Assessing the effectiveness of the PBS Scheme
Discussion paper
August 2017

NTC AUSTRALIA
National Transport Commission

Report outline

Title	Assessing the effectiveness of the PBS Scheme
Type of report	Discussion paper
Purpose	For public consultation
Abstract	The purpose of the PBS evaluation project is to review the effectiveness of the PBS scheme with a view to proposing improvements to the efficiency of the PBS scheme. The NTC believes that there is scope to improve the efficiency of the PBS scheme and to achieve greater access certainty.
Submission details	Submissions will be accepted until 9 October 2017 online at www.ntc.gov.au or by mail to: Att: PBS Effectiveness Review National Transport Commission Level 3/600 Bourke Street Melbourne VIC 3000
Key words	Performance Based Standards, PBS, evaluation, review, assessment, innovation, heavy vehicle, barriers, access
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ISBN	978-0-6480157-1-0

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Executive summary

The National Transport Commission (NTC) is evaluating the Performance-Based Standards (PBS) scheme with a view to proposing improvements to the PBS scheme.

The aim of this discussion paper is to present the preliminary findings of this evaluation and outline possible actions that will improve the effectiveness and efficiency of the scheme. The paper also summarises the benefits of the PBS scheme to industry, governments and the community in general.

Context

The PBS scheme was introduced in 2007 as an alternative performance-based regulatory system that could replace the prescriptive method of using mass and dimension limits. The NRTC developed the performance-based standards in the late 1990s. The scheme has not previously been comprehensively reviewed.

The objectives of the evaluation are to:

- Identify whether the PBS scheme is meeting its original policy intent.
- Identify whether the PBS scheme's design and associated approval processes contain barriers to operating as an effective marketplace for the development, sale and commercialisation of innovative vehicles.
- Identify how access decisions affect the effectiveness of the PBS scheme.
- Identify whether there are modifications that could improve the effectiveness and efficiency of the PBS scheme.

The evaluation key inputs include an analysis of available data and current process, feedback from industry and government stakeholders, and an external assessment of the benefits of the scheme.

Issues

The PBS scheme is enshrined in the Heavy Vehicle National Law (HVNL) and administered by the National Heavy Vehicle Regulator (NHVR).

The NTC and its predecessor the National Road Transport Commission (NRTC) developed the scheme in response to growing freight demand; it plays a critical role in supply chain logistics. The scheme's aim is to create more sustainable transport systems through improved, more flexible regulation that supports innovation.

Analysis of data relevant to the PBS scheme shows that take-up of the PBS scheme is growing. Three thousand of the **current PBS fleet of 5000 vehicles** has been approved in the last three years. PBS vehicles are emerging almost exclusively from the hire and reward sector. **In 2016, about 47 per cent of newly registered vehicles in this sector were PBS-approved.** The scheme has also led to increased innovation in the movement of freight by heavy vehicles.

Key positive benefits of the scheme in safety, productivity and for the environment include:

- PBS vehicles are involved in 46 per cent fewer major crashes than the existing non-PBS vehicles for the same distance travelled.
- An estimated reduction of over 440 million kilometres in truck travel and at least four lives in 2014-2016.
- An average of 24.8 percent productivity gains across all commodities carried by various PBS vehicles.
- PBS vehicles delivered a 6.2 per cent gross tonne-kilometre saving for 2016. They are likely to have saved about $65 million in road maintenance expenses (based on total expenditure for the financial year 2015-16).
- Use of PBS vehicles has saved an estimated 94 million litres of fuel in 2016, which in turn reduced the CO2 emissions by about 250,000 tonnes.

Factors both within and outside of the scheme have constrained PBS growth. **The biggest barriers reported by industry were the complexity and cost of the approval process and the access uncertainty** which results from a number of administrative process issues. This includes the need for individual access permits for most PBS vehicles, the time taken by road authorities to give consent for access on their respective roads and the imposition of additional state-based operating conditions.

The responses to the NTC's industry survey support this assertion that PBS vehicle growth could be greater if issues with the existing approval and access processes are resolved.

Evaluation results and outcomes

The NTC compared vehicle numbers and current benefits of the PBS scheme against the targets and estimates developed as part of the 2001 and 2011 PBS Regulatory Impact Statements. Our evaluation concluded that the scheme is **effective against performance measures in innovation, productivity, safety and the environmental impact**. While the number of PBS vehicles did not fully meet initial expectations, this is attributable to the current network access and the Australian economic slowdown.

The evaluation also concluded that the **level of customer satisfaction with the scheme is not satisfactory**. Industry's reluctance to participate in the scheme also helps explain the lower than expected take-up.

The NTC has identified a number of barriers to innovation and take-up. These include the complexity and cost of the PBS approval process, network access limitations and uncertainty, and the limitations of the performance-based standards themselves. In addition, issues outside of the scheme's jurisdiction – such as limitations with non-road infrastructure at the supply chain level – also created barriers to greater take-up of the scheme.

We also identified improvement opportunities through the review and evaluation process, and directly through stakeholder feedback. Based on these opportunities, we have developed a list of possible actions, which, if implemented, could help to overcome the barriers to innovation and increase uptake of the scheme.

Possible actions include:

- reviewing specific parts of the PBS framework (including the standards) that are currently problematic,
- investigating development of a simplified PBS scheme for popular and mature PBS designs with greater access certainty,
- publishing national notices for all four levels of PBS network,
- developing a nationally harmonised infrastructure capability assessment framework for use in all access decision making,
- engagement with non-road infrastructure owners and ancillary operators to remove specific barriers,
- investigating a performance-based approach to medium-to-heavy duty commercial vehicles with gross mass within 8t to 42.5t and buses operating in urban areas.

Next steps

We expect to provide a summary of the evaluation and final recommendations to the Transport and Infrastructure Council (the Council) in May 2018. We will consider comments and feedback to this discussion paper before developing final recommendations for the Council's consideration.

The NTC will work with the NHVR, road managers and industry members to develop a high-level plan for implementing recommendations approved by the Council. The plan will include the allocation of implementation tasks to responsible parties, establish milestones and appropriate governance arrangements.

Other possible suggestions listed in section 8.2 require future consideration by the NHVR and road agencies.

1 Context

The National Transport Commission (NTC) has conducted an evaluation of the Performance-Based Standards (PBS) scheme. Objectives of the evaluation are to identify if the scheme is meeting its policy intent, whether there are barriers to the scheme's effectiveness and to identify any potential improvements.

1.1 Objectives

The aim of this paper is to present the NTC's evaluation of the PBS scheme, propose possible actions to improve the effectiveness and efficiency of the PBS scheme, and obtain stakeholder feedback.

In this discussion paper, we consider the PBS scheme, the access framework for PBS vehicles, and non-road infrastructure areas of the supply chain network such as warehouses and distribution centres.

The objectives of the evaluation are to:

- Identify whether the PBS scheme is meeting its original policy intent.
- Identify whether the PBS scheme's design and associated approval processes contain barriers to operating as an effective marketplace for the development, sale and commercialisation of innovative vehicles.
- Identify how access decisions affect the effectiveness of the PBS scheme.
- Identify whether there are modifications that could improve the effectiveness and efficiency of the PBS scheme.

Findings from the evaluation form the basis of proposed improvements to the PBS scheme.

1.1.1 Evaluation inputs

There are three key research and analysis inputs into the evaluation:

- A broad review of the current process and operational context of the PBS scheme.

  A comprehensive analysis of PBS and related data and processes. Key data and information referenced in the evaluation results are included in Section 3.

  An assessment of the scheme's impact on different vehicle types and freight sectors.
- Results of an external review of the benefits of the PBS scheme.

  A summary of results is included in Section 4; the full report is in Appendix L.
- Consultation with industry and government through an industry survey and liaison with state and territory stakeholders.

  A summary of industry survey findings is in Section 5, while detailed survey responses are provided in Appendix I.

1.2 Background

1.2.1 Project origin

In May 2014, the Transport and Infrastructure Council (the Council) approved a three year work program for the NTC, committing the NTC to reviewing the PBS scheme, assessing its effectiveness and, where appropriate, recommending changes to improve it.

1.2.2 The problem – and opportunity

The PBS scheme commenced in 2007. Its purpose was to address increasing freight demand and to improve the productivity and safety of the heavy vehicle fleet. The NTC reviewed the scheme in 2009 after its first year of operation; however a comprehensive review or evaluation of the PBS scheme against its original policy intent has not yet been undertaken.

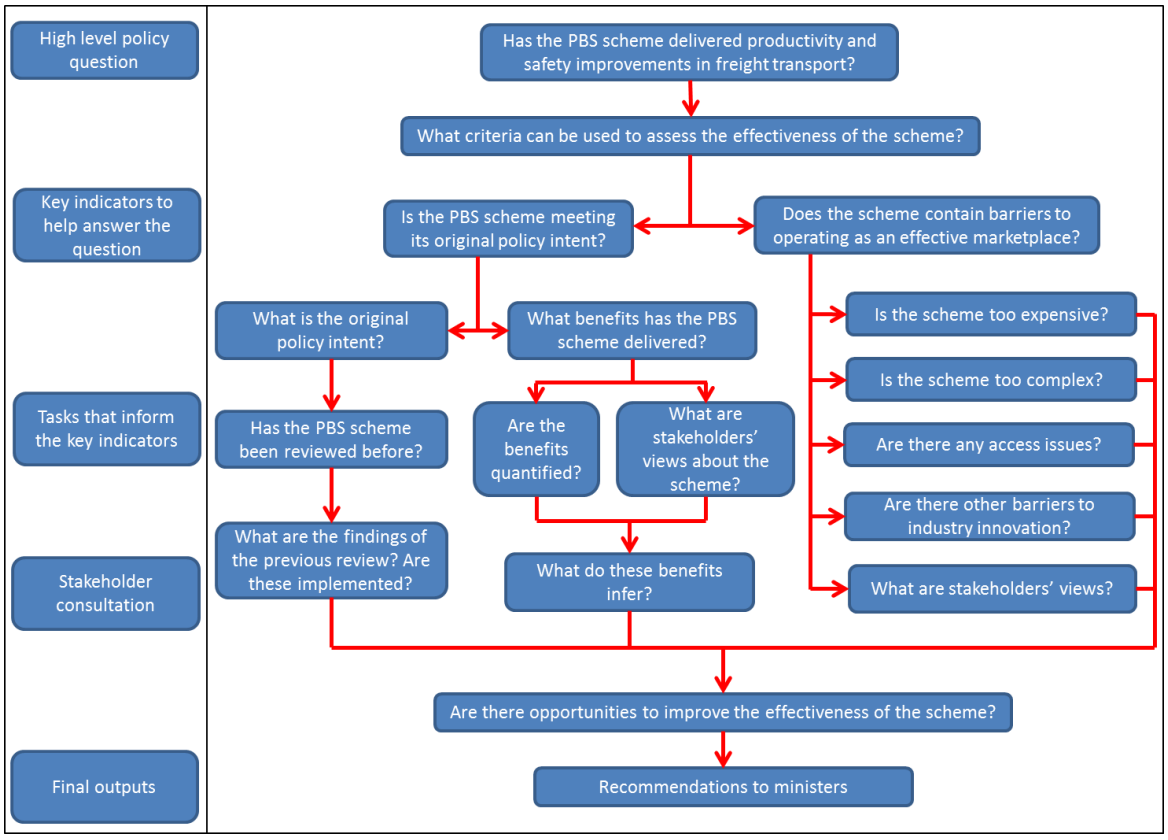
Feedback from existing manufacturers and operators of PBS vehicles indicates that the current costs, administrative processes and network access processes of the scheme are a barrier to innovation in the heavy vehicle industry and impede take-up.

Failure to review the current situation and take corrective action where required will result in both industry and governments allocating greater than necessary cost, time and resources to support innovation and improve the productivity and safety of the heavy vehicle industry.

This evaluation aligns with the NTC's purpose by seeking to improve productivity, safety, environmental performance and regulatory efficiency of heavy vehicle transport.

Figure 1 depicts the project purpose and intended outcomes described above.

Figure 1. PBS evaluation project issues tree



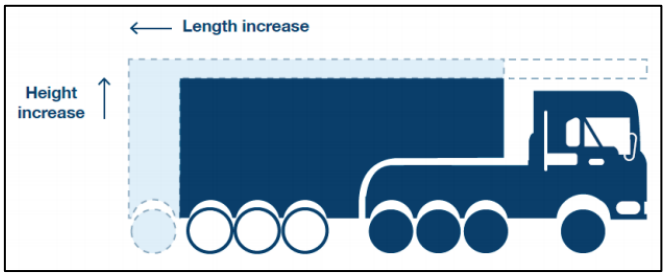
1.3 About the PBS scheme

The National Heavy Vehicle Regulator (NHVR) administers the PBS scheme under the Heavy Vehicle National Law (HVNL).

It is an alternative regulatory system for heavy vehicles, which replaces the prescriptive method of using mass and dimension limits. The purpose of the PBS scheme is to make freight transport safer and more productive, and to reduce impact of freight movement on the environment and society. The scheme also provides a means for approving heavy vehicle innovations without the need to build an expensive prototype.

The PBS scheme offers flexibility in vehicle design (see Figure 2) and provides higher mass limits on vehicles that comply with the PBS standards.

Figure 2. Vehicle design flexibility offered by the PBS scheme



With a projected increase of about 20 per cent in the road freight task over the next 10 years (NTC 2016, Who Moves What Where), the PBS scheme is perfectly positioned to enable both industry and governments to cope with the predicted increase.

1.4 How to submit

Any individual or organisation can make a submission to the NTC.

To make an online submission, please visit www.ntc.gov.au and select 'Submissions' from the top navigation menu.

Or, you can mail your comments to:

Att: PBS evaluation, National Transport Commission,

Level 3/600 Bourke Street, Melbourne VIC 3000.

Where possible, you should provide evidence, such as data and documents, to support your views.

Unless you clearly ask us not to, we will publish all submissions online. However, we will not publish submissions that contain defamatory or offensive content.

The Freedom of Information Act 1982 (Cwlth) applies to the NTC.

1.4.1 Questions to consider

1. Is any of the information presented as the basis for the evaluation of the PBS scheme incorrect or incomplete? If so, please provide evidence that we can use to rectify this.
2. Are any critical items missing from the evaluation?
3. What impact will the proposed actions to improve the effectiveness and efficiency of the PBS scheme have on your operations?
4. What other actions should be considered to improve the effectiveness and efficiency of the PBS scheme?

2 Introduction to the PBS scheme

The PBS scheme, and the policy framework behind it, was developed in response to growing freight demand. Its aim is to create more sustainable transport systems through improved, more flexible regulation that supports innovation. The scheme plays a critical role in supply chain logistics.

Several improvement projects have been completed since the NTC reviewed the PBS scheme in 2009, including enshrining the PBS scheme within the Heavy Vehicle National Law (HVNL) and establishing the National Heavy Vehicle Regulator (NHVR).

2.1 PBS policy intent

During the late 1990s, the National Road Transport Commission (NRTC) identified two objectives for a new performance-based approach to regulating heavy vehicles:

- Development of more sustainable transport systems through improved road vehicle regulations controlling heavy vehicle safety and infrastructure impacts.
- More flexible road transport regulations that provide for increased innovation and more rapid adoption of new technologies, while providing seamless operations nationally.

In 2001, the NRTC proposed development of a performance-based approach to heavy vehicle regulation to meet growing freight demands. The new approach would explicitly consider the interaction of vehicles with the roads they use.

The PBS scheme provides a nationally harmonised system to deal with innovations in heavy vehicle design. Ministers approved the scheme in 2007, and the PBS Review Panel (PRP) held its first meeting in October of that year.

2.2 The safety and infrastructure performance standards

Under the PBS scheme, there are 16 safety standards and 4 infrastructure standards (listed in Appendix B, and available on the NHVR website). These comprise four categories:

- *Powertrain* – specifies engine and acceleration requirements
- *High speed* – stability, roll over and rearward amplification
- *Low speed* – swept path, frontal and rear swing requirements
- *Infrastructure* – bridge and pavement requirements; maximum axle group mass limits.

The PBS standards replace use of the *Australian Design Rules (ADRs)* and *Heavy Vehicle (Mass, Dimension and Loading) National Regulation (HV(MDL)NR)* to regulate heavy vehicles.

The ADRs and HV(MDL)NR cap the maximum length, width, height, drawbar length, overhangs, axle groups and tow coupling locations for heavy vehicles. The PBS scheme allows vehicles outside of these limits to be constructed using a performance-based approach. A vehicle's design is assessed against the PBS standards using simulation software. Maximum permissible mass limits and access level decisions are made based on the assessment performance results.

One of the underpinning principles in the PBS scheme's development was that performance standards would be at a level at least equivalent to corresponding prescriptive schemes. **The ability to run vehicles that are more productive on a more extensive road network** would offset the costs of achieving and demonstrating compliance with the performance standards.

The NTC's 2016 comparison of PBS and prescriptive heavy vehicle standards is available on the NTC website (Increasing heavy vehicle volumetric load capacity without increasing mass limits).

2.3 PBS plays a pivotal role in supply chain logistics

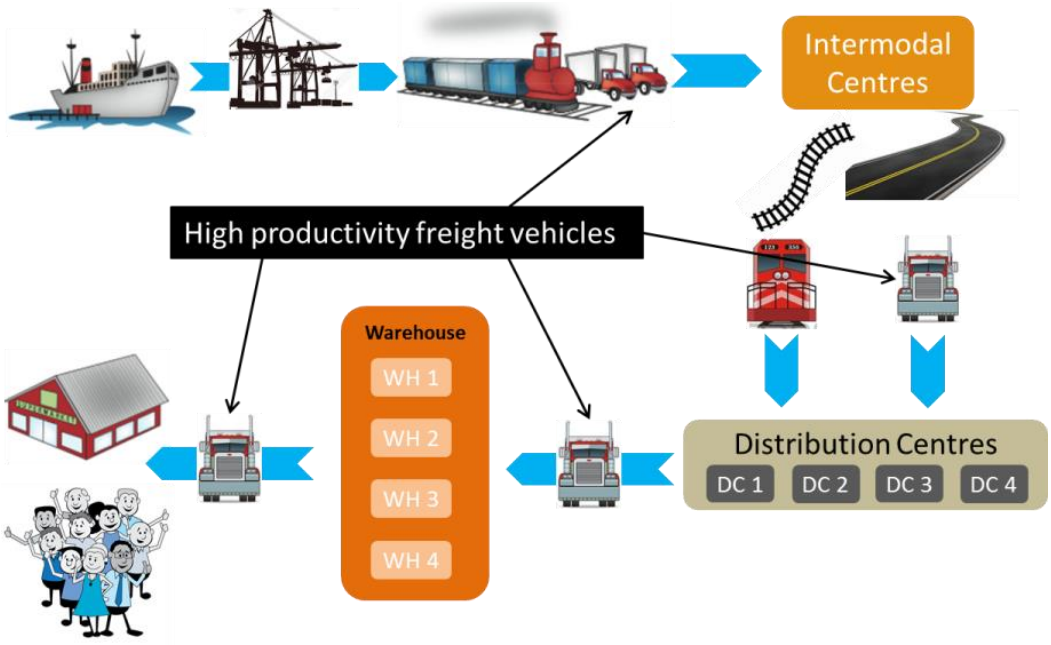
On an average day, the Australian transport and logistics industry moves nearly 5 million tonnes of freight, approximately 200 kilograms for every person in Australia.

