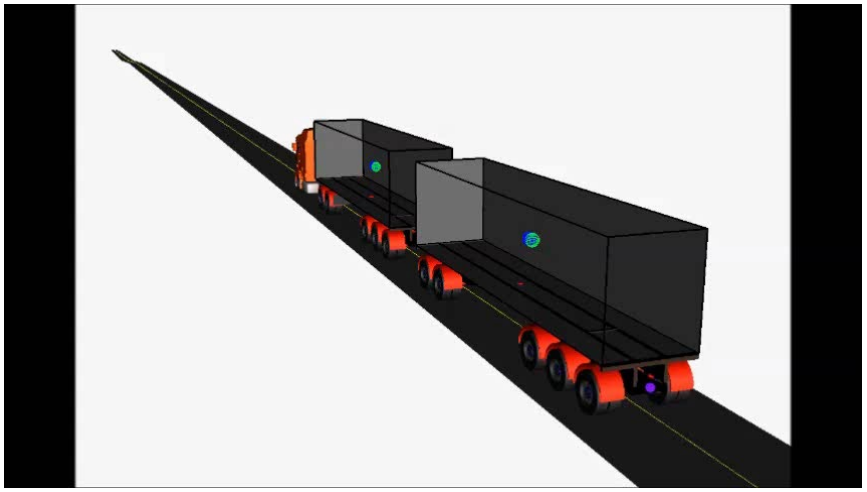
The LSSP performance of a longer 30m PBS Level 1 A-double (8.4m) vs a prescriptive 9-axle 26m B-double (8.7m).



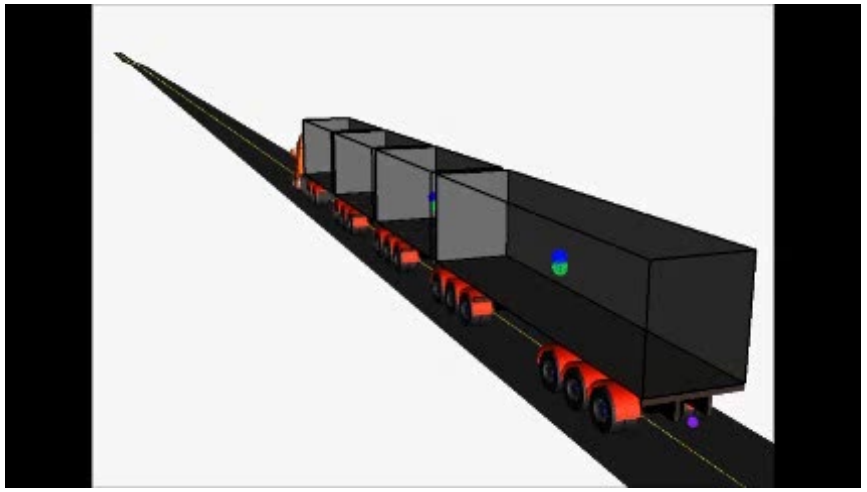
PBS safety standards - dynamic

Rearward Amplification (RA), High-Speed Transient Off-Tracking (HSTO)