As at August 2016, about 30 per cent (218 billion tkm[1]) of the 726 billion tkm domestic freight task moved by road along a freight network of over 800,000 kilometres (NTC 2016, Who Moves What Where). Heavy vehicles have delivered about 73 per cent (159 billion tkm) of the road freight task. It is important that this freight movement occurs in a safe and efficient manner.

Australia is at the forefront of addressing the challenge of increased freight demand. The PBS scheme is the world's first and only high productivity heavy vehicle scheme that is fully legislated and supported by a national regulator. Several other countries are using Australia as an example to develop and implement their own high productivity vehicle framework (see Appendix F for examples).

Figure 3 shows the supply chain logistics for import containers. Efficient intermodal operations play a pivotal role in ensuring imported goods reach the intended customers at the right time and right price. Replacing prescriptive heavy vehicles with high productivity vehicles operating at optimised efficiency is important to the long-term sustainability of an efficient supply chain network. At the same time, non-road infrastructures such as intermodal centres and warehouses must also ensure they can accommodate pick-ups and deliveries using PBS vehicles.

Figure 3. Role of PBS in container import supply chain



2.4 Improvements to the PBS scheme

2.4.1 2009 PBS review

When the NTC assessed the operation of the PBS scheme in 2009, it identified that PBS take-up was significantly lower than initial estimates. Most industry members reported that they did not obtain the desired network access for their PBS vehicles. They also regarded the scheme as expensive, complex and time consuming.

The 2009 report outlined several recommendations to improve participation, increase take-up rates and simplify the operation of the scheme. A summary of actions taken in response to these recommendations are set out in Appendix D.

[1] tkm – tonne-kilometres

Improvement projects completed since the 2009 review include:

- The NTC incorporated the PBS legislative framework into the HVNL from early 2014.
- The NHVR was established as the single national entity for all road access approvals for all heavy vehicles, including PBS vehicles.
- The NTC assessed the feasibility of migrating popular PBS designs to simpler access arrangements in 2015.
- The NHVR published a PBS Truck and Dog Class 3 National Notice in 2016 that provides automatic access to complying PBS truck and dog combinations to the networks specified in the notice. The notice removed the need to obtain access permits, reducing the lead time to obtain access to the road network. Further, in March 2017, the NHVR developed a set of truck and dog trailer design specifications that the PBS Review Panel (PRP) deemed acceptable for all future complying design applications.
- The NHVR conducted PBS 'demonstration days' in regional areas during 2016 to help local councils understand the benefits of PBS vehicles and the role they can play for local economies. These events have been instrumental in clarifying who is responsible for vehicle design, PBS approval and access approval elements of the PBS scheme.
- Austroads conducted several research projects to identify ways to improve the take-up in the PBS scheme.

Process improvement in action

NHVR pre-advised design approval process for truck and dog trailer combinations began operating on 3 April 2017. Since then, about 30 per cent of new design applications for truck and dog trailer combinations have used the pre-advised design. As at early June 2017, there have been 14 new applications processed against the pre-advice option with an average turnaround time of 3.7 business days per application. **This has reduced the turnaround time for design approval for these types of applications by four weeks.**

3 Analysis of relevant data

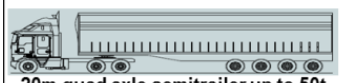
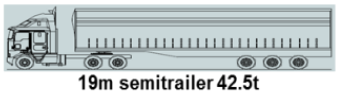
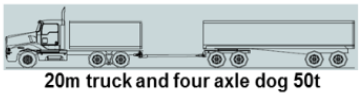
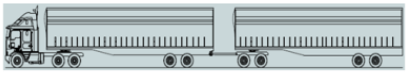
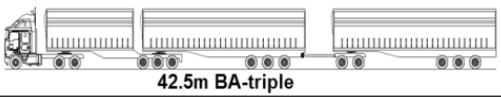
Data shows that take-up of the PBS scheme is growing. While the numbers are encouraging, the number of PBS vehicles could be greater if issues with the existing PBS process and access framework are resolved.

3.1 Vehicles and statistics

3.1.1 Vehicles approved under the PBS scheme

Vehicle types that can utilise the scheme vary from the highly innovative vehicles with a very specific freight task, to generic vehicles (with subtle changes to improve productivity or safety) that cater to broader freight tasks. Figure 4 lists the popular PBS vehicle types and the prescriptive vehicles they replace.

Figure 4. Popular PBS vehicles and the prescriptive vehicles they replace

Popular PBS vehicles	Prescriptive vehicles replaced
 20m quad axle semitrailer up to 50t	 19m semitrailer 42.5t
 20m truck and four axle dog 57.5t	 19m truck and three axle dog 42.5t
 23m truck and five axle dog 63t	 20m truck and four axle dog 50t
 30m B-Doubles 4 TEUs	 26m B-Doubles 3 TEUs
 30m A-Doubles 4 TEUs	 19m Semitrailer 2 TEUs
 30m A-Double same efficiency as 36.5m road train	 36.5m Road-train
 42.5m BA-triple	 36.5m Road-train

Most applications for PBS approvals have been for more standard vehicles such as truck and dog trailers, semitrailers and B-doubles. Applications for these vehicle types incorporate small innovations to improve productivity, such as longer draw-bar.

The PBS fleet is comprised of the following vehicle types, popular in PBS network levels 1 and 2:

- truck and trailer combinations – about 55%
- semitrailers and B-doubles – about 35%
- innovative A-doubles – about 10%

Other highly innovative vehicle designs include A-triples, BA-triples, B-triples and the BAB quad combinations, predominantly emerging from the B-double class. These vehicles use the PBS scheme as they are generally outside the normal specifications for road trains.

NHVR data shows that in majority of cases vehicle manufacturers developed and obtained design approval for blueprints to build new PBS vehicles. For the past three years, an average of 60 per cent of PBS design applications were from manufacturers, with the remainder coming from operators.

3.1.2 Innovation

Over the past 10 years, the PBS scheme has seen over 1500 innovative vehicle design applications. In 2016, the NHVR received about 190 new design applications. The bulk of these applications were for generic vehicle types such as truck and three/four axle trailers, semitrailer and B-double combinations; however the NHVR also received highly innovative new vehicle design applications.

From the innovative glass transport combination to the modern day A-doubles running in more urban areas, the PBS scheme has delivered the following innovations:

- New vehicle types from load-specific concept designs (glass carrier, tyre carrier, etc.) to modern day A-doubles, triple and quad road trains, A-B Doubles, jinker trailers, 2.55m wide buses and five/six axle dog trailers.
- Innovations within existing vehicle types such as quad axle groups, steerable axles and dollies, tri-axle dollies, belly axle concept, extendable trailers, new fifth wheel design and double drawbar coupling.
- Allowing industry to innovate by offering flexibility with internal dimensions that was not originally possible with prescriptive regulations.
- Allowing governments and industry to optimise vehicles to the type of freight and the available road network.

Delivery of these changes has resulted in innovation reaching areas previously untouched, such as the BAB-quad concept in South Australia, 30m A-Doubles in the urban areas of Queensland and 60m super quad road trains in the Western Australia Pilbara region.

Case study – Byford Equipment

In 2014, Victorian based trailer manufacturer Byford Equipment built a PBS approved 26m A-Double vehicle combination for Murray Goulburn to enable dairy distribution to a number of farms. The A-Double is fitted with a steerable rear axle in each trailer and uses a steerable dolly. **This innovation gives this vehicle a swept path of 6.33m, making it more flexible and manoeuvrable than a 19m B-Double prescriptive vehicle that has a swept path of over 9m.**

Source: Primemover Magazine, December 2015 edition

3.1.3 PBS vehicle growth

From the start of the PBS scheme until the end of 2016 a total of 1581 PBS applications have been processed and just under 5000 heavy vehicles approved.

In the last three years, NHVR has issued 669 new design approvals. From these, the NHVR has issued 2425 vehicle approvals for 3238 new PBS vehicle combinations.

Table 1. PBS vehicles approved per year

Years	PBS vehicles
2008-2009	140
2010-2011	579
2012-2013	1025
2014-2016	3238
Total	**4982**

Since 2014, the annual compounded growth rate for PBS vehicles is 58 per cent. This is four times the growth rate of the total heavy vehicle fleet in Australia.

About 94 per cent of PBS applications come from Victoria, Queensland and New South Wales. Victoria is at the forefront of heavy vehicle innovation with 63 per cent of total PBS design applications coming from this state. Queensland and New South Wales account for 17 per cent and 14 per cent respectively. (Note that a vehicle may operate in a different jurisdiction to that where the applicant lodges their application.)

PBS vehicles translate to heavy vehicle savings

In December 2016, the NHVR reported that the 2893 PBS vehicles it approved between January 2014 and October 2016 would replace 3800 prescriptive vehicles to do the same freight task. These combinations will **save 96 million km of heavy vehicle travel per year**.

Source: Primemover Magazine, December 2016 edition

Not every heavy vehicle type is suitable for the PBS scheme. Appendix E.2 shows the range of heavy vehicle types from which PBS vehicles can emerge. Also, Appendix J provides a list of vehicle types that are excluded from the range of PBS vehicle types.

The NTC's analysis reveal that in 2013 only 1.7 per cent of the total heavy vehicle fleet from which PBS vehicles can emerge were actually PBS approved. By the end of 2016, this percentage increased to 4.6 per cent. In 2016, 25 per cent of all newly registered heavy vehicle combinations were PBS approved.

Similarly, when considering the hire and reward sector only, in 2013, 3.2 per cent of the heavy vehicle fleet from which PBS vehicles can emerge were PBS approved. By the end of 2016, this percentage increased to 8.5 per cent. **In 2016, nearly every second (47 per cent) newly registered hire and reward sector heavy vehicle was PBS approved.**

3.1.4 Broader Australian financial context

The NTC estimates that the land transport sector contributes approximately 9 per cent of Australia's gross domestic product (GDP). There was significant positive road transport GDP in the years leading up to and immediately following the approval of the PBS safety and infrastructure standards (2006). In the last eight years, however, there have been six years of negative growth (see Appendix L for Australia's road freight GDP during 2001-2016). The PBS scheme has continued to grow despite the transport sector slowdown.

4 Benefits of the PBS scheme

Evaluation of the impact of replacing conventional freight vehicles with PBS vehicles shows that:

- PBS vehicles are safer than comparable conventional vehicles. The major crash involvement rate of PBS vehicles is 46 per cent lower per kilometre travelled than comparable freight vehicles.
- PBS vehicles are more productive than comparable conventional vehicles. Productivity improvements range from 15% for transport of cars and groceries to over 30% for transport of general freight and containers.
- Use of PBS vehicles reduced road maintenance requirements by about $65 million in 2016.
- Use of PBS vehicles in 2014-16 reduced the kilometres travelled to deliver Australia's road freight task by 440 million km.
- In 2016, use of PBS vehicles reduced the need for fuel to deliver Australia's road freight task by 94 million litres, and resultant CO_2 emissions by 250,000 tonnes.

The purpose of PBS scheme is to encourage innovation that would provide safer, more productive and more sustainable road freight vehicles, and minimise the impact of freight movement on road assets. The NTC engaged an independent expert to examine and quantify the safety, productivity and environmental benefits attributable to the PBS scheme. The results revealed that in all cases examined, the scheme delivers positive outcomes. This chapter summarises the key findings; Appendix L contains the full report.

4.1 Safety

4.1.1 Crashes

Across all PBS combinations, PBS vehicles were involved in **46 per cent fewer major[2] crashes** when compared against similar non-PBS vehicles for the same distance travelled.

Table 2 shows the annual major crash rates for PBS vehicles and their equivalent non-PBS vehicles. Crash rates per 100 million kilometres travelled was used as a benchmark to assess safety performance.

Table 2. Average annual major crash rates for conventional vs PBS vehicles 2013-16

Comparison Conventional Vehicle Configuration	Crash Rate per 100 million km	PBS/HPV Vehicle Configuration	PBS crash Rate per 100 million km
Heavy Rigid (HR) with 3-axle Trailer	9.5	HR with 3-axle Trailer	8.4
		HR with 4-axle Trailer	9.8
		HR with 5-axle Trailer	2.3
		HR with 6-axle Trailer	0.0
TOTAL Rigid Combinations	9.5	TOTAL Rigid Combinations	7.8

[2] For the purposes of this exercise, major crashes are accidents with insurance claims > $50,000.

Comparison Conventional Vehicle Configuration	Crash Rate per 100 million km	PBS/HPV Vehicle Configuration	PBS crash Rate per 100 million km
Semi-trailer	20.9	6/7 axle articulated Semi-trailer	9.8
B-Double	9.4	Longer B-Double	6.5
		B-Triple	4.2
		A-Double	14.0
Road Train 1/2	26.1	AA, AB, BA Triple	4.2
B-Double	9.4	AAB BAB Quad	13.7
TOTAL Articulated	15.3	TOTAL PBS Articulated	6.2
TOTAL Conventional	13.6	Total PBS	7.3

In most cases, the PBS class of vehicles performed better than their non-PBS counterparts. Only three PBS configurations performed worse than their benchmark conventional vehicles. In several cases, however, PBS combinations performed exceptionally well against their benchmark conventional vehicle counterpart.

4.1.2 Fatalities

Data from fatal crash files and PBS vehicle operators indicate that PBS vehicles are involved in **significantly fewer fatal crashes** than non-PBS vehicles.

Table 3 compares fatal crash rates for PBS vehicles and their equivalent conventional vehicles.

Table 3. Conventional vs PBS fatal crash rates by truck configuration

Truck type	Fatal crashes per 100 million km (rate as at 2014)	Fatal crashes per 10,000 registered vehicles (rate as at 2015)
Rigid trucks	0.80	2.23
Rigid PBS	0.0	0.0
Articulated trucks	1.30	10.53
Articulated PBS	0.49	1.07

Note: Data for PBS fatal crashes was collected via a separate operator survey and cross checked with insurance company data.

4.2 Productivity

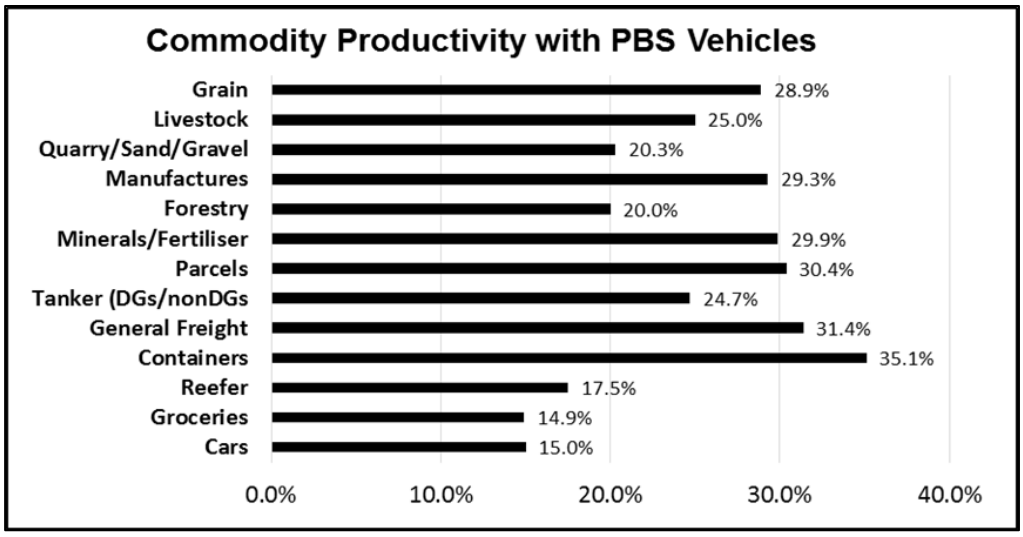
PBS vehicles are delivering outstanding productivity benefits in the majority of cases examined.

4.2.1 Commodity gains

We examined the percentage of the fleets carrying particular commodities. Truck and trailer combinations carrying quarry products are dominant in the PBS market, representing 34 per cent. General freight (13 per cent) and tanker operations (11 per cent) are the next biggest applications. A full list of commodities carried by PBS vehicles is included in Appendix E.

Figure 5 shows the productivity gains for particular commodities carried by the PBS fleet. The benefits range between 15 per cent and 35 per cent for different commodities. For example, the popular quarry/sand/soil industry has achieved a 20.3 per cent productivity improvement across a mix of 3, 4, 5 and 6 axle trailers.

Figure 5. Average productivity gains delivered by PBS Vehicles 2013-2017



Case study: Thurwood Transport

Thurwood Transport is a transport logistics company based in the western suburbs of Melbourne transporting fresh produce along the Eastern Seaboard of Australia. They recently upgraded their prescriptive refrigerated van to a PBS approved quad-axle refrigerated trailer. This increased their vehicle capacity by six pallets from 22 to 28. This in turn **reduced the number of trips by 27 for each 100 trips for the same freight task**.

Source: Primemover Magazine, December 2016 edition

4.2.2 Infrastructure maintenance savings

In the calendar year 2016, the gross tkm travelled by PBS vehicles was 6.2 per cent less than would have been required to carry the same freight with non-PBS vehicles. (These results include forward and backhaul load factors and vehicles operating under HML and CML allowances.) Operating 4600 PBS vehicles for one year equates to a saving of about 2.5 billion tkm for the freight task performed by all heavy vehicles. PBS vehicles were estimated to have reduced the national freight task by 1.6 per in gross tkm for all heavy vehicles greater than 4.5 tonne. During the years 2014-16 PBS vehicles have reduced truck travel by 440 million km.

Analysis of road and bridge maintenance expenses showed that use of PBS vehicles is likely to have reduced the total maintenance expenditure requirement in 2015-16 by about

$65 million based on the 1.6 per cent reduction in national freight task. These estimates are based on 100 per cent maintenance cost allocation to heavy vehicle use. Table 4 shows the road expenditure, including bridge works for both state-managed and local roads and bridges. The total amount spent in road and bridge maintenance and rehabilitation is $4.062 billion.

Table 4. Road maintenance expenditure for state and local road network 2015-16 ($ millions)

Metric	NSW	VIC	QLD	WA	SA	TAS	NT	ACT
Total **state** road and bridge expenditure	872	310	474	287	102	48	61	13
Additional expenditure avoided by use of PBS vehicles (Estimated at 1.6% reduction in gross tonne-kilometres)	14	5	7.5	4.5	1.6	0.8	1	0.2
Total **local** road and bridge expenditure	448	371	685	229	103	41	9	9
Additional expenditure avoided by use of PBS vehicles (Estimated savings at 1.6% reduction in gross tonne-kilometres)	7	6	11	3.6	1.6	0.6	0.1	0.1

Total does not include servicing/operating expenses or low-cost safety and traffic improvements.
Source – State data: provided to the NTC annually.
Source – local data: ABS GFS Local Government current road and bridge expenditure. This ABS data has been distributed into expenditure categories based on NTC assumptions (except for the ACT).

4.3 Environment

The environmental benefits of the PBS scheme accrue through fuel savings obtained through travel reductions by using a PBS vehicle in place of a conventional heavy vehicle. The net fuel benefit is the fuel saving of a conventional benchmark vehicle, less the differential consumption rate of the PBS vehicle, less the consumption rate of the conventional vehicle over the PBS distance travelled. **In 2016, PBS vehicles delivered a fuel saving of 94 million litres translating to about 250,000 tonnes of CO_2.**

Case study: Western Australia

Western Australia has recently approved the use of **60m Super Quad road trains** to operate in the Pilbara region. These quad road trains are approved to carry **140t of payload per trip**, which resulted in **cutting 38,500 trips** in this region for the year 2016.

Source: Primemover Magazine, December 2016 edition

These estimated benefits lead to a number of flow-on benefits to the community, including but not limited to:

- reduced traffic crashes and fatalities
- broader public health effects from reduced emissions
- decarbonisation and improved air quality
- improved mobility – less congestion and lost time
- reduced infrastructure consumption – roads and bridges
- economic sustainability and positive impact on business, commerce and international competiveness.

4.4 Future forecast

The external expert modelled future PBS vehicle growth and associated savings using three forecast growth scenarios of 4 per cent (low), 7 per cent (moderate) and 8.5 per cent (high). These growth rates are based on projected heavy vehicle sales and access availability for PBS vehicles (see Table 12 in Appendix L).

For the period 2014 to 2016, the total number of motor vehicles in the Australian heavy vehicle fleet has grown by 6.0 per cent (102,461 to 108,613). For the same period, PBS vehicle combination numbers have increased by 185 per cent (1744 to 4982).

The NTC expects that PBS growth will start to plateau once PBS-approved truck and four axle trailer combinations replace most of the truck and three axle trailer combinations. However, expanding the PBS 'B' networks, simplifying the access framework and improving access certainty will encourage newer vehicle types to be approved under the PBS scheme.

Under a conservative, moderate PBS vehicle growth rate of 7 per cent, we expect the PBS scheme to deliver the following results over 2014-34:

- over 15,000 vehicles in PBS fleet
- 50 per cent reduction in major crashes
- saving of approximately 115 lives
- over 24 per cent productivity savings
- 3.2 billion litres of fuel and 8.7 million tonnes of CO_2
- $17.2 billion operational cost savings
- 8.86 billion km in heavy vehicle travel

5 Industry and government views

The NTC gained industry data and views about the PBS scheme via a survey. The results indicate that the biggest barriers to participation are the PBS application process and lack of access certainty.

Both industry and government stakeholders suggested several improvements to make the PBS scheme simpler and cheaper.

In late 2016, the NTC conducted workshops with industry and the PBS Review Panel to discuss our preferred project approach and performance measures. We then undertook a detailed information collection exercise with stakeholders such as the PBS assessors and certifiers, vehicle manufacturers, freight operators, the NHVR and all road agencies. The NTC received over 100 responses to the industry survey.

Detailed industry survey results are included in Appendix I. Case studies outlining industry and government experiences with the PBS scheme are included throughout this discussion paper (see also Appendix C).

5.1 High level analysis of results

For most manufacturers, the scheme has led to increases in innovation, improved safety and greater recognition in the transport sector and the supply chain. Improved product uptake by operators has assured sustained demand for high productivity vehicles.

For operators, the PBS scheme has improved business efficiency and competition by allowing them to carry more volume and mass. The scheme has improved fleet safety performance and reduced the number of vehicles that would otherwise have been on the road, saving on fuel and wages, reducing emissions and reducing supply chain costs. Businesses reported a growth in the freight task without needing to buy additional vehicles.

Most manufacturers and operators have about three to four PBS approved designs. On average, PBS vehicles make up 15 per cent of the fleet of operators who use these vehicles.

Costs for operating PBS vehicles include manufacturing and compliance costs embedded in the price of PBS vehicles. These range from about $3500 for simpler designs, to $7000 for multi combinations and, in extreme cases, over $120,000 for highly innovative vehicles.

Many survey respondents reported that the PBS scheme is time-consuming, complex, expensive and resource-intensive. Having to deal with multiple government departments (i.e. local councils, state road agencies and the NHVR) is particularly time-consuming. In some instances, survey respondents reported taking several years to obtain permits. Some manufacturers reported that they had not fully recovered their investment costs.

Respondents also reported that they can easily manage popular vehicle types through the PBS process, but truly innovative ideas are put in the ‘too hard basket’. Further, additional operating conditions can be expensive and NHVR-issued in-principle approvals that do not convert to actual permits results in significant losses to industry. Delays in obtaining permits results in purchased PBS combinations not operating while waiting for all approvals to come through. For some operators, the initial costs and delays have exceeded the estimated benefit from using PBS vehicles.

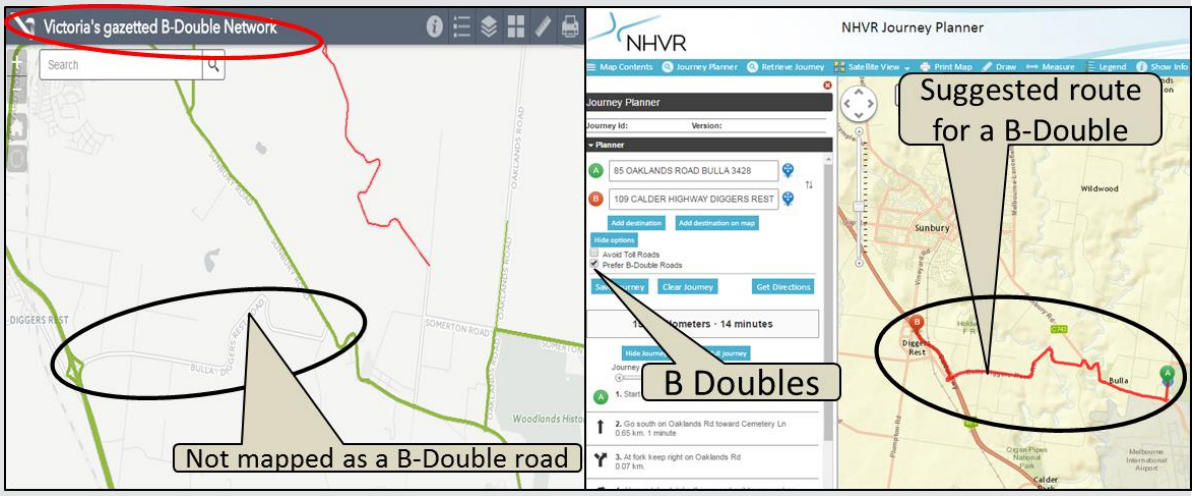
Difficulties in planning journeys for PBS vehicles

The NHVR has launched the Journey Planner and Access Portal to allow heavy vehicle operators to plan a journey and obtain access permits. However, these tools are not yet sufficiently sophisticated to provide PBS-specific advice. **The NHVR advises that its Journey Planner and Access Portal maps are indicative and do not reflect the actual PBS networks, nor do they**

include all innovative vehicle types such as A-Doubles.

Based on industry feedback, the NTC used the NHVR Journey Planner to plan a journey for a 25m B-Double from Melbourne's Oakland Junction to Calder Freeway. Despite choosing the 'Prefer B-Double routes' option, we were advised to use the 'Bulla Diggers Rest road'.

According to the VicRoads website, however, this road is not mapped as a B-Double route. The B-Double maps in the NHVR Journey Planner database also did not include this road as part of the B-Double network.



This example illustrates some of industry's difficulties in planning journeys using the NHVR Journey Planner. Some road agencies advised that it takes about six weeks for the NHVR Journey Planner to update amendments to the network. Industry feedback indicates that the NHVR Journey Planner is not yet sufficiently sophisticated to advise industry to use the approved network based on the inputs.

5.2 Improvement opportunities suggested by industry

Survey respondents identified a number of opportunities to improve the PBS scheme. We summarise the key suggestions below; detailed responses are at Appendix I.

- Introduction of a process or tool that assists with assessment of innovative vehicle designs to mapped networks. This could assist industry to self-assess their new ideas, reduce PBS process time, and provide a marketing tool for the scheme.
- Review ADRs, which are identified as a key barrier to innovation in heavy vehicles and consider inclusion to the PBS ADR exemption list.
- Introduce a self-certification scheme, at least for known and popular vehicle types, backed by rigorous quality and audit system.
- Harmonise operating conditions, which are currently state-based, to enable efficient cross-border operation.
- Identify and implement ways to offer low-cost entry to the PBS scheme (over 90 per cent of respondents requested this). Suggestions include migrating popular PBS vehicles to regulations, expanding blueprints, and offering visibility of already-approved popular vehicles' general dimension ranges.
- Simplify the process for incorporating minor design and build variations.
- Develop an alternative means of assuring compliance for sealed imported containers with payload height limits.
- Create a centrally-managed heavy vehicle component database.
- Improve access certainty by:
    - mapping networks for all four A and B levels of the PBS network at GML, CML and HML, and ensuring these are integrated with the NHVR Journey Planner and Access

Portal; the mapped networks could then be used to close gaps in the road network, including disjoints at state boundaries

  - providing PBS vehicles with as-of-right access to the PBS networks without the need to obtain permits.

- Implement a harmonised method across states for undertaking in-principle assessments so that the majority of in-principle approvals result in permits.
- Improve consistency and accuracy of advice obtained from the NHVR Access Portal and access department call centres.
- Assist local councils to improve their knowledge of the PBS scheme to help improve response times to permit applications and increase success rates.
- Develop a bridge database and nationally harmonised bridge assessment tool. Also, allow bridge assessments at reduced live load factors where vehicles are fitted with monitoring devices (e.g. Intelligent Access Program).

5.3 Government stakeholder feedback

The NTC consulted with jurisdictions to identify ways to maximise productivity and access availability and certainty for PBS vehicles. Jurisdictions believe the current PBS framework restricts productivity because it requires matching appropriate vehicles to appropriate level of PBS network. Receiving detailed technical results of a new vehicle design, beyond the information currently included, would allow road managers to undertake a risk-based approach to allow access to roads not currently mapped as PBS network. Other feedback from jurisdictions suggested the following items:

- Developing nationally harmonised assessment guidelines to assess and approve vehicles more than 2.5m wide.
- Changing current bridge assessment approach to infrastructure capability assessment framework. At present the focus is on an individual vehicle's suitability to travel over a bridge. Changing this to an infrastructure capability assessment will eliminate the need for multiple assessments of the same bridge for similarly looking vehicles.
- Supplying accurate tare weight and individual axle group loading for vehicles will allow road managers to more accurately assess a vehicle's suitability to travel over a bridge.

A number of states and territory agencies did not support the ability of the NHVR to exempt a PBS design from complying with one of the 16 PBS safety standards. These jurisdictions believed that such exemptions could compromise infrastructure and increase the likelihood of minor inadvertent impacts on roadside infrastructure.

6 Evaluation of the PBS scheme process

Key points

The NTC examined the PBS scheme and associated access processes. Our analysis revealed the combined PBS approval and access processes are very comprehensive and may potentially act as a deterrent to greater PBS take-up; this is also evident from the responses to the PBS survey. The recent growth in the PBS scheme has occurred despite most PBS vehicle types needing permits to operate. The NTC believes that if access issues are resolved, PBS can significantly grow within both the hire and reward and the ancillary sectors.

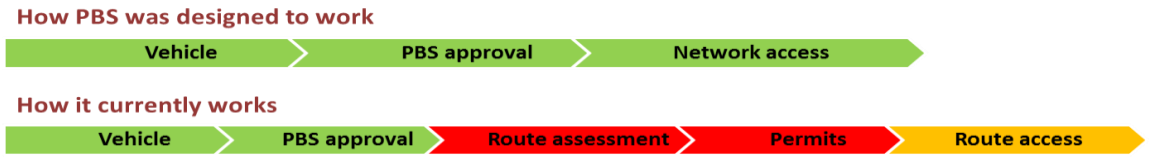
6.1 Current PBS practice

The PBS scheme was designed to approve innovations to vehicles and allow access to gazetted networks. In practice, however, the PBS process includes additional steps between vehicle approval and authorised access. Operators must obtain route assessments and permits because the PBS network is not gazetted via national notices.

Even after receiving design and vehicle approval, there is no certainty that an applicant will obtain access to their required routes. NHVR data shows that it issues **about 85 per cent of PBS vehicle approval requests within two business days** (70 per cent in one day, 15 per cent in two). The PRP takes **four weeks on average** to respond to new PBS design applications.

While the NHVR is responsible for access approvals, under the HVNL they may not grant a mass or dimension authority unless each relevant road manager has consented to the grant. Road managers can withhold consent for a number of reasons. Figure 6 illustrates the extra steps in the approval.

Figure 6. How PBS was designed to work (2001) and how it currently works (2017)



6.2 Customer satisfaction from PBS Industry Survey

The outcomes of the PBS industry Survey revealed industry dissatisfaction with several aspects of the PBS scheme processes. Our evaluation found that the NHVR PBS team continues to deliver design and vehicle approvals within a short turnaround time and that PBS customers are satisfied with the NHVR PBS performance.

The analysis also revealed that the average time taken for the PBS Review Panel (PRP) to respond to PBS design applications is about 25 business days. Around 24 per cent of applications take over 30 business days to obtain a minimum number of votes. This represents significant ‘lost time’ to industry.

PBS customers are generally satisfied by the permit turnaround times for popular vehicle types to available networks. However, the need for permits for a vehicle design that demonstrates superior safety performance over prescriptive vehicles is seen as a barrier. Often PBS vehicles are only allowed to operate at reduced mass limits or on a reduced network. This severely hampers the use and value of PBS vehicles.

Responses to the industry survey also revealed that customers are dissatisfied with the cost, complexity, time taken and network available to PBS vehicles. Lack of access certainty and costs involved in undertaking route assessments are seen as key barriers to greater uptake of PBS

vehicles. Based on the responses to the industry survey, customer satisfaction with process lead time and access framework was assessed as **not-satisfactory**.

6.3 Most PBS vehicles need permits to operate

The HVNL provides three main ways in which a heavy vehicle can obtain access to the road network: either 'as-of-right' access, or restricted access managed by notices or permits.

Despite demonstrating greater safety without adverse infrastructure impacts, most PBS vehicles require permits to use the road network. **Generally, the more productive a heavy vehicle, the more likely it is to be regulated under a permit regime.** One of the key contributors to access uncertainty is the lack of a clear method to quantify the impacts of PBS vehicles on infrastructure such as pavement and bridges.

Case study – PBS networks for truck and trailers in New South Wales

Prior to the commencement of the HVNL, NSW had the following access arrangements for PBS approved truck and trailer combinations via:

General Access is available for truck and four axle dog trailer combinations up to a General Mass Limit (GML) of 50.5 tonnes.

Vehicles operating above GML, up to a Higher Mass Limit (HML) of 57.5 tonnes will be required to enrol in the Intelligent Access Program (IAP) and will be restricted to the **HML B-Double Network**.

There was no Concessional Mass Limit (CML) for this combination.

Roads and Maritime Services had ministerial delegation to approve access for PBS approved vehicles in NSW for all roads irrespective of who managed them. **This ministerial delegation ended with the commencement of the HVNL on 10 February 2014.** The prevailing access arrangements continued, but subject to road manager consent.

In May 2016, in conjunction with the release of the *National Class 2 PBS Level 1 & 2A Truck and Dog Trailer Authorisation Notice 2016 (No.1)* Roads and Maritime Services (RMS) published dedicated PBS approved road network maps as below:

For PBS level 1 vehicles, General Access is reduced to **PBS Level 1 GML/CML network.**

For PBS Level 2A vehicles, B-Double network is reduced to **PBS Level 2A GML/CML network**, but without the need to enrol in the IAP.

For operating at PBS level 1 and 2 HML, access is restricted to **PBS Level 1 or 2A HML network** respectively.

The changes were necessary to make the permit process and access availability comply with the HVNL requirement of obtaining the relevant road manager's consent before issuing a permit.

Closer examination of the NSW PBS map reveals that the current PBS networks are only state managed highways. Very limited or no local roads are included in these maps. This is in contrast to Queensland (QLD) where PBS Level 1 and 2A networks are the same as general access and B-Double networks. With this restriction, **an operator that previously had general access to all roads in NSW is now restricted to highways and few local roads only**.

An operator driving from QLD to a non-major-highway-road destination in NSW can no longer operate a PBS approved vehicle legally at 50.5t. **This is a serious issue for truck and dog quarry operators** who have spent time, money and effort to upgrade their vehicles to PBS vehicles, but are being restricted for being longer than the maximum prescriptive length of 19m. In contrast, a 19m prescriptive truck and trailer (which is not required to comply with the safety performance standards of PBS) is able to operate on any road at 50.5t if it complies with the *National Class 3 Heavy Vehicle 19m Truck and Dog Trailer Combination Mass Exemption (Notice) 2014 (No.1)*.

The situation is more problematic for PBS vehicle operators with existing permits, since they lose access when they renew the permits. Industry reported this has led to compliance problems, load breaches and other enforcement issues. Detailed NSW PBS networks are included in Appendix L.

6.4 States' role in developing PBS networks

Detailed data on the infrastructure impacts of PBS vehicles was not available at the commencement of the PBS scheme. This prompted state road authorities to develop dedicated PBS networks instead of approving use of existing networks under relevant legislation.

There are four levels of PBS networks. While they roughly equate to existing networks for prescriptive vehicles, the **PBS networks are more restrictive than the equivalent prescriptive networks** (see Appendix E.4 and E.5 for more information).

State and territory road agencies undertake a number of activities to support the PBS scheme. Other than bridge assessments and permits, these services are at their own cost.

They continue to assess routes available to PBS vehicles with a view to expanding the current network. In addition, encouraged by the growth in PBS vehicles, several states are maintaining and strengthening their infrastructure to suit PBS vehicles. In general, most 'A' level networks for shorter vehicles have been mapped; 'B' level networks for longer vehicles have not. See Appendix E.4 for 'B' level vehicle lengths.

Initiatives include Victoria's heavy vehicle network maps, Northern Territory's open road train access, New South Wales' Safety, Productivity and Environment Construction Transport Scheme (SPECTS) policy, and Tasmania's class 3 truck and dog notice.