36.5m long A-double



36.5m long B-quad



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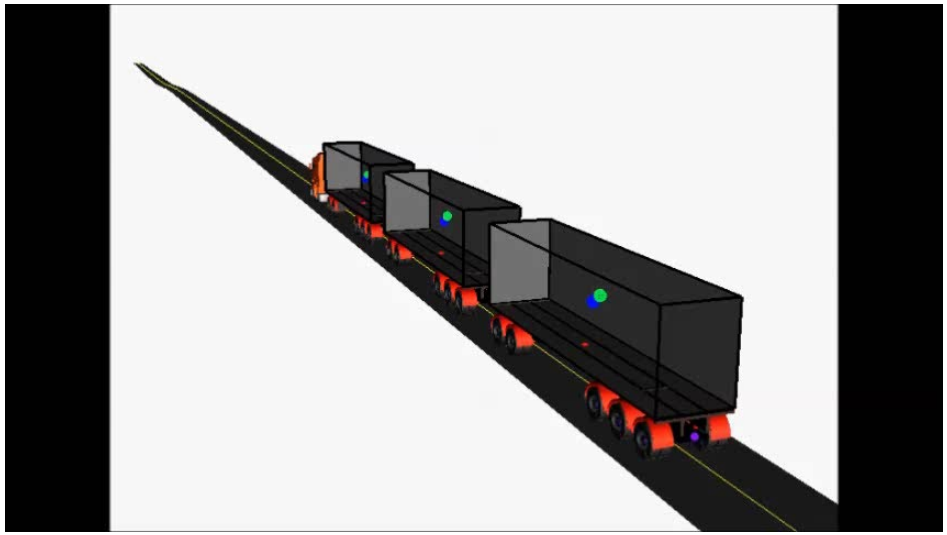
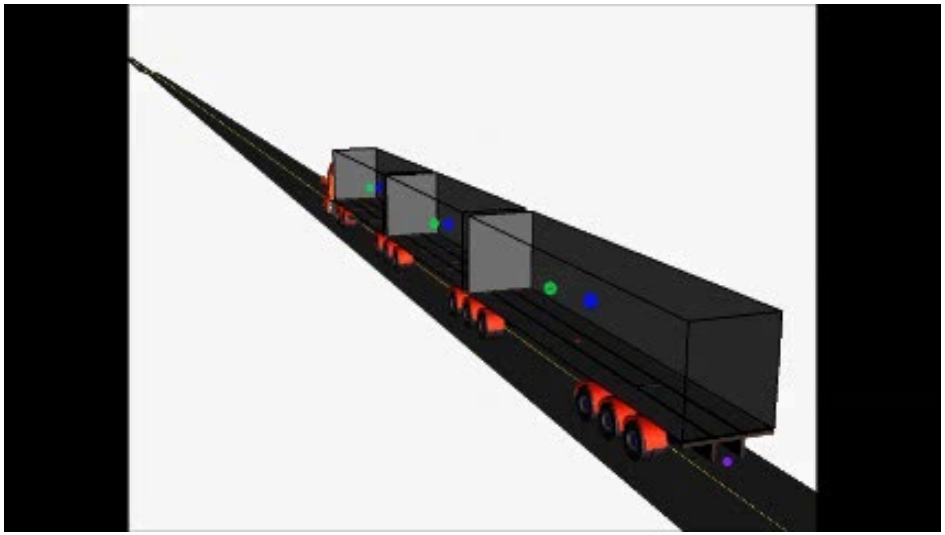
PBS safety standards - dynamic

Rearward Amplification (RA), High-Speed Transient Off-Tracking (HSTO)

49m long A-Triple



42m long B-triple



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Compliance with PBS specific performance requirements

- PBS assessment specified self-steered axles for a PBS B-triple
  - Self-steered axles are needed to achieve the required low-speed performance
  - Self-steered axles must be locked above 30 km/h
- Knorr-Bremse TEBS (Trailer EBS) trailer brake module (TBM)
- The system provides full roll stability (RSP/RSC)
- TEBS has 9 programmable auxiliary functions available
- There are 8 electrical plus 1 x pneumatic functions
- Practically any function required that is related to **speed or load** may be configured

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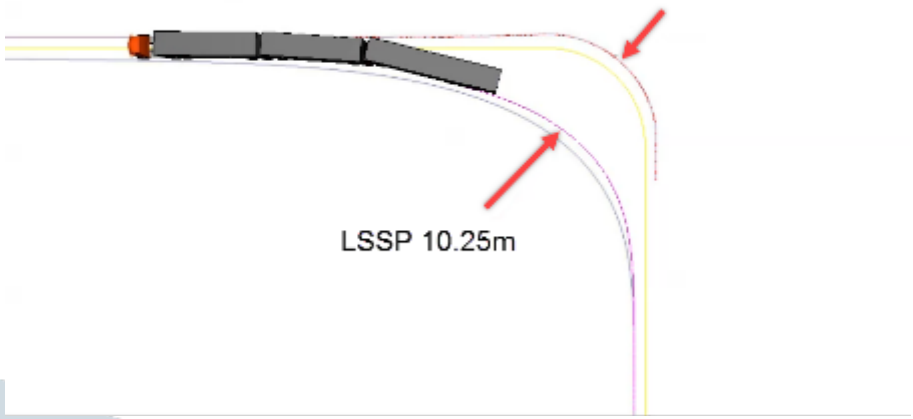
KNORR-BREMSE

Application of technology

Steer axles are locked using Knorr-Bremse TEBS depending on the speed of the combination

Knorr-Bremse TEBS (Trailer EBS) trailer brake module (TBM)

- PBS requirement for dual rear steer axles to lock at > 30km/hr
- Steer axles are “normally locked”
- Using the TEBS, the pneumatic output configured to apply air pressure to axle unlock actuators from 0 km/hr to 30 km/hr and then remove air supply (lock axles)
- Locking the axles for reversing represented a problem as steer axles may not be aligned
- Therefore the system was configured to operate a solenoid to cut supply to axle actuators and ‘lock’ axle at <6km/hr