The need to leverage state policy

SPECTS is a voluntary scheme designed to improve the safety, environmental performance and productivity of heavy vehicles used by the construction industry, enabling the efficient movement of construction materials in NSW.

Vehicles enrolled in this scheme enjoy a simpler access framework and greater access certainty than comparable PBS vehicles. Access certainty for SPECTS vehicles was achieved by reducing the bridge live load factor from 2 to 1.6.

There is an opportunity for **states and territories to consider how the benefits of schemes such as SPECTS can apply to PBS vehicles.**

6.5 Role of local government – first and last mile access

Local governments are responsible for providing consent for access to the 'first and last mile' local roads that vehicles use to access pick-up or delivery points. Generally, local councils have not provided mapped roads due to their concerns regarding asset protection, lack of funding for road maintenance, perceived safety concerns and the lack of resources to conduct road and bridge assessments. Some state and territory road authorities have been working with local governments to improve access for PBS vehicles.

Austroads has developed guidelines to provide local governments with a set of nationally consistent guides on assessing the suitability of their road networks (AP-R333/09, 2009). However, guidelines such as these can only be of use if local governments have sufficient resources with the expertise and capacity to assess and map networks.

Case study – City of Greater Dandenong

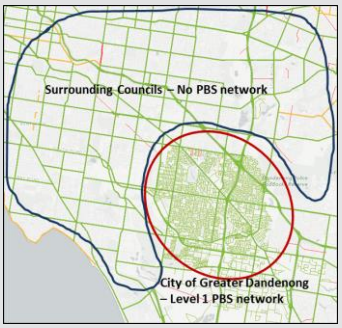
At 24 square kilometres, the Dandenong South Industrial Area in the City of Greater Dandenong in Melbourne's south-east region is one of the largest industrial estates in Australia. There are more than 5000 manufacturing businesses and about 90,000 manufacturing jobs within the City of Greater Dandenong. This makes the region the second largest provider of manufacturing jobs in Australia, and has led the City to develop strong relationships with road transport operators and local industry.

In 2011, Wettenhall Logistics contacted the City of Greater Dandenong to operate two 30m B-Doubles on local roads. The council assessed the suitability of Wettenhall Logistics' individual vehicles against the local area's entire strategic road network to see which roads could accommodate various types of PBS vehicles. In addition, **the council worked with VicRoads to**

understand more about the PBS scheme and how they could promote and manage PBS networks.

The council chose to weigh the perceived negative impacts of PBS vehicles against the economic and environmental benefits of using PBS vehicles. While the council did not have its own data, it used publicly available information to assess that, by allowing PBS vehicles, there would be improved productivity, safety and environmental impact on freight movement without adversely affecting the infrastructure.

Consequently, in 2012 **the council developed a policy for assessing 30m B-Doubles that was subsequently altered and adopted for other PBS vehicles**. Further, the council regularly reviews its networks for all vehicle types known to be using its roads. The result is that the City now has an extensive network of gazetted and pre-approved roads for PBS Level 1 vehicles. **The benefit is that the council can assess and respond to access requests with an established method and short turnaround time**.



Martin Halden, Acting Team Leader Transport for the City of Greater Dandenong notes that the adoption of the policy for assessing PBS B-doubles and the Council's relationship with industry has helped grow the industry in the City. While there are some issues with PBS vehicles, such as illegal site access and travelling on non-approved routes, the benefits outweigh the costs.

The City of Greater Dandenong recommends other local councils allow PBS vehicles on their roads and enjoy the productivity and safety benefits.

A recently published case study from Transport Certification Australia reports that Millers Transport Group operates Super B-Doubles in the South Dandenong area and use the dedicated High Productivity Freight Network in Victoria. The PBS approved Super B-Doubles have increased the company's efficiency in container transport by 33 per cent.

Source: TCA case study, March 2017

6.6 Permit turnaround times and success rates

A significant part of the total time needed to get a new PBS vehicle onto the road is the access permit process. **NHVR data reveals that operators using PBS vehicles need to set aside a minimum of seven weeks (up to 35 business days) to obtain a permit.** Complicated permit applications involving detailed infrastructure assessment can take significantly longer (up to two years) for access approval.

Not every PBS vehicle permit application is approved. The average approval rate for permit applications is about 88 per cent for state roads and 90 per cent for local government roads. Cases where access was refused at the in-principle stage are not included in these figures. Some applications are approved (after negotiation) with reduced mass limits or fewer roads than originally sought. Responses to the NTC's PBS industry survey reported that 33 per cent of operators did not obtain the requested level of access for their vehicles. For example, **Victoria has reported that it agrees to 85 per cent of PBS vehicles' access permit applications, but 75 per cent of approvals are at reduced mass limits or for a reduced network.**

The average success rate for in-principle approvals is 64 per cent. **One in three new PBS applications are refused access at the in-principle approval stage, mainly due to infrastructure constraints.**

Supporting data for process turnaround times and approval rates is in Appendix E.

6.7 Additional operating conditions

Some states and territories have applied additional (and in some cases conflicting) requirements on PBS vehicles by way of additional operating conditions.

These conditions include restrictions such as reduced payload, mass, access and time of travel. This has led to **fragmented regulation of PBS vehicles**, effectively reducing the capacity for vehicle manufacturers to provide improved vehicles on a national basis. **Lack of larger combinations in the PBS scheme is an indication that these vehicles, typically used for line haul and interstate operations, are not able to obtain consistent cross-border access conditions.**

Additional state based operating conditions are included in Appendix H.

The need for the PBS Review Panel

Several responses to the NTC PBS industry survey questioned the need for the PBS Review Panel (PRP).

The PRP comprises representatives of states and territories who are also road managers for state- and territory-controlled roads. In this capacity, the PRP provides a layer of quality assurance by supporting the NHVR in deciding PBS design applications. The PRP considers relevant guidelines, rules and vehicle operating conditions in addition to assessing the vehicle's suitability to operate on their roads. This provides greater assurance to PBS applicants before spending significant amounts of time, money and effort to build the vehicle. The NTC believes PRP advice is a significant contributor to the success of the PBS scheme.

Often PBS design applications have minimal differences between them. These designs can be blueprinted to benefit industry. The NHVR's truck and trailer pre-approved design is one such example. The NHVR was able to blueprint the design with the support and advice of the PRP. This has allowed industry to benefit by reducing their design approval turnaround times.

The following example summarises the need for the PRP when the NHVR considers an innovative PBS vehicle design for approval:

The NHVR approved an innovative semitrailer tanker combination to carry Liquefied Petroleum Gas (LPG). This tanker could carry 30 per cent more payload than comparable prescriptive vehicles and could increase operator profitability by up to 60 per cent. The semitrailer was designed by Victoria-based Gas Tank Hire, in collaboration with Fuwa K-Hitch, a supplier of trailer components to the Australian transport industry.

The vehicle incorporates a unique self-steering belly axle, in the middle of the tanker, that produces less pavement wear for the payload it carries. The vehicle also incorporates several safety enhancements such as additional internal baffles that improves overall vehicle safety.

Consulting on this design with the PRP played an important role in informing the road managers about the safety and infrastructure impacts of operating the new vehicle on their network. The PRP was also able to assess the suitability of this vehicle design against the requested network, which provided greater access certainty to the operator prior to building the vehicle.

Source: Trailer Magazine, June 2017 edition

6.8 Process improvements make a significant difference

The incorporation of the PBS scheme into the HVNL and the introduction of PBS-approved blueprints simplified the PBS process, resulting in significant time and cost savings. These improvements have contributed to the increased number of PBS vehicles in the last two years.

This recent growth in PBS has occurred despite most PBS vehicle types needing permits to operate. If access issues are resolved, the use of PBS vehicles is likely to significantly grow within both the hire and reward and the ancillary sectors.

7 Evaluation of the PBS scheme outcomes

Key points

The NTC compared the vehicle numbers and the current benefits of the PBS scheme against the targets and estimates developed as part of the 2001 and 2011 PBS Regulatory Impact Statements. Our analysis indicates the scheme is effective in delivering productivity and safety; but the number of PBS vehicles approved for use has not fully meet initial expectations. The PBS scheme evaluation has revealed a number of barriers to innovation and take-up, but also led the NTC to examine several improvement opportunities.

7.1 Development of performance measures

When the NTC developed the PBS scheme we identified the following items as critical success factors of the scheme:

- Certainty of access for PBS vehicles
- National consistency in operating and access conditions
- Improved operational flexibility of PBS approved vehicles
- Reduced compliance cost
- Improved industry participation.

We measured the effectiveness of the PBS scheme by assessing the outcomes of the scheme since its approval, against the original policy intent outlined above.

7.1.1 2001 and 2011 Regulatory Impact Statements

The 2001 PBS Regulatory Impact Statement (RIS) estimated that from its third year of operation, all new heavy vehicles would be approved under the PBS scheme. The RIS estimated this to be about 3000 new heavy vehicles per year (increasing slightly over time). Due to the volatility of the Australian economy over the past 10 years, it would be impractical to assess PBS scheme's outcomes based solely on the original baseline values.

The 2001 RIS also estimated that the PBS scheme would start to fully deliver its potential from the fifth year of operation. Annual estimates of the impacts of the PBS scheme from its fifth year of operation included:

- 15 per cent reduction in stability or control-related heavy vehicle crashes, estimated to be a saving of around $19 million (at $1.7 million per fatal crash) [$28 million in 2017 dollars – estimate based on a 2.5% annual index rate from 2001]
- $16 million infrastructure savings or 0.5 per cent reduction in total maintenance expenditure [$24 million in 2017 dollars]
- 2.5 per cent increase in payload creating benefits of $180 million per annum
- 5 per cent increase in volume available to 25 per cent of heavy vehicle travel creating benefits of $25 million per annum

The 2011 PBS RIS forecast a number of metrics over a 20 year period, on the assumption that PBS would be incorporated in the national legislation as the result of the RIS. This is set out in Table 5 below.

Table 5. PBS scheme metrics identified in the 2011 RIS

Metric	Year 2030	Estimated 2014-2034 target*
PBS vehicle fleet	13,848	16,608
Reduction of heavy vehicles	4,362	5,231
Heavy vehicle travel reduction	3.7 billion km	5.1 billion km
Fatality savings	87 lives	120 lives
Total fuel savings	1.398 billion litres	1.931 billion litres
Total CO_2 savings	3.75 million-t	5.17 million-t
Operator cost savings	$5.45 billion	$7.53 billion

** Trend data from 2011 PBS RIS was used to populate 2014-2034 targets in order to assess if PBS delivered against the original policy intent.*

7.2 Assessing outcomes against original policy intent

The NTC has compared vehicle numbers and current benefits of the PBS scheme against the above targets and estimates.

7.2.1 PBS vehicle fleet

The PBS fleet numbered about 5000 heavy vehicles at the end of 2016. This is significantly less than the 2001 PBS RIS expectation that there would be about 18,600 PBS vehicles by the end of 2016. The 2001 RIS was based on two key assumptions however: that access to PBS vehicles would be the same as the prescriptive vehicles they replaced, and that Australia's GDP growth would continue.

Instead, Australia experienced six years of negative transport GDP growth between 2009-16 and access to PBS vehicles is significantly restricted, with permits needed for most PBS vehicles.

Despite these challenges, PBS continues to expand with a three year average to 2016 of over 1000 new vehicles per year. At this rate the scheme will have approved over 19,000 vehicles by 2030, which exceeds the forecast of the 2011 RIS.

7.2.2 Reduction of heavy vehicles

In December 2016, the NHVR reported that the 2893 PBS vehicles they approved between January 2014 and October 2016 would replace the 3800 prescriptive vehicles necessary to do the same freight task, thus reducing the fleet size by about 900 vehicles. We assess the PBS scheme to be on-track to achieve a reduction in heavy vehicle fleet by 5231 in 2034.

7.2.3 Heavy vehicle travel reduction

Our examination of heavy vehicle travel revealed that during 2014-16 PBS vehicles have saved about 440 million km. The 2011 PBS RIS estimated PBS vehicles would achieve a reduction of 5.1 billion-km travelled by 2034. Current trends, based on a 7 per cent PBS growth rate, estimates that by 2034 PBS vehicles would exceed this travel saving with a reduction of 8.9 billion-km of heavy vehicle travel.

7.2.4 Fatality savings

During 2014-16, we estimated the PBS scheme to have saved about 4 lives. The forecast conducted in 2016 estimates that the PBS scheme would save about 115 lives between 2014-34. This falls slightly below the 2011 PBS RIS estimate of 120 lives.

A number of reasons contribute to this. Firstly, the overall safety record of the heavy vehicle fleet in Australia has improved, thus reducing the fatality rates. Secondly, the emergence of truck and four-axle dog trailer vehicles has resulted in a number of operators using older trucks (more than 10 years old) as part of their PBS vehicle combination. This affected the safety performances of this particular vehicle type to the point where the number of major crashes for these vehicles is more than the prescriptive truck and trailer combination for the same distance travelled.

Our forecasts expect the truck and dog trailer segment to saturate, paving the way for other vehicle types such as semi-trailers, B-Doubles and road trains to emerge. These vehicles have an excellent safety record when assessed against comparable prescriptive vehicles.

Based on current values and expected increase in PBS vehicle take-up in the future, we are confident that the PBS scheme is on track to achieve or exceed the fatality savings forecast in the 2011 PBS RIS.

7.2.5 Fuel savings

Our analysis on fuel consumption estimated that in 2016, PBS vehicles saved about 94 million litres of fuel resulting in a CO_2 reduction of 250,000 tonnes. Extending the 2011 PBS RIS forecast to 2034 showed that PBS vehicles would save an estimated 1.93 billion litres of fuel and reduce CO_2 emissions by 5.17 million tonnes. Our analysis, based on a 7 per cent growth in PBS vehicles, showed that by 2034 PBS vehicles would save 3.2 billion litres of fuel and 8.7 million tonnes of CO_2 emissions.

7.2.6 Infrastructure savings

The 2001 PBS RIS estimated a 0.5 per cent reduction in infrastructure impacts from the fifth year of PBS operations. Our analysis of the scheme's impacts during the period 2014-16 indicates that the PBS scheme reduced the total freight task as set out below:

- 1.6 per cent reduction in the total gross tkm freight task performed by all heavy vehicles (i.e. greater than 4.5t).
- 2.4 per cent reduction in the total gross tkm freight task performed by the range of vehicle types from which PBS vehicles can emerge.
- 6.2 per cent reduction in the total gross tkm freight task from delivering the freight using prescriptive vehicles.

Analysis of road and bridge maintenance expenses showed that PBS vehicles are likely to have saved about $65 million based on the total expenditure of $4 billion for 2015-16. This is significantly more than the $24 million infrastructure savings forecast in the 2001 PBS RIS.

7.2.7 Operator cost savings

The 2011 PBS RIS estimated a net operator cost saving of $5.45 billion over 20 years (2011-30) based on a take-up rate of about 690 PBS vehicles per year. Extrapolating the data to 2034 resulted in a benefit of $8.3 billion. Our current analysis using a PBS take-up rate of about 595 PBS vehicles per year estimated a net operator cost saving of $17.2 billion over 20 years from 2014-34. This significantly exceeds the estimates from 2011.

7.2.8 Productivity

We could not directly assess productivity based on the 2001 PBS RIS due to its assumptions that there would be a volumetric increase of 5 per cent available to 25 per cent of all heavy vehicles, and a 2.5 per cent increase in payload across the total fleet, six years after the PBS scheme started operation. The RIS also assumed that all new heavy vehicles with gross mass limits of over 15t would be PBS approved. Given the actual PBS vehicles' take-up rates did not match the assumptions, we concluded that based on the 1.6 per cent reduction in gross tonne-kilometres freight task, the PBS scheme is on track to deliver significant productivity benefits if barriers to innovations in heavy vehicles are removed.

A summary of this analysis is included in Table 6 below.

Table 6. PBS scheme output against original policy intent

Performance criteria	2001 RIS	2011 RIS	Actual performance 2014-2016	Outcome
Vehicle take-up	All heavy vehicles >15t	692 per year	1080 per year	Partial
Reduction in crashes	15%	-	46%	Exceed
Infrastructure saving (annual)	$24 million	-	$65 million	Exceed
Productivity (volume)	5% (volume)	-	1.6% reduction in gross tonne-kilometres freight task for heavy vehicles >4.5t	On track
Productivity (payload)	2.5% (payload)	-		
Fatality saving (20 years)	-	120	115	On-track
Fuel saving (20 years)	-	1.9 billion litres	3.2 billion litres	Exceed
CO_2 emissions (20 years)	-	3.75 million-t	8.7 million-t	Exceed
Heavy vehicle travel saving (20 years)	-	5.1 billion km	8.9 billion km	Exceed
Infrastructure saving (annual)	$16 million	-	$65 million	Exceed
Operational cost saving (20 years)	-	$7.53 billion	$17.2 billion	Exceed

Note: A combination of metrics from both the 2001 and 2011 RIS was used, as information was not available for all metrics in both documents. Actual performance data from 2014-16 used to populate 2014-34 expected outcomes.

7.3 Evaluation of PBS scheme's effectiveness

The NTC used information from the PBS industry survey, workshops with industry and government stakeholders, as well as our own research and analysis to review and assess the effectiveness of the PBS scheme. The evaluation of effectiveness was assessed using five performance measures. The four outcomes performance measures relating to Innovation, Productivity, Safety and Environment are discussed below. The fifth, Customer Satisfaction, was discussed in Chapter 6.

Performance measure	Innovation
Metrics used	Number of unique PBS designs
Discussion	There have been over 1500 innovative vehicle design applications with approximately 190 new design applications received in 2016. While the bulk of these applications are for generic vehicle types, there have also been applications for highly innovative new vehicle designs. Innovative PBS vehicles are reaching and improving road freight in all corners of Australia. Some innovation is constrained when road managers remove ADRs from the exemption list, or access is restricted. While the PBS scheme has delivered innovation, there is scope for further improvement.
Outcome	Based on the innovations delivered over the past decade, the NTC assess the PBS scheme to be **effective** in promoting innovation in the heavy vehicle industry.

Performance measure	Productivity
Metrics used	Take up rate of PBS vehicles, increase in a PBS vehicle's payload, number of PBS vehicles as a percentage of the heavy vehicle fleet, reduction in the total gross tonne-kilometres for a freight task and reduction in total vehicle kilometre travel
Discussion	Over the years 2014-2016 the take up rate of PBS vehicles has increased by 58 per cent per annum compounded. This is a significant rise in PBS penetration. In 2016, **25 per cent of newly registered heavy vehicles** were PBS-approved. Considering the **hire and reward sector only, nearly every second (47 per cent) newly registered vehicle was PBS-approved**. These are increases of 270 and 265 per cent respectively in the last three years. Our analysis reveals that despite the increase in take-up rate, there is scope for the use of PBS vehicles in the ancillary sector, in medium-sized/longer rigids delivering freight in inner urban areas, for buses, and for type 1 and 2 road trains. Limitations in intermodal logistic centres and the warehouses to which they deliver freight also restrict the capacities of PBS vehicles. The PBS assessment report also informed that on average PBS vehicles delivered a 24.8 per cent productivity improvement and 6.2 per cent reduction in gross tonne-kilometres. For the years 2014-2016 we estimate PBS vehicles have saved 440 million km of truck travel. These are significant productivity benefits.
Outcome	The productivity assessments reveal several benefits when using PBS vehicles including increased payload, reduced total gross tonne-km and total vehicle travel. The NTC assess the scheme to be **effective** in improving productivity.

Performance measure	Safety
Metrics used	Crash rates for PBS vehicles, reduced fatalities from using a PBS vehicle.

Discussion	Results from the safety assessment of PBS vehicles shows that PBS vehicles are involved in 46 per cent fewer major crashes than prescriptive heavy vehicles. Detailed analysis also revealed that articulated PBS vehicles delivered a 60 per cent reduction in major crashes, while the rigid combinations delivered an 18 per cent reduction. The analysis also revealed that truck and four axle dog trailer combinations performed slightly worse than conventional rigid truck and trailer safety performances. This is most likely due to the current PBS standards that allow older vehicles without modern braking technology to be PBS approved. The assessment also indicates that PBS vehicles are involved in significantly fewer fatal crashes than non-PBS vehicles. Excluding suicides, a PBS rigid truck and trailer combination has never been involved in a fatal crash.
Outcome	Because of the reductions in major crashes (per km travelled), the inherent safety benefits of PBS vehicles and the lower reported fatal incidents for PBS vehicles we assess the PBS scheme as **effective** in improving safety in freight transport.

Case study – Evans Petroleum

Evans Petroleum is a fuel distribution specialist operating in the regional Victoria region of Leongatha in Gippsland that has been in operation for almost five decades. They currently deliver fuel using 21 heavy vehicles and employing 116 staff operating under the BP label.

Their fleet includes truck and trailer combinations for transporting diesel, which includes PBS vehicles operating since late 2015. They also operate semitrailers to transport petrol, of which one is PBS-approved operating since early 2017. Their new PBS-approved semitrailer is a 20m quad-axle group combination capable of delivering more volume with fewer trips.

By upgrading their fleet to PBS-approved combinations they increased their diesel capacity from 40,000 litres to 43,500 litres per vehicle (9 per cent payload increase) and petrol capacity from 41,850 litres to 48,000 litres per vehicle (15 per cent payload increase).

The new PBS quad-axle semitrailer combination reduces the number of trips required from 2389 to 2083 per one million litres of petrol.

By replacing prescriptive vehicles with PBS vehicles in the Gippsland area, truck trips running through Leongatha town can be reduced from 3200 to just 2432 per week (24 per cent reduction). Similarly, the **number of truck trips running past St Laurence O'Toole Primary School can be reduced from 1171 to 890 per week to deliver the same freight task**.

Stuart Evans, Managing Director of Evans Petroleum, draws just as much satisfaction in the safety benefits his PBS vehicles bring to the community as the economic benefits they bring to his business. He recommends all operators to upgrade their fleet to PBS vehicles.

Image and article source: Trailer Magazine, April 2017 edition

Performance measure	**Environment**
Metrics used	Fuel consumption, CO_2 reduction, economic savings, impacts on road infrastructure.

Discussion	For the year 2016, use of PBS vehicles reduced fuel requirements by 94 million litres – equating to about 250,000 tonnes reduction in CO_2 emissions than would have been produced if non-PBS vehicles were used to deliver the same freight task. The analysis also revealed that over the next 20 years, a 7 per cent take up of PBS vehicles would net operators $17.2 billion in operational cost savings by way of reduced fuel, trips, maintenance costs, wages and other expenses. The gross tonne-kilometres calculation for the calendar year 2016 showed that PBS vehicles reduced the total freight task by 6.2 per cent in comparison to what would have been incurred by using non-PBS vehicles. We estimated this to reduce infrastructure maintenance costs for the country by $65 million.
Outcome	The NTC used the savings in fuel consumption as well as CO_2 emissions to assess the PBS scheme to be **effective** in improving the environmental performance of heavy vehicles.

Results of NTC's evaluation of the PBS scheme are summarised in Table 7.

Table 7. Summary of the PBS scheme effectiveness review

Performance measure	Outcome
Innovation	
Number of unique PBS designs	Effective
Productivity	
Take-up rate of PBS vehicles	Effective
Increase in a PBS vehicle's payload	Effective
Number of PBS vehicles as a percentage of the fleet	Effective
Reduction in the total vehicle tonne-kilometres for a freight task	Effective
Reduction in total vehicle kilometre travel	Effective
Safety	
Crash rates for PBS vehicles	Effective
Reduced fatalities from using a PBS vehicle	Effective
Environment	
Fuel consumption	Effective
CO_2 reduction	Effective
Economic savings	Effective
Road infrastructure impacts	Effective
Customer satisfaction (see Chapter 6)	

Performance measure	Outcome
NHVR operational performance	Satisfied
PBS Review Panel turnaround time	Not satisfied
Network mapping and Access	
Percentage of total road network mapped as PBS networks	Not satisfied
Number of roads added to the PBS network per year	Not satisfied
Time from lodgement of access application to access approval	Not satisfied
Satisfaction with the relevant knowledge of PBS staff	Not satisfied
Experiences with dealing with Local governments for access	Not satisfied
Access certainty including knowledge of available PBS networks	Not satisfied
Adequacy of PBS information in the NHVR website	Satisfied
Adequacy of PBS information in the road agency websites	Satisfied

7.4 Key barriers to innovation and take-up

As part of the NTC's evaluation, we identified a number of barriers that impact industry innovation, affect productivity and hamper greater uptake of the PBS vehicles. These barriers stem from the PBS scheme itself or its current operating context.

Through our research and analysis combined with significant stakeholder consultation involving governments and industry alike, we also identified barriers caused by emotional responses or societal perceptions or influences. These are just as common as process and access barriers.

7.4.1 Process or access barriers

- **Industry has asserted that obtaining PBS approval and subsequent access permits is complex, expensive and time consuming.**

  A barrier to greater innovation within the heavy vehicle industry is the process requirements around obtaining PBS approval. NHVR data revealed that every PBS application takes about eight weeks from the time of lodgement to vehicle approval. This does not include the time needed to build the subject vehicle.

  Similarly, obtaining an access permit can take anything from a few weeks to several months, or even years in some cases, depending on the complexity of the vehicle and the requested route. These timelines do not include initial in-principle approval time nor the time needed for third party assessment of a new vehicle design against PBS standards.

- **Restrictions imposed by existing regulations such as the ADRs and the HV(MDL)NR are a barrier to innovation.**

  While the PBS scheme exempts complying vehicles from a number of ADRs and Vehicle Standards, there are limitations. Requirements surrounding axle configuration and retractable axles are some of the ADRs that industry has told us restrict innovation.

- **Network availability, access certainty and access permit approval process continue to restrict industry.**

  Most jurisdictions have mapped PBS networks and published maps on their websites, however these maps are not automatically updated in the NHVR Journey Planner or the recently released NHVR Access Portal.

The mapped networks are more limited than the network available for prescriptive vehicles. This is generally due to infrastructure and geometric limitations. PBS vehicles are safer than equivalent prescriptive vehicles, but do not automatically obtain access to available PBS networks. Instead most vehicles must obtain an access permit prior to using the network.

The NTC estimates that **one month's waiting cost to obtain permits for 5000 PBS vehicles at $2,000 per vehicle is $10 million.** Ultimately**, these costs are passed on to the end consumer** (see S&S Tyquin Case Study).

Lack of as-of-right access for most PBS vehicles has continued to limit greater PBS uptake.

All state and territory road authorities and local councils undertake bridge and route assessment activities but **there is a lack of a nationally harmonised network assessment guideline**. This can lead to inconsistent results, a repeat assessment of the same network for a slightly different vehicle. It also results in inconsistent operating conditions for PBS vehicles that can impact interstate operations.

A related barrier is the cost of obtaining a bridge assessment. The current model lacks a capability assessment framework combined with a cost recovery model. Instead it is focussed on the specific vehicle that requests access, hence forcing every potential operator to spend a significant amount of money to assess the same bridge for similarly performing but slightly different vehicles. The cost of a bridge assessment discourages an operator from buying a PBS vehicle, limiting PBS uptake and hence industry innovation.

The PBS standards do not reflect current technology and pose operational limitations. Current technical standards for PBS were originally developed in the late 1990's and have not been comprehensively reviewed since. Several advancements in technology such as ABS/EBS braking system and roll over protection are not included in the deemed-to-comply provisions. This presents a barrier to innovation.

Currently PBS operates on a one-size-fits-all model where, for example, a level 2 performing vehicle is restricted to level 2 networks only. This is a barrier to dedicated supply chain operations, as the way the scheme was designed constrains a vehicle to a network that may not be relevant to its operation. As a result, some PBS vehicles are unable to operate at their optimal capacity. Similar barriers also exist within other supply chain nodes such as the intermodal centres and warehouses.

- **The lack of a permanent pavement vertical loading standard results in PBS vehicles relying on interim prescriptive limitations such as the GML, CML and HML for estimating maximum operating mass limits.**

  This limits PBS vehicles from carrying optimal operating mass limits, restricting productivity and indirectly poses a barrier to greater uptake of PBS vehicles.

S & S Tyquin – good intentions impacted by unfulfilled promises

Steve Tyquin, owner of S & S Tyquin Bulk Haulage, reports that the PBS scheme continues to benefit his business productivity since he first chose to operate PBS vehicles in 2008.

In July 2016, the company operated two innovative PBS 26m A-Double combinations, at the same overall length as prescriptive B-Doubles. These combinations are capable of operating safely at 74.5 tonnes, 6t more than the maximum capacity of the B-Doubles (68.5t) they replace**. The new combinations reduce the number of trips by 13 for each 100 B-Double trips.**

Despite these benefits, Steve believes there is room for further improvement in the PBS scheme, especially the timeframes for the grant of access permits, after it took him over three months to obtain permits to operate his first set of PBS vehicles.

Access permits for the new A-Doubles, however, were approved in about one month, because, as Steve reports, he spoke to VicRoads at the in-principle approval stage. VicRoads assisted Steve in resolving permit issues, but only at 68.5t; 6t less than the optimised capacity of these vehicles.

Nevertheless, the true cost of obtaining permits to operate a safer PBS vehicle is left unrecognised. Steve's A-Doubles cost about $750,000 each. An investment of such magnitude can be realised only by borrowing large sums of money. The interest,fees and charges associated with repaying

the loan amounts to more than $65,000 per year over a five year period or $5,500 per month.

Loan repayments must be made regardless of the vehicles operating or not. These vehicles generate an operator's wage only if they operate and hence a month's lost road access is never regained. The wait time offsets any profit operators can make by using PBS vehicles. Some operators reported in the industry survey they have lost contracts because of delays.

One month's waiting cost to obtain permits for 5,000 PBS vehicles at a conservative $2,000 per vehicle is $10 million. Ultimately, these costs are absorbed by the manufacturer and the operator and eventually passed on to the end consumer.

Steve is currently working with VicRoads to operate his new A-Doubles at its optimised capacity of 74.5t. **He urges governments to provide as-of-right access to PBS vehicles.**

Source: Direct communication with Steve Tyquin and ATN Magazine, September 2016 edition

7.4.2 Emotional and societal barriers

- **Road managers for local roads are uncomfortable about approving PBS permit applications due to the perceived risk of accelerated road and bridge wear.**

  This issue impacts first and last mile access, which is mostly within local roads. Resource-intensive bridge assessments continue to limit attempts to maximise heavy vehicle productivity. In some cases, permit applications are refused because of a lack of benefit to some local road managers (i.e. if a PBS vehicle is only passing through a local road, there is no economic benefit to the council to approve the permit request). In other cases, councils are influenced by the position taken by a neighbouring council. Public perception of large trucks, especially around safety performances, can also influence government decisions.

- **Perceived impacts of heavier trucks on infrastructure continues to be a vital cause behind the limited network available to operate PBS vehicles.**

  Lack of understanding about PBS vehicles can lead to an emotional response by road managers during access decisions for innovative vehicles. This is especially common among local councils, which often assume that bigger or unknown trucks will cause greater infrastructure wear. Underlying this assumption is a lack of knowledge about the benefits of PBS vehicles, lack of guidelines on how to assess a PBS vehicle's access application, resource limitations, and reluctance in decision making due to the perceived risks.

7.5 Key improvement opportunities

The PBS scheme effectiveness review has revealed a number of improvement opportunities that could help increase greater vehicle uptake in future and ensure the sustained success of the scheme. These improvement opportunities could potentially lead to greater innovation in heavy vehicles as well.

1. **Review the PBS technical standards to give flexibility to industry to use technology to comply with the safety standards.** The current PBS standards were originally developed in the late 1990s. Technology has improved to a level where a number of these standards can be complied with through alternative deemed-to-comply provisions. This includes fitting equipment such as ABS/EBS and Roll-over protection that demonstrates stability and braking requirements. This will in turn improve the safety performance of the PBS fleet. The safety performance of truck and four axle dog combinations, for example, is slightly below the prescriptive reference vehicle (rigid vehicles). This is because some PBS standards, such as the braking requirements, can be demonstrated by calculations without the need to use modern technology such as ABS/EBS brakes. This resulted in older vehicles (i.e. more than10 years old) entering the PBS scheme without modern braking technologies. Upgrading the braking

standard to replace the current requirements with deemed-to-comply provisions such as the ABS/EBS will eliminate this issue. Another example of using deemed-to-comply provisions is including roll-over protection as part of demonstrating a vehicle's static rollover performance.

This review could also include how technical results are presented in a new PBS design application for the NHVR/PRP's consideration. An improvement in this area would give road managers more accurate information that could improve access available to PBS vehicles.

2. **Develop a permanent pavement vertical loading standard to replace current interim provisions built on prescriptive axle group mass limits.** A recent Austroads project (AP-R541-17) delivered a draft framework to develop a permanent pavement vertical loading standard. The framework can be used to develop an instrument that eventually leads to calculating the optimal mass limits for an axle group.
3. **Enable the NHVR to assess and approve popular and similar PBS design applications without consulting with the PRP.** This improvement will speed up the process since about 90 per cent of PBS design applications received are for truck and trailer, semitrailer, B-double and A-double combinations. By allowing the NHVR to decide PBS design applications for popular vehicle types, the PRP can focus on innovative vehicle design concepts and redirect energies towards resolving access and other strategic issues that hinder heavy vehicle productivity. **This process is already underway.**
4. ***For road managers:*** **Agree to allow as-of-right access for PBS vehicles within the declared networks.** Mapped and declared PBS networks should be regularly updated in the NHVR Journey Planner and Access Portal.
5. Assess the suitability of PBS for:
    a. Medium sized commercial vehicles (8t to 42.5t) to deliver freight to inner urban areas (last mile), which would improve the overall supply chain efficiency
    b. buses
    c. ancillary operators.
6. Encourage other areas of the supply chain such as the intermodal logistics centres and warehouses to build capacity to send and receive optimised PBS vehicle deliveries.
7. Accelerate the development of the strategic freight network suitable for use by PBS-approved High Productivity Vehicles. This will simplify the task of managing heavy vehicle access for road managers.
8. Include a provision in the PBS framework to allow a clear delineation between route-specific and network access vehicles. The current PBS model operates on a one size fits all model. This is a barrier to dedicated supply chain transport tasks which can be best optimised by not constraining those vehicles to meet the generic criteria of a road network that is not relevant to their operation.
9. Austroads has recently completed a number of research projects to improve the safety, productivity and efficiency of the heavy vehicle industry via the PBS scheme. The NTC recommends that these research papers are considered for future implementation by the relevant authorities. The list of relevant Austroads projects is included at Appendix G.

8 Possible actions

Using the outputs of our evaluation of the PBS scheme, the NTC has developed possible actions that would help increase take-up of PBS vehicles, and help ensure the sustained success of the scheme. The proposed actions are based on improvements in societal, economic and supply chain aspects of freight transport.

The PBS scheme has delivered substantial productivity, safety, infrastructure, environmental and operational savings resulting in significant economic benefits. The estimated benefits also deliver number of flow-on benefits to the community. However, access to road networks for PBS vehicles is not certain and the process to obtain PBS approval and subsequent access permit approval can take between 17 weeks to over two years. When this is combined with the need to invest large sums of money, it is not surprising that some heavy vehicle operators have been reluctant to invest in PBS vehicles.

We have developed a list of possible actions, which, if implemented, could help to overcome the current barriers and increase uptake of the PBS scheme.

8.1 Proposed actions

Sector: Supply chain/Regulatory/Process

Issues

1. Current PBS standards are nearly 20 years old and hence to not recognise more recent technologies that can improve the safety performance of some vehicle types.
2. Current PBS infrastructure standards use interim prescriptive arrangements affecting productivity of PBS vehicles.
3. Existing ADR's are a barrier to innovation in heavy vehicles.
4. Current PBS framework does not optimise a vehicle to a specific network.
5. A number of Austroads research findings have not been implemented.

The technology gap in the standards, which have not been reviewed since their development nearly two decades ago, has a knock-on effect which affects the safety performance of some vehicle types.

Existing PBS infrastructure protection standard (pavement vertical loading standard) includes interim provisions that are based on prescriptive axle group mass allowances (GML, CML and HML). This does not draw the most out of existing infrastructure because PBS vehicles are constrained by prescriptive axle group mass limits. The intent of the PBS scheme is to 'sweat' the infrastructure without exceeding load limits beyond which maintenance and repair costs exceed the economic benefits drawn from the productivity and safety gains. Continued reliance on prescriptive infrastructure standards is a major limitation on the PBS scheme unlocking productivity.

The pavement vertical loading standard should be reviewed to develop a permanent standard that allows industry and governments to develop and optimise safe axle group mass limits and overall total combination mass limits to suit the roads they use. A recent Austroads project (*AP-R541-17*) delivered a draft framework to develop a permanent pavement vertical loading standard. This task can be expanded to develop a tool that allows the optimal mass limits to be calculated for an axle group and the vehicle combination.

Feedback from the industry survey suggested that current ADRs are a key barrier to innovation in heavy vehicles. PBS vehicles are exempted from complying with a number of ADRs. Some of the ADRs that are not part of the PBS exemption list are several decades old, and are a barrier to innovation. While industry has proposed exempting PBS vehicles from complying with all ADRs, the NTC believes this is impractical. This could result in industry being able to design and build heavy vehicles with no design parameters to a point where they cannot be regulated.

Under the current PBS framework, new vehicle designs demonstrate safety and infrastructure performances to a particular level of network. For example, a PBS level 2 vehicle is assessed and

matched to PBS level 2 network. This does not optimise the vehicle's productivity since the vehicle is assessed for roads that it may not operate on. While this method is more efficient than the current prescriptive framework, some dedicated supply chain tasks are constrained to meet the generic criteria of a road network that is not relevant to their operation.