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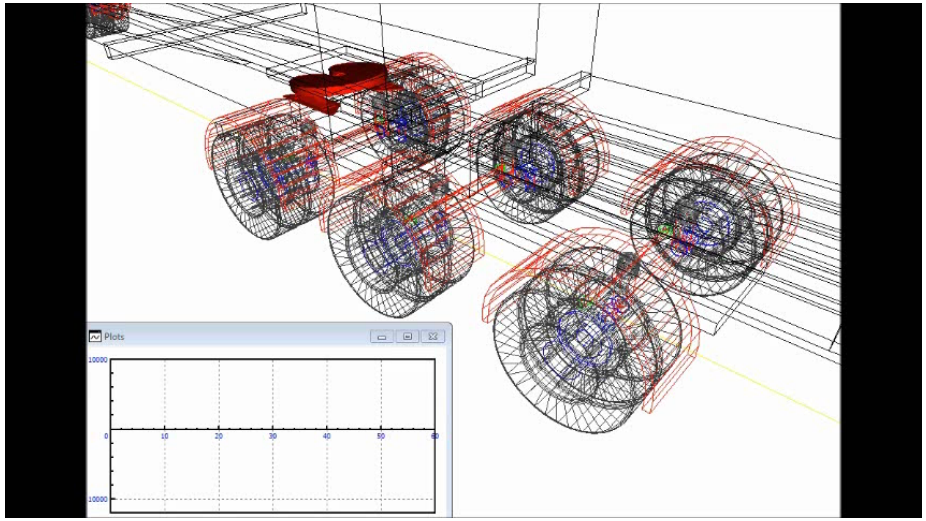
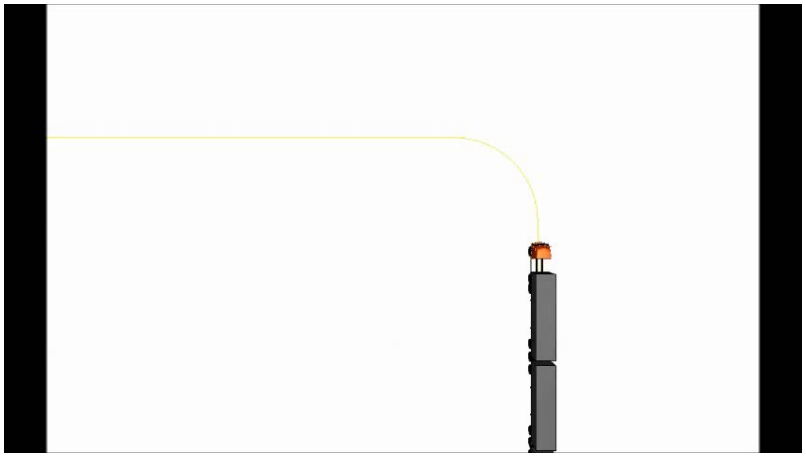
Application of axle technology

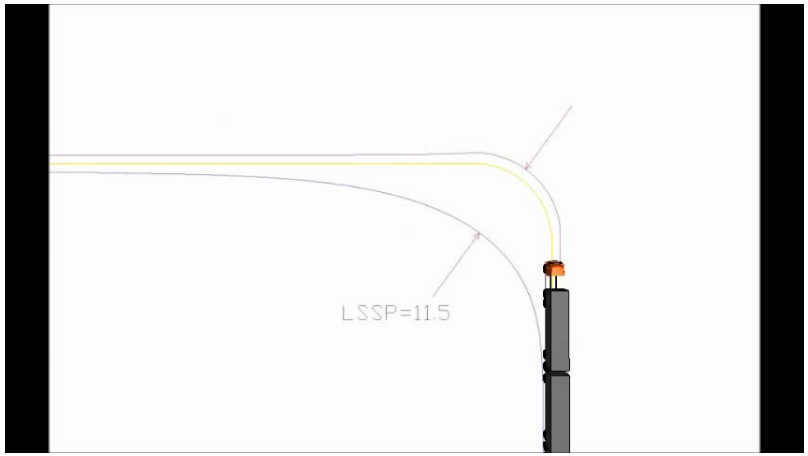


Application of technology

42m long PBS B-triple (no steer axles)



42m long PBS B-triple (steer axles)



Improved performance

Multiple Trailer Configurations

- ISO11992 requires that CAN electrical control signals must not exceed 40m
- The Trailer Roadtrain Module[1] (TRM) is a CAN splitter, amplifier, creates CAN address detail (for multiple trailers)
- The TRM separates the input CAN from the output CAN's so that each output CAN is subject to the full 40m limit
- Fitting the TRM to non EBS towing trucks, effectively converts the standard (and relatively slow) pneumatic control signal from the truck, into an electrical CAN signal to activate the TEBS for braking
- This significantly 'speeds up' brake activation and release for trailers and substantially increases safety by reduced stopping distances

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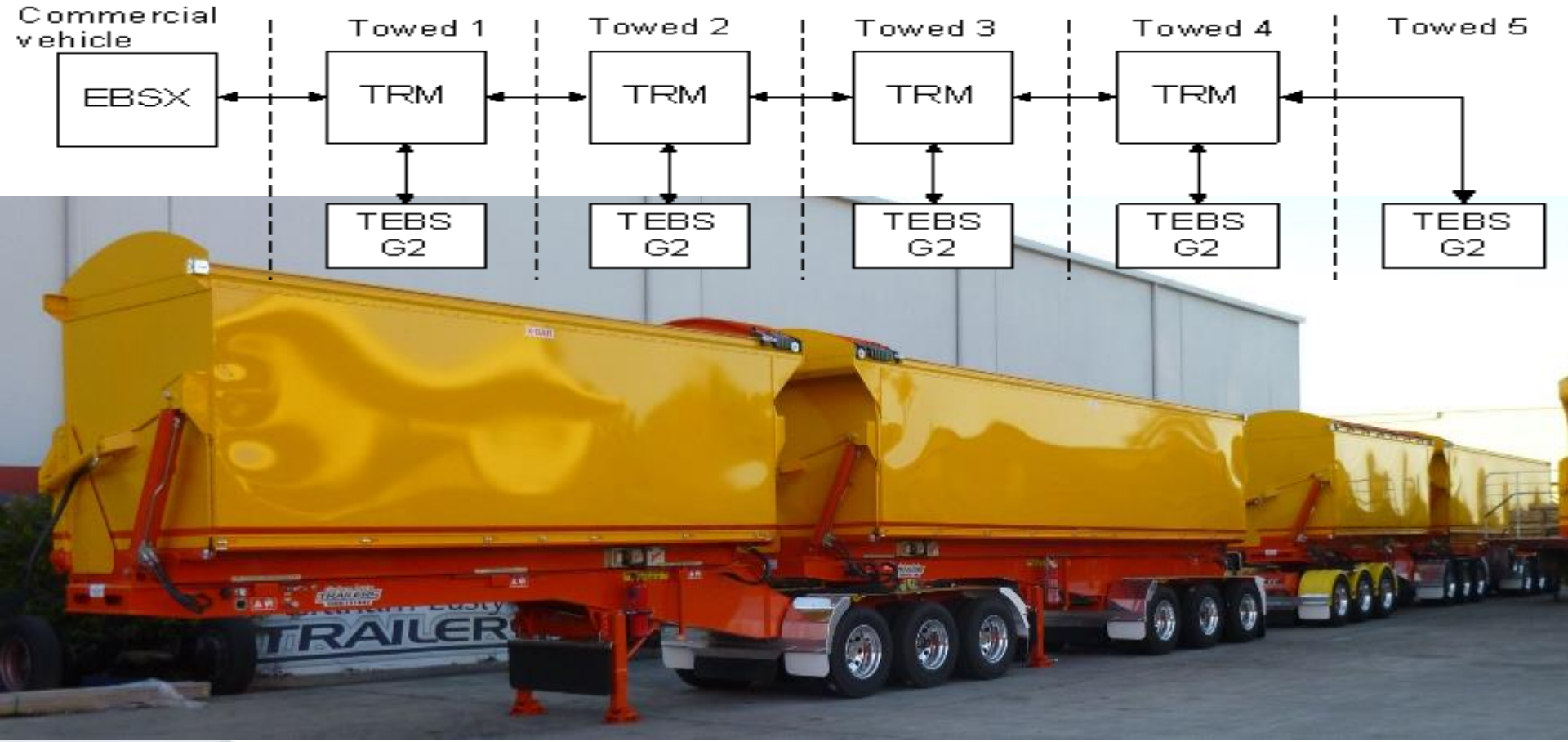
Roadtrain Application (Australia specific)

A triple (prescriptive) roadtrain could consist of seven towed vehicles (units) The TRM enables up to seven TEBS G2 systems to use the information from the ISO11992 CAN bus reducing brake response time