Amending the PBS standards to allow applications to report performance results differently, for example, at various mass limits instead of road network levels, will allow the system to better match a vehicles' productivity to the road network.

Austroads has also completed a number of research projects to improve the safety, efficiency and infrastructure impacts of the heavy vehicles via the PBS scheme. Given these are research projects, the publications have not been implemented. We recommend that these research papers are considered for future implementation by the relevant parties. Appendix G provides a list of relevant Austroads projects.

Possible actions
Review the PBS framework and the standards to improve productivity, safety and the precision of matching vehicles to roads. The task includes the following items: 1. Review current PBS standards (***Standards and Vehicle Assessment Rules*** and ***Network Classification Guidelines***) to identify changes that could further improve safety of PBS vehicles. The task is to assess if safety can be demonstrated by use of modern technology and include them as deemed-to-comply provisions. Upgrading standards to what is the modern industry standard will improve safety performances of PBS vehicles and encourage vehicles to use modern technology to demonstrate safety. 2. Review how new PBS applications report the performance results of vehicle designs. Identify how reporting can be restructured to better optimise vehicles to the freight task and the roads they intend to use. 3. Amend the HVNL and supporting legislation to include additional ADRs and HV(MDL)NR from which PBS vehicles can be exempted. 4. Develop permanent pavement vertical loading standard to replace current interim standard. Follow on from the framework delivered as part of the Austroads project AP-R541-17. 5. Review recommendations from relevant Austroads publications and prioritise these for inclusion in the forward work program. This work could be undertaken by the NTC/NHVR.

Sector: Regulatory/Process

Industry has asserted that the process for obtaining PBS approval and subsequent permit is complex, expensive and time consuming. Over 90 per cent of industry survey respondents supported the idea of government intervention to develop simpler and cheaper ways to obtain PBS approval with greater access certainty.

The NHVR is already investigating ways to implement earlier NTC recommendations for allowing all complying seven axle truck and dog combinations at PBS mass limits without obtaining PBS approval and permit. In the interim, the NHVR has obtained a pre-approved design from the PBS review panel to review and approve design applications for complying truck and dog combinations. This, combined with the release of the PBS truck and dog national notice, will significantly reduce the lead time needed to obtain design, vehicle and access approvals for specific PBS truck and trailer combinations.

This raises the need to assess whether a simplified PBS scheme is needed for popular PBS vehicle types that does not need the intervention of the PRP at individual application level. Under simplified arrangements, the PRP may provide delegated powers to the NHVR to assess and decide PBS design applications for popular vehicle types such as the semitrailers, B-doubles and A-doubles. These vehicle types can then be blueprinted via Vehicle Specification Envelopes (similar to the NTC's 2015 project) with as-of-right access authorised via a National Notice. Migrating popular PBS designs to a simplified approval and access framework will lower the cost of obtaining PBS approval and boost participation rates. This concept would also reduce the burden

on road managers and provide certainty that vehicles approved under this set-up pass all PBS standards and do not impose unacceptable impact on infrastructure. In order to further develop this concept, the NTC/NHVR could develop criteria and a legal avenue to migrate popular PBS designs to national regulations.

The Council approved a PBS-self certification scheme as part of the 2011 PBS RIS. This self-certification scheme should be implemented and backed by an audit framework to reduce the overall lead time for obtaining a PBS vehicle approval.

Possible action
Investigate the need to develop a simplified PBS scheme for popular and mature PBS designs backed by greater access certainty. The NTC also suggests industry bodies take the lead in developing blueprints for popular PBS vehicle types. This will allow greater PBS vehicle uptake. The NTC believes that industry bodies are better suited to this task.

Sector: Regulatory/Access

PBS vehicles do not have automatic access to suitable sections of the road network.

Despite demonstrating safety and acceptable infrastructure use, PBS vehicles cannot automatically access the mapped, declared and published PBS networks. Instead, most PBS vehicles must still obtain a permit. The permit process adds about five weeks to the total lead time for a PBS vehicle.

All participating road managers are required to map, declare and publish their PBS networks on their websites as well as the NHVR Journey Planner and Access Portal. These PBS networks must be included in the NHVR issued national notices giving automatic network access to PBS vehicles. These PBS networks and all subsequent access decisions for PBS vehicles must take into account the net economic benefits of PBS vehicles along with infrastructure capability assessments. The mapped networks must include, at a minimum, the networks available to prescriptive vehicles at the relevant levels. For example, PBS level 1 network must be the same as the current general access network, level 2 network must be same as the B-Double network and level 3 and 4 networks must be the same as road train type 1 and 2 networks. As part of this exercise the ‘B’ level networks must also be mapped, declared and published in the notices.

Possible action
The NHVR publish national notices for all four levels of PBS network.

Sector: Access

No single method is used across Australia when undertaking bridge and route assessments. While methods are designed to cater for the type of bridges within each jurisdiction, this has led to inconsistent assessment results for a similar vehicle design in different jurisdictions. There are similar issues when requesting access to local roads. Local councils often do not have the resource, time or skills to undertake infrastructure capability assessment.

Furthermore, in many cases assessment of infrastructure suitability for the vehicle seeking access is not applicable to other vehicle types that could use that part of the network. Shifting the method to assess the capability of the infrastructure will help set maximum limits for vehicles wishing to access that part of the network.

A number of recent Austroads publications have attempted a framework for assessment of heavy vehicle access applications (Ref No. AP-R466-14 and AP-R398-12). These frameworks can be used as the baseline to develop a nationally harmonised infrastructure capability assessment framework with an appropriate cost recovery model. Once developed, this must be the only instrument available to all road managers for infrastructure assessments.

This work can be supplemented by developing and publishing a bridge database to support efficient, accurate, timely and consistent heavy vehicle access management decisions for all bridges including local roads. Publishing this data allows industry to self-assess their vehicle’s required routes against the maximum capabilities of infrastructures on those routes.

Possible action
Austroads and the NHVR develop a nationally harmonised infrastructure capability assessment framework for use in all access decision making.

Sector: Regulatory

Current regulatory framework does not reward safe and efficient freight transport.

In an ideal world, a performance based approach that has proven safety, productivity and environmental benefits combined with significant operating benefits and net savings to the economy and the community would be the default standard over prescriptive regulations. However, as per the current regulations, it is quite the opposite. It takes about 17 weeks (minimum) and unquantifiable rigour for a simple PBS vehicle to obtain access to the road network. Yet a similarly looking vehicle with half the safety performance and at least 20 per cent lower efficiency can access the roads without any process requirements. This regulatory barrier can be removed by reversing the current regulatory requirements.

The suggested action provides an opportunity to assess the suitability of using PBS as the minimum standard for all heavy vehicles over 42.5 tonnes. This would guarantee minimum safety and efficiency levels that exceed those of the current heavy vehicle fleet. All existing heavy vehicles and new heavy vehicles under 42.5 tonnes can use the current prescriptive regulations.

Possible action
Develop a Regulatory Impact Statement (RIS) to assess whether a performance based approach should be the standard to assess and register a heavy vehicle's suitability on the road. This would apply to all new heavy vehicles over 42.5 tonnes. Current HVNL and HV(MDL)NR would only be used if the heavy vehicle did not meet the PBS requirements. Implementation options and enforcement framework to be developed after the agreement to develop a RIS. This work could be progressed by the NTC.

Sector: Supply chain

Issues

1. Current intermodal and distribution centres restrict PBS vehicles' productivity.
2. Few ancillary operators participate in the PBS scheme.

A number of existing, and older, intermodal centres, distribution centres and warehouses are too small or have restricted access points that are designed for older and non-PBS vehicles. Removing barriers to innovation in heavy vehicles and improving the uptake of PBS vehicles will only shift the supply chain bottle neck from roads to the despatch and receivable facilities. Building capacity to receive optimised PBS deliveries at intermodal and distribution centres will improve the overall supply chain efficiency.

Data from the NHVR reported that over 99 per cent of PBS operators are from the hire and reward sector. Given ancillary operators' heavy vehicle fleet comprises nearly half (46 per cent) of total heavy vehicle fleet in Australia, there is a significant growth opportunity within this sector. Encouraging ancillary operators to upgrade their heavy vehicle fleet to PBS vehicles will result in significant improvement in productivity (24 per cent), safety (46 per cent) and environmental aspects of freight movement without compromising infrastructure wear while bringing significant economic benefits to the community.

To achieve this, the NTC/NHVR must work with relevant industry bodies to promote the benefits of using PBS vehicles to ancillary operators, the broader supply chain network and the community.

Possible action

Engage with non-road infrastructure owners to identify the costs and benefits of upgrading their infrastructure to accommodate PBS vehicles. Also engage with ancillary operators to identify if the PBS scheme can optimise the productivity and safety of their heavy vehicle fleet.

This work could be progressed by the NTC/NHVR.

Sector: Strategy/Supply chain

Urban freight and passenger moving vehicles may not be operating at optimised productivity and safety due to a lack of performance based approach.

An increase to urban population is resulting in greater demand for moving people and freight in the urban areas. A combination of issues such as road access, increased traffic congestion and regulatory burden on vehicles is driving industry to find new ways to deliver freight to urban areas in a safer and more productive manner. Data from Australian Road Transport Suppliers Association reported that there is a surge in the sale of medium-duty commercial vehicles to improve transport versatility within urban areas.

The PBS standards were originally developed to meet growing freight demands and were focussed on medium to long haul articulated vehicle segments. These arrangements are not suitable for use by the medium-duty urban vehicles operating with mass limits between 8t and 42.5t. A new performance based approach to these vehicle segments will improve productivity and safety within urban areas as well as remove existing barriers for innovation.

For example, with a performance based framework, urban freight productivity can increase by up to 50 per cent if new concepts such as city-trailer or Vision Van are approved. These innovative vehicles have a 33-pallet carrying capacity that could replace current rigid vehicles with 24-pallet capacity.

Similarly, buses do not participate in the PBS scheme. The swept-path requirement for buses exceeds the maximum PBS allowances to operate in urban areas. Consideration of a new performance based approach in approving innovative buses could result in greater productivity and safer passenger transport.

Possible action

Identify if there is a need to develop a performance based approach for medium-to-heavy duty commercial vehicles (8t to 42.5t total mass) and buses operating in urban areas.

This work could be progressed by the NTC.

Action due in 2017 on longer rigid vehicles

Earlier this year *Trailer Magazine* reported a reduction in total heavy vehicle registrations for the past three years by about 9.5 per cent. Trailers and prime movers reduced by 23 per cent and 15.5 per cent respectively. But during the same period registrations for medium and heavy rigid vehicles increased by 7 per cent and 3 per cent respectively.

A recently completed NTC project on improving volumetric efficiency of heavy vehicles recommended allowing longer rigid vehicles without increasing the gross mass limits. This recommendation was approved by the Council in May 2017 and the NTC is now progressing the necessary amendments to legislation.

Similarly, recommending a performance based approach for medium duty commercial vehicles would allow productivity, safety and environmental benefits in the inner urban areas.

Source: Trailer Magazine February 2017

8.2 Suggestions for consideration by NHVR and road managers

The NTC encourages the NHVR and road managers to consider the following suggestions.

1. **Encourage local governments to approve the use of PBS vehicles as a better alternative to prescriptive vehicles.**

   To achieve this, the NTC/NHVR will need to work with road agencies to promote to local councils the benefits of using PBS vehicles and an understanding regarding the impacts of operating PBS vehicles. Almost every freight task includes first and last mile road networks for which local councils are road managers. It is essential that they are able to make fully informed access decisions.

2. **Develop nationally harmonised operating conditions** for different PBS vehicle types, network levels and mass limits for use in both state and local roads. Identify and eliminate network connectivity gaps at borders to enable operators to continue to move freight without having to make changes at the borders.

3. **Substitute existing in-principle assessments by issuing permits with a delayed start date** unless there are unacceptable levels of changes in vehicle design, mass limits, routes or PBS safety and infrastructure performances. This will eliminate access uncertainty for operators and encourage them to invest more thought in their vehicle design prior to requesting in-principle access approval. It will also remove some of the administration burden on the NHVR and road managers by reducing the number of unnecessary in-principle assessments.

4. Accelerate the development of the strategic freight network and work done on major and popular highways (Hume and Pacific highways) to simplify the task of managing heavy vehicle access for road managers. This often means lesser bridges to fix and minimum pavement to repair. Risk based operating conditions such as Intelligent Access Program – Mass (IAP-M) will allow the live load factor to be reduced to allow safer and more productive vehicles to use a broader network.

5. Address the lengthy and expensive PBS approval process. Industry suggestions include developing a means to allow prospective applicants to self-assess their innovations against PBS requirements, and developing a centrally managed database for heavy vehicle components. (The Australian Tyre Industry Council is currently working with the NHVR to develop a centrally managed database for PBS tyres – see Appendix K.)

6. The NTC notes a number of survey respondents are concerned about the inconsistent advice provided by the NHVR call centre for PBS permit applicants. Industry also reported that in some instances this has led to inconsistent and subjective decision making to PBS permit applications.

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Appendix B: PBS vehicle standards

Safety performance standards	
Startability	Ability to commence forward motion on specified grade
Gradeability	Ability to maintain forward motion on specified grade; and achieve a minimum speed on 1 per cent grade
Acceleration capability	Ability to accelerate either from rest or to increase speed on a road
Overtaking provision	Currently assessed as part of the Network Classification Guidelines that prescribe maximum vehicle lengths to PBS network levels
Tracking ability on a straight path	The total swept width while travelling on a straight path
Ride quality	*This standard is currently undefined and not used*
Low-speed swept path	The maximum width of the swept path in a prescribed 90° low speed turn
Frontal swing	Maximum lateral outswing of the front outside corner of the prime mover and trailer
Tail swing	Maximum lateral out-swing of the outside rear corner of the truck or trailer as the turn commences
Steer tyre friction demand	Maximum steer tyre friction in a prescribed low speed turn
Static rollover threshold	The steady-state level of lateral acceleration that a vehicle can sustain during turning without rolling over
Rearward amplification	Measures the ‘whip crack’ effect of a lane change manoeuvre
High speed transient off-tracking	The lateral distance that the last-axle on the rear trailer tracks outside the path of the steer axle in a sudden evasive manoeuvre
Yaw damping coefficient	The rate of decay of the ‘sway’ from the rearmost trailer after a single pulse steering movement
Handling quality	*This standard is currently undefined and not used*
Directional stability under braking	The ability to maintain directional stability under braking

Infrastructure protection standards	
Pavement vertical loading	Degree to which vertical forces are applied to the pavement
Pavement horizontal loading	Degree to which horizontal forces are applied to the pavement
Tyre contact area	Degree to which tyre contact pressure is distributed over the pavement
Bridge loading	The maximum effect on a bridge measured relative to a reference vehicle

Appendix C: Further case studies

C.1 Hills Tankers

Peter Hill, Managing Director of Hills Tankers, Newcastle, New South Wales, believes that PBS can be incredibly useful to achieve the next level of productivity only if businesses assess if PBS is right for them. In 2014, Hills Tankers teamed up with Holmwood Highgate and Volvo Trucks to upgrade their current fleet to PBS vehicles. The team developed the first modular A-Double concept to the fuel haulage market. **The initiative brought in increased fleet flexibility to the business with vehicles broken down and reassembled to operate as semitrailers, B-Doubles or AB-Triples as needed**.

While Peter initially had issues in obtaining access from the Port of Brisbane to Eagle Farm, including the Gateway Bridge, he was able to convince road managers that his PBS vehicles can safely operate without any unacceptable damage to infrastructure.

The company also teamed with Roads and Maritime Services, NSW to trial their new A-Doubles from Port Botany through the Sydney city areas which led to obtaining access for these vehicles at 81.5t gross combination mass (GCM). **This initiative gave a 30 per cent payload increase over prescriptive vehicles to Hills Tankers. It also provided significant flow on benefits such as fuel use efficiency, reduced operational costs and lead time and other non-tangible positive impacts on congestion, air quality, public health and emissions.**

Peter is currently working with Transport and Main Roads, QLD to operate PBS A-Doubles in the Gold Coast Coolangatta airport area.

Source: http://www.primemovermag.com.au/featured/article/hills-tankers-the-true-meaning-of-disruption

C.2 IOR Petroleum

QLD based IOR Petroleum operates an innovative PBS AB-Triple combination for transporting fuel. The company runs PBS approved semitrailer and 26m B-double combinations from Brisbane to Toowoomba. Beyond Toowoomba, the vehicles are combined to form a single innovative 39.9m AB-Triple combination with a gross mass of 118t at Higher Mass Limits.

With this innovative concept the company has experienced a reduction in truck movements by 22 per cent and total kilometres travelled by 42 per cent.

Source: Trailer Magazine, December 2015 edition.

C.3 Herb Blanchard Haulage

Prior to 2008, Robert Blanchard of Herb Blanchard Haulage based in Grafton, New South Wales, had problems with transporting timber power poles. They used a specialised on-board log handling crane that had significant impact (5 tonnes) on the payload of their current fleet of non-PBS heavy vehicles.

They contacted the NTC in 2008 to find out how this productivity issue can be addressed via the then newly implemented PBS scheme. As a result, they replaced their current fleet of heavy vehicles with PBS approved twin steer semitrailer combinations.

At this stage Robert had spent about $100,000 including internal administration costs and waited about 12 months to obtain a PBS approval and a permit. Robert also had difficulties with cross border operations due to inconsistent operating conditions between Victoria, New South Wales and Queensland and the need to obtain permits from each state.

It took several discussions with road agencies, especially New South Wales, to obtain increased mass limits to their extendable trailers. Robert also reported dealing with a number of road agencies for obtaining permits as time consuming and frustrating. However, with the NHVR coming on-board the process is streamlined.

When the NTC approved their PBS vehicles and permits were issued by Victoria, Queensland and New South Wales, **PBS offered them an increase in vehicle length from 19m to 20m and increased the mass limits from 42.5t to 48.5t in the PBS level 1/general access network**. The increased flexibility also allowed them to use safer vehicles with sleeper cabs to ensure driver comfort and improved management of fatigue levels.

The improvements resulted in Herb Blanchard Haulage delivering to over 120 destinations using safer and higher productivity PBS vehicles while enjoying a 20 per cent payload increase and a 10 per cent fuel saving. **They were able to deliver the same freight task using four fewer vehicles resulting in significant operational cost savings.**

The combination of additional payload and fewer empty return trips reduced the cost of pole transport by almost 50 per cent. Consequently, the costs were reduced for the electricity industry and eventually for the end consumer. Increased vehicle length also allowed Herb Blanchard Haulage to tow a 14.63m trailer which would not have been possible under prescriptive regulations.