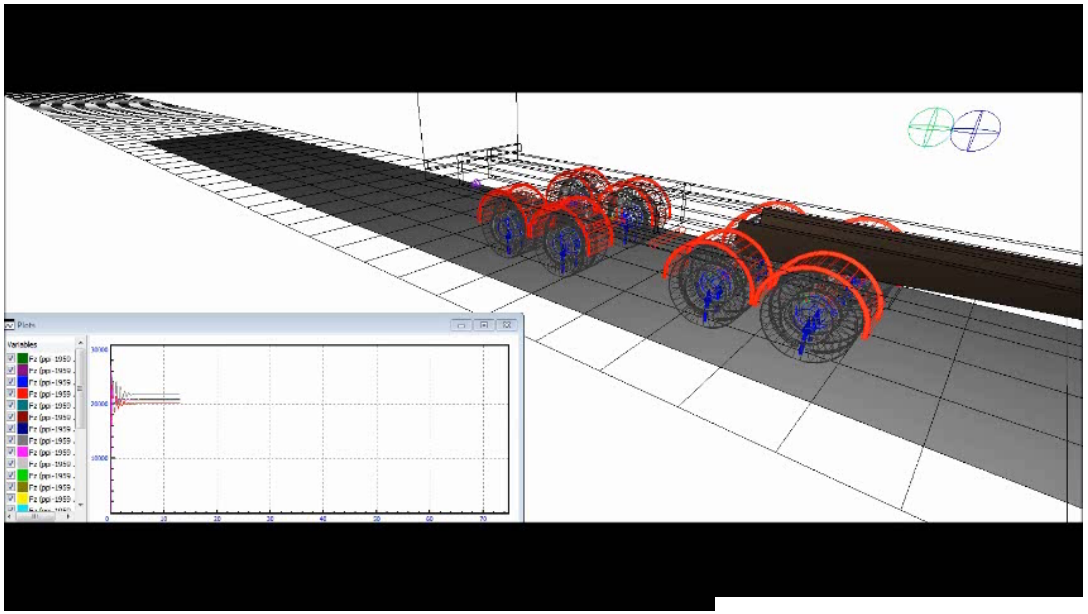


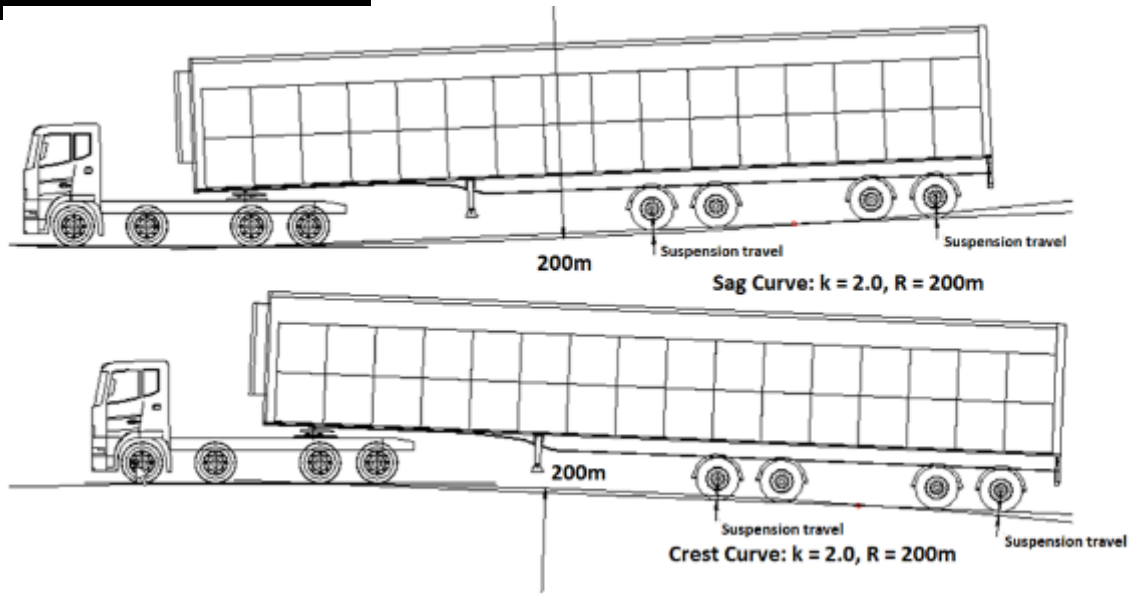
Innovative vehicle designs

Semitrailers with more axle groups
These vehicles don’t comply with the ADR definition of a semitraler
No standards are available for their assessment

Innovative vehicle designs

New assessment methods are needed

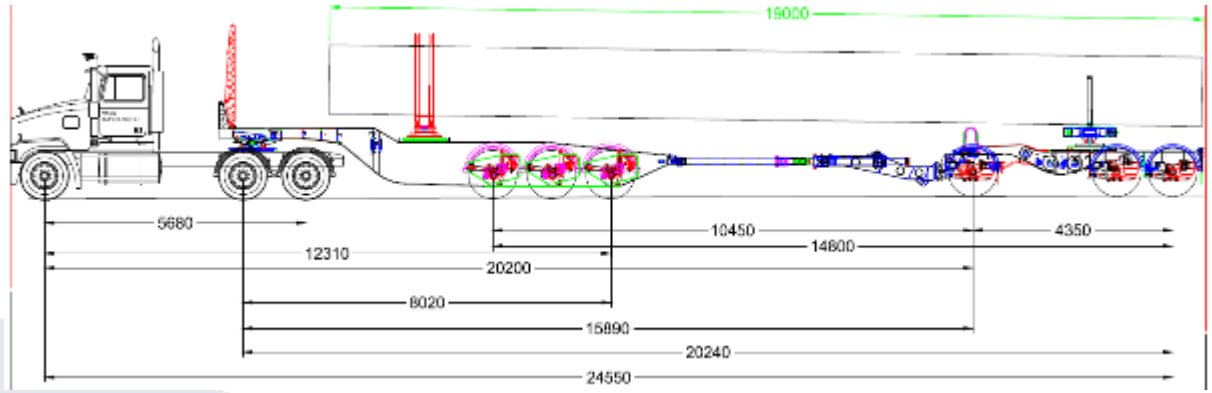




Innovative vehicle designs

19.5m (64 foot) long semi

20.25m (66 foot) long semi



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Innovative vehicle designs

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New combination designs

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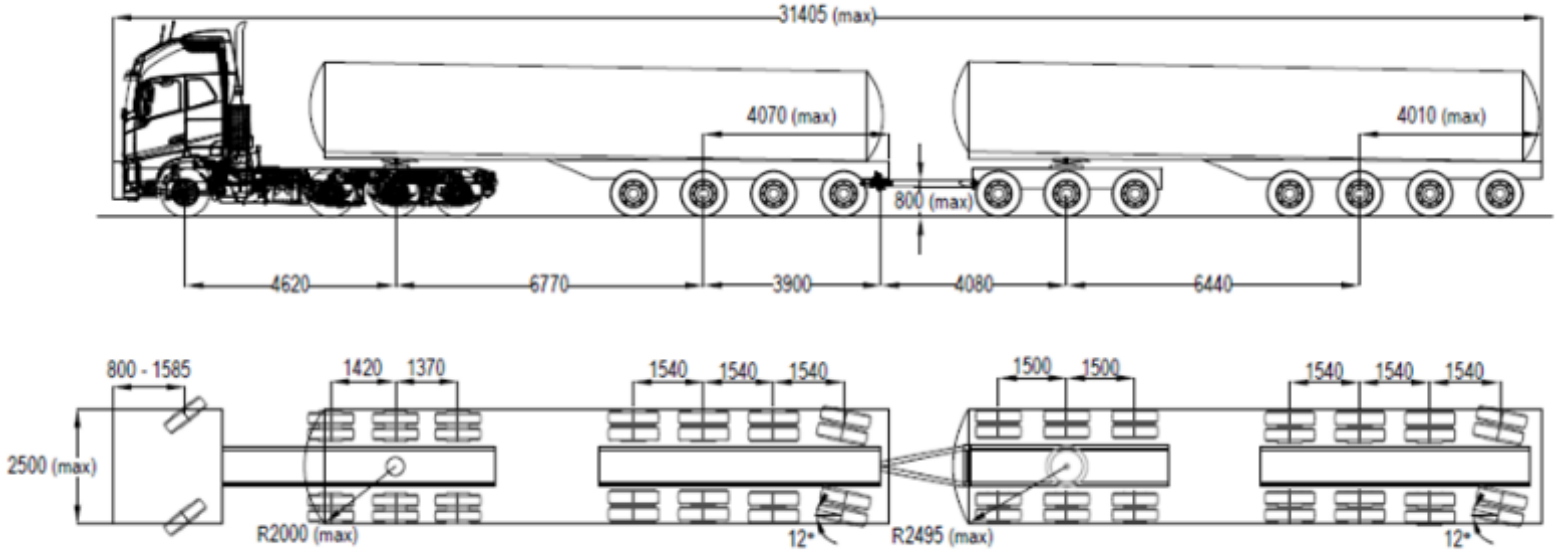
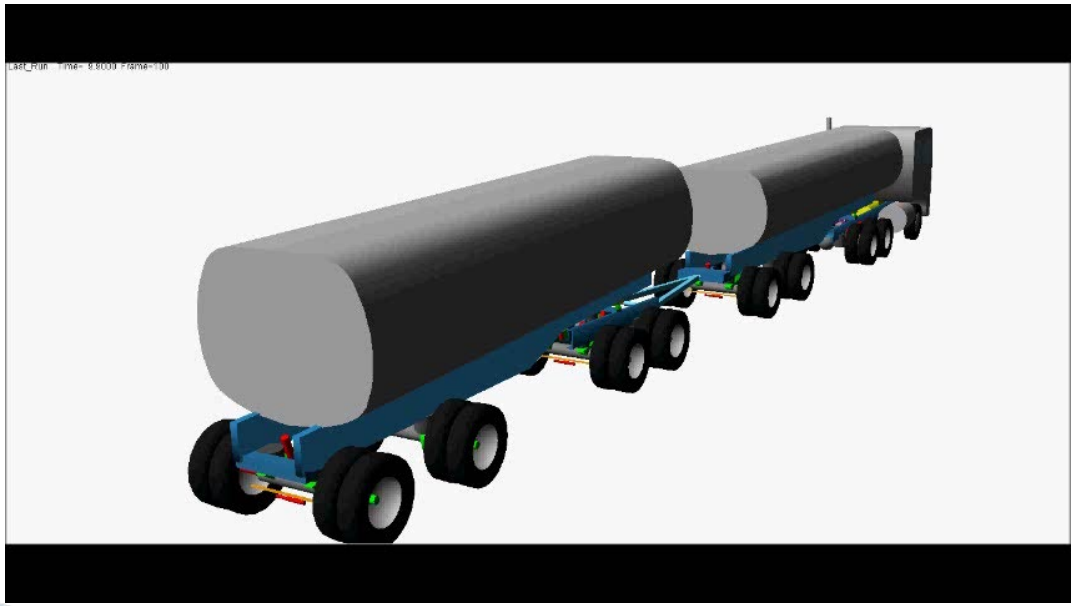
Further development in technology is needed