The safety awareness created by the PBS scheme also prompted Robert to introduce EBS braking to the entire fleet, including non-PBS vehicles. Finally Robert says that without the PBS scheme they would not have been able to deliver power poles safely and more efficiently. **He recommends other freight operators use PBS vehicles to minimise their costs.**

C.4 Cartage Australia

Cartage Australia

100 per cent of Cartage Australia's heavy vehicle fleet is PBS approved. Founders Ray Cauchi and Wayne Vella decided to build a full PBS fleet when they realised they had a productivity problem that needed solving in their payload driven bulk haulage quarry industry.

The bulk of their fleet is made up of truck and five or six axle trailers that gives them significant payload advantage over prescriptive vehicles. The truck and five axle trailer combination carries a payload of up to 45t in a GCM of 63t, while the truck and six axle trailer combination carries a payload of 49t in a GCM of 68.5t in the pre-approved PBS road network. A prescriptive truck and four axle trailer can carry up to 33.5t payload under the national notice.

Their average fleet age is 2.5 years (national average is 13.8 years, according to Australian Bureau of Statistics) resulting in significant safety benefits to the fleet and the community.

Source: Primemover Magazine, December 2015 edition

C.5 Milk Logistics

Dean is the head of logistics for Brad's Milk, a milk logistics company based in New South Wales (NSW). The company transports milk from a dairy facility in NSW using a heavy vehicle with 35.5t pay load per trip. This gives a total weekly net volume of 248.5t when operating under Concessional Mass Limits (CML).

In 2016, the company decided to build a PBS compliant A-Double combination. Dean reports that they learned about the PBS scheme through industry and related advertising. They had spent over 200 person-hours to assess the suitability of PBS vehicles to their business. **The decision to introduce PBS vehicles to their business is to achieve the ability to access the required destinations of delivery while increasing the net payload.**

Dean initially had reservations about being able to quickly obtain access for their PBS vehicles. This was partially due to the known access and permit delays through word-of-mouth information. However, they obtained permit within four weeks since they approached the access request in the correct format. Only one local council denied access to their roads. Dean is currently collecting necessary information about PBS vehicles to overturn that council's decision.

The only downside to PBS operations for Brad's Milk is the need to spend over $5,000 to purchase and implement Intelligent Access Program (IAP) equipment. Once approved**, PBS offered them an increase in payload from 35.5t to over 48t per trip. This increased their weekly net volume from 248.5t to 366t (47 per cent productivity increase).** This reduced their weekly fuel consumption, driver paid hours and fatigue risks.

Dean recommends the use of PBS vehicles to other freight operators to minimise their costs.

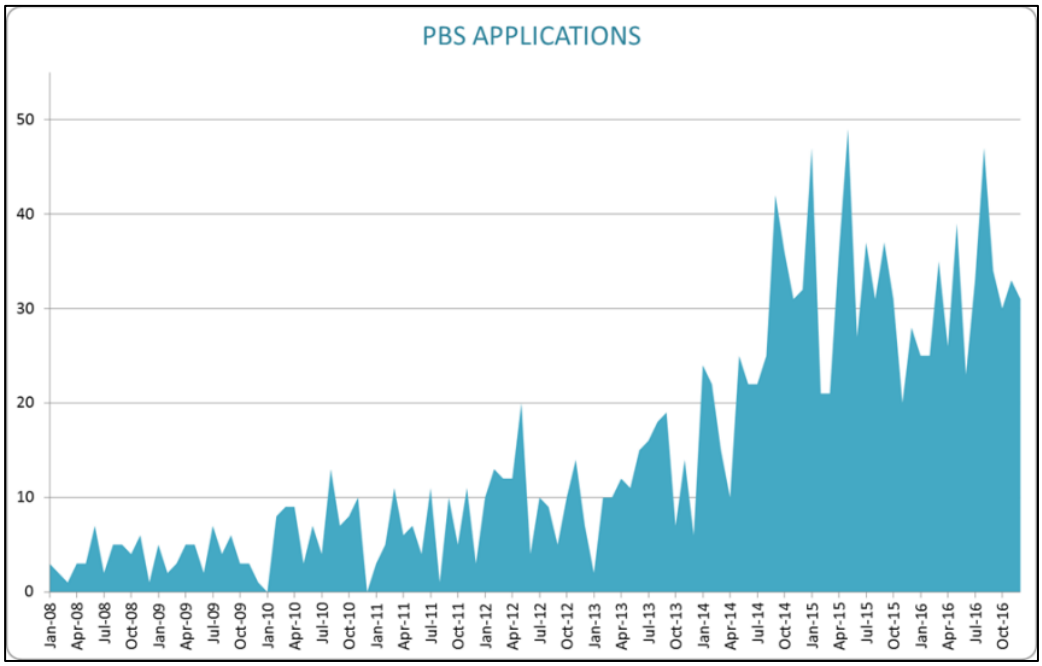
Source: Direct communication (Note: the name of the person and the organisation has been changed to preserve their anonymity)

Appendix D: 2009 PBS review – recommendations and outcomes

Recommendation	Outcome
Develop PBS legislation	PBS vehicles are regulated under the HVNL.
Publish PBS guidelines	A number of PBS guidelines are published by the NHVR and State and Territory road agencies.
Publish PBS maps	State and Territory transport agencies have published maps of PBS networks for all four levels. The consolidated maps are available in the NHVR Journey Planner and Access Portal.
Simplify access to PBS vehicles	The NHVR recently released a PBS truck and dog notice that removes the need for operating permits for truck and dog combinations.
Develop improved blueprints that could minimise the cost of buying a PBS approved vehicle for smaller operators	The NTC recently completed a project that assessed the feasibility of migrating seven axle truck and dog combinations to simpler access arrangements.
Review restrictive PBS level 4 requirements	In 2015, Austroads completed a review of PBS Level 3 and 4 standards. The outcomes are not implemented.
Undertake research to develop a pavement wear assessment method to replace the interim pavement vertical loading standard	Austroads has published a framework to assess pavement wear for high productivity vehicles with a view to replace the existing interim pavement vertical loading standard.
Develop a nationally consistent and transparent bridge assessment method	Austroads has published national guidelines on bridge assessment procedures for high productivity vehicles.
State and Territory governments to undertake programs of strategic bridge strengthening	All state and territory road agencies' work programs include projects aimed at strengthening bridges suitable for the use of high productivity vehicles.

Appendix E: Relevant PBS data

E.1 PBS applications submitted each month from 2008 to 2016



E.2 Range of vehicle types from which PBS vehicles can emerge

Vehicle Type	Rego Code	Number at 2015
Semi-Trailer Tandem Axle Group	TS2	21834
Semi-Trailer Tri Axle Group	TS3	126026
Semi-Trailer Quad Axle Group	TS4	2591
Dog Trailer Single & Tandem Axle Group	TD12	9791
Dog Trailer Two Tandem Axle Group	TD22	4294
Dog Trailer Tandem & Tri Axle Group	TD23	625
Dog Trailer Two Tri Axle Groups	TD33	262
Lead Trailer Tandem Axle Group	TL2	2393
Lead Trailer Tri Axle Group	TL3	19560
Lead Trailer Quad Axle Group	TL4	140
3 Axle Prime Mover for Single Heavy Trailer	SP3	54525
4 Axle Prime Mover for Single Heavy Trailer	SP4	341
5 Axle Prime Mover for Single Heavy Trailer	SP5	2

Vehicle Type	Rego Code	Number at 2015
3 Axle Prime Mover with 2/More Heavy Trailers (RT)	LP3	81
4 Axle Prime Mover with 2/More Heavy Trailers (RT)	LP4	33
5 Axle Prime Mover with 2/More Heavy Trailers (RT)	LP5	0
3 Axle Prime Mover with 2/More Heavy Trailers (B-D or RT)	MC3	37929
4 Axle Prime Mover with 2/More Heavy Trailers (B-D or RT)	MC4	1246
5 Axle Prime Mover with 2/More Heavy Trailers (B-D or RT)	MC5	42
3 Axle Rigid Truck Tows Heavy Trailer(S)	L3	9186
4 Axle Rigid Truck Tows Heavy Trailer(S)	L4	1501
5 Axle Rigid Truck Tows Heavy Trailer(S)	L5	34
Total motor vehicles*		**104,920**
Hire and reward component of motor vehicles (54%)*		**56,657**

**Source: Who Moves What Where, NTC 2016*

E.3 PBS design application origins

Year	Manufacturer	Operator
2014	61%	39%
2015	54%	46%
2016	65%	35%

E.4 PBS maximum permissible length and access levels

PBS access level	PBS maximum length Class 'A'	PBS maximum length Class 'B'	HVNL access level	HVNL maximum length
Level 1	20m		General access	19m
Level 2	26m	30m	B-double network	25m
Level 3	36.5m	42m	RT Type 1	36.5m
Level 4	53.5m	60m	RT Type 2	53.5m

E.5 Declared PBS networks for various states

State	Level 1	Level 2	Level 3	Level 4
QLD	General access network	B-Double network (930km for 2B)	Type 1 Road Train network (340km for 3B)	Type 2 Road Train network (1,113km for 4B)
NSW	108,548km or 60% of NSW state roads	56,582km or 30% of NSW state roads	6,654km or 4% of state roads	Only one road section of 130km
VIC	110,340 km or 47% of all roads	64,064km or 27% of all roads (45,838km for 2B)	Currently unavailable	
SA	23,303km or 8.3% of all roads	15,565km or 5.5% of all roads	9,142km or 3.3% of all roads	1,019km or 0.4% of all roads
TAS	26km (one section only)*	26km (one section only)	Currently unavailable	
NT/WA	Provide open road train access to most areas			

E.6 Lead times for issuing permits to PBS vehicles

PBS Network Level	State roads (business days)	Local government roads (business days)
Level 1	15.7	22.5
Level 2	24.0	23.3
Level 3	34.3	31.0

E.7 PBS vehicle permit application results from NHVR

Permit Type	Approved	Refused	Total	Success Rate
State Roads				
Amend or Cancel Permit	739	301	1040	71.0%
PBS Permit	1841	242	2083	88.4%
Renew Permit	357	0	357	100%
Total	2937	543	3480	86.5%
Local Government Roads				
Amend or Cancel Permit	2543	576	3119	81.5%
PBS Permit	3897	433	4330	90%
Renew Permit	1518	0	1518	100%
Total	7958	1009	8967	90.5%

E.8 PBS vehicle permit application results from states and territories (% approved)

Access Type	Qld	NSW	SA	VIC	TAS	TAS-RA[1]
PBS vehicles general	89%	99%	84%	85.0%[2]	83%	64%
In-principle to actual permit	70%	64%	61%	85.0%[2]	75%	25%
Involves bridge assessment	31%	80%	84%	95%	NA	61%

E.9 In-principle approval results for PBS vehicles

Level	Approved	Refused	Total	Success Rate
Level 1	124	24	148	83.8%
Level 2	130	60	190	68.4%
Level 3	32	0	32	100%
Level 4	0	4	4	0%
Level Unknown	666	295	961	69.3%
Total	952	383	1,335	64.3%

E.10 Most popular commodities carried by PBS vehicles

Commodity	Proportion
Quarry/sand/gravel	34%
General freight	13%
Tankers (Dangerous Goods and non-Dangerous Goods)	11%
Grain	8%
Minerals	8%
Building materials	7%
Containers	6%
Groceries	5%
Parcels	3%
Livestock	2%
Others	3%

Appendix F: Addressing increased freight demand overseas

In **Europe**, High Capacity Vehicles (HCV) are in operation in several countries at 60t maximum mass limits with vehicles up to 25.25m long (Australian B-Doubles can operate at 68.5t and 26m long under the HVNL).

In **New Zealand** the 50MAX policy allows truck and trailer combinations to operate at 50t on 9 axles. Access is allowed by over 95 per cent of councils giving 15 per cent improvement in productivity. In Australia the PBS scheme allows 7 axle truck and trailers to operate up to 57.5t.

New Zealand has also developed a draft set of PBS standards ready for industry consultation as at November 2016. It anticipates to fully develop the PBS scheme over the next two years.

South Africa continues to trial a pilot PBS scheme, based on the Australian PBS scheme, involving 167 heavy vehicles. The pilot scheme is largely funded by freight operators.

In **Sweden**, the government has decided in October 2016 to open a HCV network.

Finland is currently conducting trials with 32m heavy vehicles operating at 110t.

Appendix G: PBS-relevant Austroads publications

Austroads project title (Ref. number)	Abstract
National Steer Axle Mass Limits (AP-R505-16)	This report examines issues associated with potential changes to mass limits for steer axles on heavy vehicles in Australia.
Expansion of PBS Route Assessment Tool (AP-R503-16)	This report summarises the outcomes of an Austroads project which investigated expansion options and priorities for the Performance-Based Standards Route Assessment Tool (PBS RAT).
PBS Level 3 and 4 Standards Review (AP-R483-15)	This report details a review undertaken to identify potential issues that are limiting the uptake of the PBS Level 3 and 4 vehicles and provide recommendations for improving the standards.
Review of Axle Spacing Mass Schedules and Future Framework for Assessment of Heavy Vehicle Access Applications (AP-R466-14)	This project demonstrates the development of an assessment framework to allow fast assessment of bridges using a simple line model comparison approach.
PBS Level 1 Length Review (AP-R411-12)	Identifying a maximum length allowable for PBS Level 1 networks.
Investigating the Development of a Bridge Assessment Tool for Determining Access for HPVs (AP-R398-12)	The Bridge Assessment Tool Project is a part of Austroads Project FS1580 'Bridge Assessment for Future Higher Productivity Vehicles'
Developing Braking Standards for Heavy Vehicles to Brake Effectively and Safely on Steep Declines (AP-R539-17)	This report proposes a new rule for inclusion in the Performance-Based Standards scheme, adding a requirement for applicant vehicles to meet a minimum level of auxiliary braking performance.
Reassessment of the benefits and impacts of the use of high productivity vehicles on Australian highway pavements (AP-R541-17)	The aim of this project is to gain a thorough understanding of the pavement vertical loading due to HPVs and subsequent deterioration such that the impacts can be quantified and compared with the other benefits derived from operating HPVs.

Appendix H: Operating conditions for PBS vehicles

H.1 Operating conditions supplied by the NHVR PBS team

Vehicles requesting Higher Mass Limits (HML)

- For tandem axles groups:
  - Road-friendly suspensions (certified road-friendly suspensions)
- For tri-axle groups:
  - National Heavy Vehicles Accreditation Scheme (NHVAS) – Mass Management Module and road-friendly suspensions.

Vehicles requesting Concessional Mass Limits (CML)

- A National Heavy Vehicle Accreditation Scheme (NHVAS) – Mass Management Module must be in force for the operator of the vehicle.

Vehicles with components that might require specific routine maintenance to ensure that PBS compliance is maintained, e.g. steerable axles

- A National Heavy Vehicle Accreditation Scheme (NHVAS) - Maintenance Management accreditation of the vehicle must be in force for the operator of the vehicle.

Vehicles requesting 6.5 tonnes on steer axle

- 6.5 tonne complying steer axle requirements:
  - an engine that complies with the engine emission standards of Australian Design Rule (ADR) 80/01 (Euro 4) or a later version of ADR 80; and
  - a front underrun protection device (FUPD) that complies with UN ECE Regulation 93 or ADR 84; and
  - a cabin that complies with UN ECE Regulation 29.

Vehicles requesting 11.0 tonnes on twin-steer axle groups

- For twin-steer axle group operation above 10.0t:
  - Load sharing suspension.

Maximum payload height

- Maximum payload heights measured from the ground may be restricted.

All Truck and Dog trailer combinations

- When the trailer mass exceeds the truck mass, at least 16 tonnes on the drive axle group is required. This clause does not apply for an unladen vehicle.

Vehicle combinations longer than 22.0 metres

- Vehicles longer than 22.0 metres but not longer than 30.0 metres in length:
  - A “LONG VEHICLE” sign must be displayed at the rear of the vehicle.
- Vehicles longer than 30.0 metres but not longer than 36.5 metres in length:
  - a road train that includes 1 or more dog trailers:
    - A “ROAD TRAIN” sign must be displayed at the front and rear of the vehicle;
  - a road train that does not include a dog trailer
    - A “ROAD TRAIN” sign must be displayed at the front and rear of the vehicle; or
    - A “LONG VEHICLE” sign must be displayed at the rear of the vehicle.
- Vehicles longer than 36.5 metres in length:
  - A “ROAD TRAIN” sign must be displayed at front and rear of vehicle.

Vehicles fitted with quad-axle groups

- A Tier 3 bridge assessment is required when operating at HML masses. In some jurisdictions, a Tier 3 bridge assessment may be required at GML or CML masses.
- The axles in the quad-axle group must relate to each other through a load-sharing suspension system.
- If the quad-axle group is fitted with a retractable axle, the retractable axle must comply with ADR 43/04. The transition mass is 15t.
- The quad-axle group must be fitted with either:
  - a steerable axle with no less than 12° steering articulation and an effective automatic centring mechanism; or
  - another steering mechanism proven to be effective in mitigating the impacts of road scrubbing by tyres.
- A National Heavy Vehicle Accreditation Scheme (NHVAS) - Maintenance Management accreditation of the vehicle must be in force for the operator of the vehicle.
- The accreditation labels issued for the vehicle:
  - must be attached to the vehicle in a way that the information on the labels is readable from outside the vehicle; and
  - must not be wholly or partly obscured, defaced or otherwise not legible; and
  - if the vehicle is a combination - must be affixed to the most forward vehicle.
- For the operation with mass exceeding 20.0t on the quad-axle group:
  - the quad-axle group must be fitted with a road-friendly suspension system that is certified for tri-axle groups in accordance with the requirements of VSB 11; and
  - all axles in the quad-axle group must be fitted with dual tyres; and
  - National Heavy Vehicle Accreditation Scheme (NHVAS) - Mass Management accreditation of the vehicle must be in force for the operator of the vehicle.

Vehicles not complying with Tier 1 bridge formulae

- A Tier 2 or 3 bridge assessment is required.
  - A Tier 2 assessment is used to demonstrate that the maximum bridge effects are no worse than those caused by existing commercial vehicles. The assessment must be undertaken by a prequalified engineer.
  - A Tier 3 requires approval by the owners of the bridges on a specific link, based on detailed individual bridge assessment. Note that this type of assessment may attract significant charges and may take an extended period of time to be completed.

Road train minimum mass required on the drive axle group

- When combination is partly laden, the drive axle group load must exceed 20% of the vehicle combination's total mass (Drive axle group load = 0.2 x total combination mass, e.g. at 79.5t total combination mass as measured, 79.5 x 0.2 = 15.9t is required on the drive axle group). This clause does not apply for an unladen vehicle.

Vehicles with restricted payload height or payload centre of gravity

- For vehicles carrying containers with restricted payload heights, the operator will need to demonstrate how the final payload heights are managed prior to the issue of the Vehicle Approval. This information must be provided to the NHVR, and the results of the method used must be measurable and verifiable to ensure compliance with the PBS assessment.