Evaluation of the technology is needed



Source: MSD

PBS benefits

4

PBS Case study – B-quad

B-quad

Payload: Carrot/Potato
Length: 36.5m

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PBS Level 3 Access at 103t GML

Productivity Benefits

	PM Semi	B-Double	B-Triple	B-Quad
Performance	19m prime mover and semi-trailer	Prescriptive B-Double	PBS Level 2	PBS Level 3
Length (m)	≤ 19	≤ 26	≤ 30	≤ 36.5
GCM (t)	50.5	68.5	85	105
Nominal Payload (t)	32.7	43.5	52.8	65.6
Payload Equivalency	1	1.33	1.61	2
Trips per 1000t of payload	31	23 (26%)	19 (38%)	16 (49%)

Productivity Benefits

	PM semi	B-double	PBS B-double	PBS B-double	B-quad	B-triple
Length (m)	≤ 19	≤ 26	≤ 26	≤ 30	≤ 36.5	≤ 42
Number of pallets	22 (24)	32	36	42	50	60
Payload equivalency	1	1.45	1.63	1.90	2.27	2.72
Trips per 1000 pallets	46	32 (30%)	28 (40%)	24 (48%)	20 (57%)	17 (64%)

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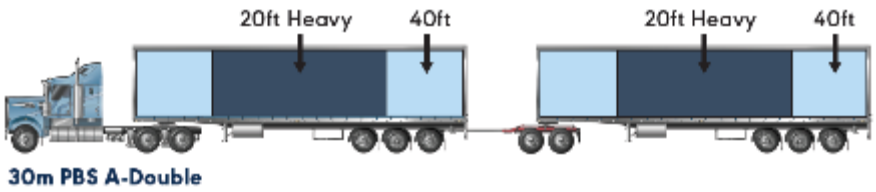
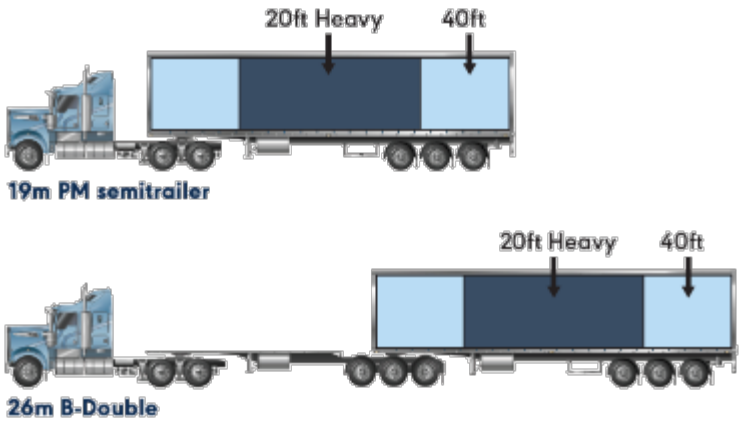
30m PBS A-double





100% productivity improvement for specific freight tasks

- 30% average growth/year for A-doubles
- 27% increase in freight movements in Port of Brisbane
- 16% increase in truck numbers
- Overall decrease in truck trips per TEU container

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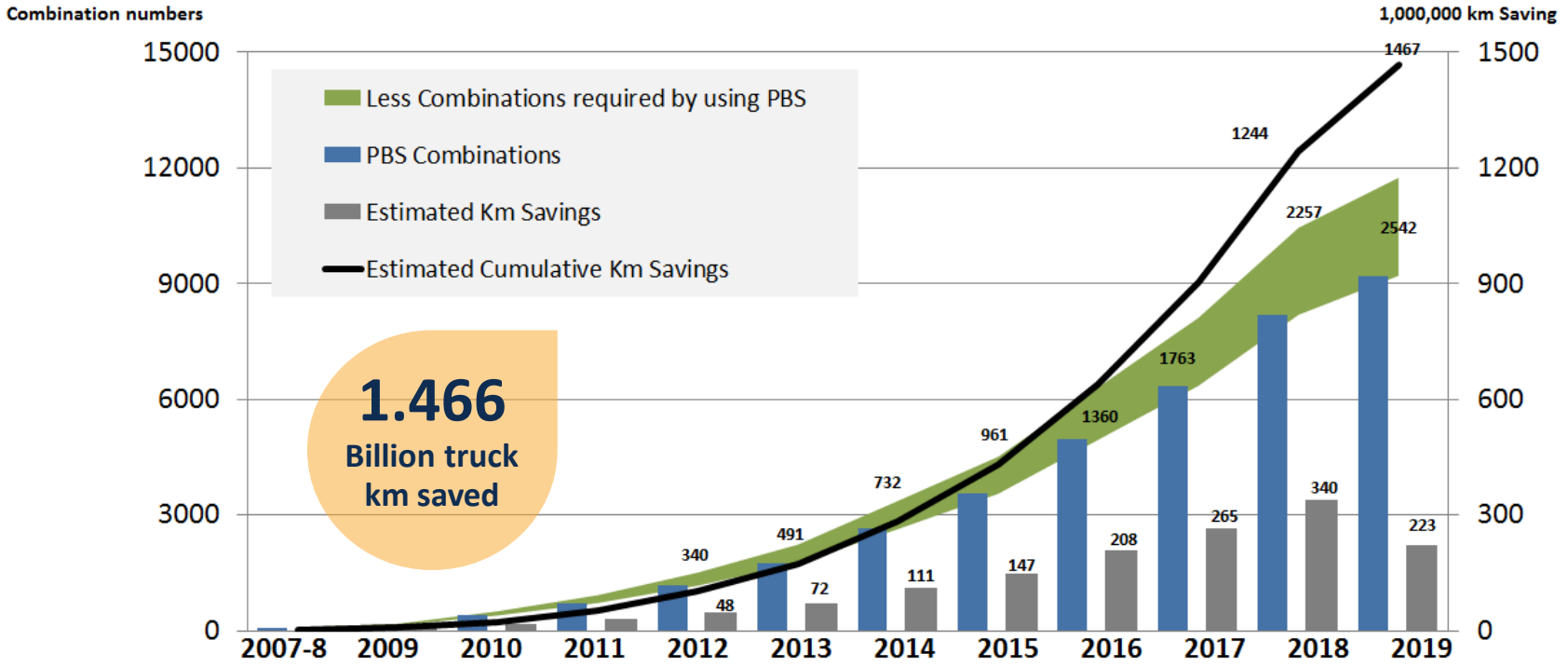
PBS productivity benefits

Productivity Benefits of PBS Combinations Approved 2007 to July 2019

2 Aug 2019



	2007-8	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
PBS combinations added	**70**	**73**	**252**	**324**	**450**	**575**	**893**	**915**	**1402**	**1399**	**1839**	**1015**
Million km saved by using PBS	2	5	16	29	48	72	111	147	208	265	340	265
Less combinations by using PBS	**16**	**37**	**109**	**203**	**340**	**491**	**732**	**961**	**1360**	**1763**	**2257**	**2542**
Min drivers freed by using PBS	16	37	109	203	340	491	732	961	1360	1763	2257	2542

The factor and methodology from the Austroads Research Report AP-R465-14 (Quantifying the Benefits of High Productivity Vehicles) has been used with the number for approved PBS combination to quantify the benefits achieved from PBS.

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PBS Benefits

46% less major crashes per km travelled

1.46 billion truck km saved (2008-2019 July)

9213 PBS combinations 2542 combination "saved"

223 million truck km saved in 2019

1.88 million t of CO2 saved (2008-2019)

reduced number of trips can lead to reduced road maintenance

744 million l of fuel saved (2008-2019)

20% of new units were PBS approved in 2018

301,000 t of CO2 saved in 2019

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QUESTIONS?