H.2 Operating conditions supplied by the road agencies

Queensland

- 30m A-Doubles operating between Toowoomba and the Port of Brisbane require IAP and OBM as well as National Heavy Vehicle Accreditation Scheme (NHVAS) – Mass Management Module accreditation
- Truck and 6-axle dog combinations may require a Tier 3 bridge assessment
- All combinations operating at 'B' networks* require IAP
- All combinations operating at HML require IAP

Victoria

- Maximum gross combination mass may be capped at 68.5t depending on the route
- 20m Quad-axle semi-trailers (50.5t) and B-Doubles longer than 26m and exceeding 68.5t (Quad-Tri max 73.0t and Quad-Quad 77.5t) would be allowed to operate on Victoria's HPFV network. Subject to Intelligent Access Program (IAP), On Board Mass (OBM) and a maximum speed limit of 90km/h. For more information visit HPFV B-Doubles and HPFV Quad-axle semi-trailers. Note that you must obtain a Class 2 permit to access the HPFV network.
- HPFV A-Double combinations that exceed 26m and/or has a GCM in excess of 68.5 tonnes, may be able to operate on roads that have been approved as suitable by VicRoads
- Combinations longer than 26m will require a separate rail crossings permit

New South Wales

- All combinations operating at 'B' networks*, CML or requiring a bridge assessment (Tier 2 or 3) require IAP
- PBS Level 3 vehicles operating on approved routes on and East of the Newell Highway require National Heavy Vehicle Accreditation Scheme (NHVAS) – Maintenance Management
- Other route specific operating conditions may include restrictions on the hours and days of operation as well as maximum speed limits.

Enrolment and monitoring in the NSW IAP: all PBS vehicles operating at HML, all PBS 2B vehicles and greater at GML/CML/HML, all tier 2/3 bridge compliant vehicles.
Maximum operating speed at 90km/h: all PBS 2B vehicles and greater.
NHVAS Maintenance Management: PBS Level 3 vehicles operating on approved routes on and East of the Newell Highway.
On Board Mass Management (OBMM): applied to all PBS vehicles (typically tier 2/3) vehicles where access can be granted with a reduced operating maximum mass or sensitive structure where applying reduced live load factors can provide conditional access or other sensitivities around access exist.

South Australia

1) A L2 vehicle must not be assembled or disassembled on a route except—
    1. if the vehicle has broken down; or
    2. in order to proceed on a temporary by-pass around a road blockage.
2) A L2 vehicle may only use a roadside parking area showing a 'Rest Area' sign or a 'Truck Parking Area' sign. Parking areas can only be used for rest purposes or vehicle checks but not for assembly or disassembly purposes except if broken down or required to disassemble in order to proceed on a temporary by-pass around a road blockage.
3) If travelling along Main South Road between Cape Jervis and Delamere, the mass on the dual-drive tandem axle group must be at least 14t if the mass of the load of the vehicle is more than 10t.
4) After disembarking from the ferry at Cape Jervis, a L2 vehicle must allow all passenger vehicles disembarking from the ferry to proceed toward Myponga before the L2 vehicle proceeds.
5) A L2 vehicle must not reverse into or out of a road or depot.
6) A L3 vehicle must not be assembled or disassembled on a route except—
    1. if the vehicle has broken down; or
    2. in order to proceed on a temporary by-pass around a road blockage.
7) A L3 vehicle may only use a roadside parking area showing a 'Rest Area' sign or a 'Truck Parking Area' sign. Parking areas can only be used for rest purposes or vehicle checks but not for assembly or disassembly purposes except if broken down or required to disassemble in order to proceed on a temporary by-pass around a road blockage.
8) All right turn manoeuvres across National Highway 1 (between Port Augusta West and Northern Adelaide) are prohibited except where otherwise indicated on the relevant L3A route network map.
9) The L3 hauling vehicle must have one of the following illuminated at all times—
    1. headlights; or
    2. daytime running lights.

    (Note: A daytime running light must comply with ADR 76.)

10) A L3 vehicle must not reverse into or out of a road or depot.
11) If operating a L3 vehicle on a route between Port Augusta West and Northern Adelaide, the driver must undergo and pass a medical examination in accordance with the national standards for commercial vehicle drivers as set out in the document titled 'Assessing Fitness to Drive for Commercial and Private Vehicle Drivers (2016 edition)' a joint publication of Austroads and the National Transport Commission.

    (Note: The routes between Port Augusta West and Northern Adelaide include National Highway 1 and any other approved routes in Northern Adelaide.)
12) If the driver is aged up to and including 49 years, the medical certificate is valid for a period not exceeding 3 years from the date of the examination, providing there has been no change in the driver's medical condition in that time.
13) If the driver is aged 50 years or over, the medical certificate is valid for a period not exceeding 12 months from the date of the examination, providing there has been no change in the driver's medical condition in that time.
14) If operating the L3 vehicle on a route between Port Augusta West and Northern Adelaide, the driver must carry their medical certificate or a legible copy and produce it if requested by an Authorised Officer or a Police Officer.
15) If the L3 vehicle operates between Port Augusta West and Northern Adelaide the operator must hold maintenance management accreditation for all vehicles in the combination.

    (Note: The routes between Port Augusta West and Northern Adelaide include National Highway 1 and any other approved routes in Northern Adelaide.)
16) A L3 vehicle must not exceed a speed of 90km/h or 100km/h or a specified speed limit as prescribed in the South Australian Road Traffic (Road Rules – Ancillary and Miscellaneous Provisions) Regulations 2014.
17) Where the speed limit is in excess of 60 km/h, the combination shall, when following another vehicle more than 7.5 metres in length, stay at least 200 metres behind the other vehicle.

Tasmania

The Tasmanian State Road Authority intends to require that PBS combinations operating with overall mass limits, or individuals axle group mass limits which exceed those of standard non-PBS combinations currently operating will be required to be remotely monitored for route and mass compliance. This requirement is to ensure that vehicle operation complies with State road access conditions in the interests of infrastructure sustainability and public safety. IAP and OBM monitoring scheme for heavy freight vehicles is not currently operational in Tasmania, and therefore this requirement is waived until such time as it is made available to operators.

Northern Territory

No additional operating conditions

H.3 Operating conditions supplied by the NHVR permits team

Level 1-Tier 1- GML

- Vehicle limited to individual route consideration.
- Operator to pay for damage to infrastructure.

Level 1 – HML

- IAP
- The payload must be contained within the heights of the bins. Maximum payload heights must comply with PBS Final Approval VA xxxx xxxxxxx.

Level 2,3,4 - Tier 1,3 HML,CML

- IAP
- The IAP must remain operating on all occasions the vehicles access the routes specified.

Any vehicle or vehicle combination operating under this consent will be monitored for vehicle identification, vehicle location, vehicle mass and configuration, system malfunctions, tampering, and speed above the lesser of:

(a) a speed limit on infrastructure as specified in this consent;

(b) the speed limit for any vehicle or vehicle combination for that class of vehicle: or

(c) the limited speed in accordance with ADR 65/00.

On-Board Mass monitoring device

The following requirements pertain to participating operator:

1. All vehicle components making up a combination operating under this consent must be fitted with an OBM system by an IAP Service Provider (IAP-SP) meeting the standards set out in the Queensland Interim OBM Business, Operational and Technical Requirements and approved by the department.

2. The requirements of the approved OBM system may be amended at the discretion of the Chief Executive. The OBM service and system installed in the vehicles listed under this consent will need to comply with all updated requirements within timeframes specified by the Chief Executive, or this consent will become invalid until the requirements are met.

3. Then an OBM system certified by Transport Certification Australia (TCA) becomes available as part of the IAP, all vehicle combinations operating under this consent will be required to transition to OBM equipment which is TCA certified within the timeframes specified by the Chief Executive.

4. The Applicant consents to providing IAP and OBM monitoring data to the department directly from the IAP-SP.

5. The department may collect and use the data from the OBM for:

(a) compliance and enforcement purposes;

(b) assessment of impacts of vehicle operation under this consent upon road assets;

and

(c) research purposes related to the development of OBM systems.

Note: The data received by the department may be used in conjunction with other internal systems and released to TCA. The department will not disclose or share the information collected with any other person or organisation without consent unless required to do so by law.

6. Information and data received by the department from the OBM system is presumed, in the absence of evidence to the contrary, to be a correct report of information generated by the system.

Operational Requirements

7. The participating operator will make the vehicle(s) available to the IAP-SP for the purposes of the following:

(a) OBM hardware installation; and

(b) OBM calibration and maintenance

8. The participating operator must arrange for an OBM calibration for every mass measuring component at:

(a) six monthly intervals; or

(b) upon request by the department.

9. The participating operator of the vehicle(s) listed in this consent must ensure that training is provided to the driver(s) on the correct operation of the IAP and OBM system before the driver's first journey operating under this consent.

10. Before a journey under this consent commences an operator must take reasonable steps to advise the driver(s) that:

(a) the vehicle(s) will be monitored by the OBM system and the parties which will be able to access that information;

(b) the vehicle information that will be monitored.

Weighbridge Audits

11. A weighbridge audit of the OBM equipment will be performed at the nominated public weighbridge when the vehicle is in operation and upon request by the department.

12. A vehicle is considered to be in operation when external power is connected to the approved ITS and OBM system and ignition is switched on.

13. A weighbridge audit of the OBM equipment will be performed at the nominated public weighbridge located at: 68 Gosport Street, Hemmant.

14. The participating operator must provide the department a copy of the Axle Measurement Ticket (weighbridge docket) as prescribed in the Licensing Directive PW12105- October 2012 (Revised).

15. The Axle Measurement Ticket (weighbridge docket) must also indicate the following:

(a) date and time of the measurement; and

(b) registration numbers of the vehicle combination in order of connection, commencing with the steer axle of the prime mover (if applicable).

OBM Malfunctions

16. If the driver of a vehicle becomes aware that the OBM system is malfunctioning the driver must immediately report the malfunction to the vehicle's participating operator.

17. If the participating operator of a vehicle becomes aware that the OBM system is malfunctioning, the participating operator must immediately report the malfunction to:

(a) The department by: Telephone -1300 753 427 (1300 QLD IAP) Fax - (07) 3220 6075

Email - iapadmin@tmr.qld.gov.au

(b) The IAP-SP, to develop a rectification schedule if applicable.

18. If an OBM system has malfunctioned and is not rectified within 10 working days, or as determined by the Chief Executive, this consent becomes invalid for the vehicle or vehicles affected by the malfunction.

GCM and axle mass limits below of that stated in VA's

GML axle group mass limits not to be exceeded with the overall gross combination mass not to exceed 68.5t. – (A-double 3-2-3).

Speed restrictions

The vehicle must not exceed a maximum speed of 90km/h, (replace with 100km/h for regional HPFVs operating in Green Triangle, Horsham and Ouyen), whilst also adhering to all relevant posted speed limits; (level 2B super B)

Contact third parties for approvals.

- Permission from the Over Dimension Load team in the Department of Economic Development Jobs, Transport and Resources is required to cross a railway track where the vehicle exceeds 26m in length; Tel: (03) 9655 6134 Mobile: 0417054626 Email: odlpermit@ecodev.vic.gov.au.
- The operator must have written consent to use the route from all affected asset owners when the route crosses railway bridges and level crossing, and power utilities when the route passes under low hanging wires.
- Provide data of number of movements
- The nominated vehicles/s must be operated in a manner to ensure lane changing on the approved route/s is minimised.
- The vehicle is to be driven only in a forward direction when entering or exiting the site.
- Turn radii should be as large as possible, to minimise the effects of wheel scuffing on the road pavement.
- The payload must be contained within the heights of the bins. Maximum payload heights must comply with PBS Final Approval VA xxxx xxxxxxx. The Department of Transport and Main Roads (the department) may audit the loading management system to ensure that payload height limits are not exceeded.
- All prime movers and trailers operating under this consent must be registered and be approved to operate under the Mass Management and Maintenance Management modules of the National Heavy Vehicle Accreditation Scheme (NHVAS).
- Any incidents such as crashes, breakdowns, stoppages, and damage to signs, kerbs or other road infrastructure which occur during any journey are to be reported by the operator to the department as soon as possible, as well as recorded in the appropriate format and forwarded to the department within three days. The applicant shall reimburse the department of local government authority for the cost of rectification of any infrastructure damaged by their vehicle in such incidents.
- The operator of this consent shall indemnify the Department of Transport and Main Roads and its employees, against any claim, action or process for damage or injury that may be sustained against them due to the use of vehicles as specified.
- Loading or unloading to occur off roads and no parking in local roads unless in designated areas.
- An emergency breakdown procedure must be documented and in place on commencement of operations.

- During harvest season it shall be the responsibility of xxxxx to maintain the haulage roads under the care and control of Naracoorte Lucindale Council in accordance with the Naracoorte Lucindale Council Road Infrastructure Maintenance standards.

Appendix I: Detailed PBS survey responses

I.1 Responses to the industry survey

The NTC received over 100 responses to the industry survey. Table 8 shows a break-down of survey participants.

Table 8. PBS industry survey participants

Participant group	Number of respondents
PBS assessor	12
PBS certifier	6
Manufacturer of PBS vehicles	29
Manufacturer of non-PBS vehicles	5
Operator of PBS vehicles	53
Operator of non-PBS vehicles	3
Total	**108**

I.2 Assessors and certifiers

1. PBS scheme's impact on your business/operations

For most of the assessors and certifiers PBS forms significant part of their business. For some assessors and certifiers PBS represents over 75% of their business operations.

2. Time spent in PBS assessments

Most assessors average about nine PBS assessments per month with an average of 50 hours spent on assessment activities. Certifiers inspect about 10 PBS combinations per month, spending about 9 hours per certification. About 50% of certifications need further action such as compliance with design approval and reassessments to ensure vehicle safety.

Certification errors occur due to a lack of understanding of the PBS process from operators. Mis-understanding due to large differences in assessments from one assessor to another also contributes to this issue.

3. Sourcing performance data from component manufacturers and suppliers

About 30% of PBS applications need data to be sourced from components manufacturers and suppliers. Sometimes the data can be difficult to validate or data is not available or the customer does not want to pay or spend time on on-field tests.

4. Process improvement between the applicant–assessors–NHVR–PBS review panel

- PRP process takes too long and sometimes is inconsistent. A self-executing process must be introduced.
- Governments must work to improve access certainty for PBS vehicles.
- Improved consistency in information supplied by different parties at the NHVR.
- Resolving tyre issue or removing tyre requirements would improve industry participation.
- Reviewing requirements of some standards (for example, MoD requirements, deemed to comply provisions and braking standards) will improve the safety standards and flexibility of the PBS fleet.

- A centrally managed database for parts and components would assist the PBS scheme eliminate any inconsistencies in assessment outcomes.

5. Changes to promote innovation

- takes many months to get through the system.
- Binding access approval for a compliant vehicle to that level, including first and last miles. Access certainty for vehicles that pass PBS and remove permit requirements.
- Allowance to run to sum of axle groups GCM for truck and dog combinations in all Levels.
- Visibility of already approved combination general dimensions to reduce assessment costs.
- Promptness and consistency in access decisions.
- Review of infrastructure standards with a view to improve productivity and reduce pavement damage.
- Review of rear OH requirements for vehicles other than rigids and dogs.
- Remove restrictions on low speed turns, frontal and tail swing for European vehicles.
- Use of wide single tyres especially to steerable axles to limit pavement wear, rolling resistance and roll stability.
- New regulatory framework to handle trailers with multiple axle groups.
- Transitional masses for retractable axles.
- PBS for livestock industry.
- As of right access to PBS vehicles.
- Dedicated supply chain transport tasks can be best optimised by not constraining vehicles to meet criteria of a road network that is not relevant to their operation. This should be formerly recognised by the PBS scheme so that there is a clear delineation between route specific and network access vehicles.
- Remove restriction on vehicle width
- LG education and training.
- Bridge database. Reduce bridge assessment costs.
- Implement self-certification only to known and popular vehicle types.
- New PBS bus standards. (especially overhang, swept path and tail swing)
- Education and training for NHVR access department, currently the call centre delivers inconsistent messages.
- Cost of waiting for vehicle approvals and access approvals is very significant.

I.3 Vehicle manufacturers

1. PBS scheme's impact on your business/operations

Heavy vehicle manufacturers chose to get involved in the PBS scheme to address the need to improve the safety of the heavy vehicle fleet. With more operators willing to explore the benefits of the PBS scheme manufacturers responded to meet market demands.

The PBS scheme has led to innovation, safety and recognition in transport sector and the supply chain. When the truck and dog market shifted from three axle dogs to four axle dogs rest of the manufacturers were forced to manufacture PBS vehicles. This resulted in greater safety and productivity, increased business activity, improved product uptake, operators updating vehicles more regularly that keep manufacturers going.

At the same time, the PBS scheme is also reported to be time consuming, complex, expensive and resource intensive. Obtaining access, particularly dealing with government departments (local councils, state road agencies and the NHVR) was very exhaustive and in some instances took several years for access approval. Some manufacturers reported that costs were not fully recovered while other mentioned that run of the mill stuff for popular vehicle types are easily

managed through the process but real innovative ideas are put in the too hard basket. In-principle approval not converting to permits resulted in significant loses to industry, with some businesses going broke. There is a lack of support for PBS scheme in WA/NT – relying on assessors and certifiers from eastern seaboard. In one case, a Victorian based manufacturer reported that their innovative vehicle provides savings to kerbs, signage, pavements, swept path performance but they were not offered any concessions with length or mass, or improved access.

Most manufacturers have about 3 – 4 PBS designs. On average about 25% of their total manufacture is PBS vehicles. Additional manufacturing and compliance costs includes about $3,000 - $4,000 for simpler designs, $7,000 for multi combinations and in extreme cases over $120,000 for highly innovative vehicles. About 50% of PBS applications need data to be sourced from components manufacturers and suppliers.

Table 9. Customer satisfaction – manufacturers

Criteria	Satisfaction level
PBS assessment and application submitting process	**Satisfied** (Over 63% reported satisfied or very satisfied)
Time taken to obtain PBS Review Panel voting	**Dissatisfied** (72% reported dissatisfied or very dissatisfied)
Time taken for NHVR to issue design and vehicle approvals	**Satisfied** (70% reported satisfied or very satisfied)
Information available on the NHVR website about the PBS scheme	**Satisfied** (62% reported satisfied or very satisfied)
Information available on road agency websites about the PBS scheme	**Neither satisfied nor dissatisfied** (30% dissatisfied, 35% neutral and 35% satisfied)

2. Process improvement between the applicant–assessors–NHVR–PBS review panel

- The manufacturers believe removing the PRP or enhancing the PRP skills with more engineers would result in acceptance of more innovative designs.
- Popular and similar vehicle designs should be decided by the NHVR to speed up the process.
- Amendments and variations process must be simplified to expedite the process, certifiers should have the capacity to allow minor build variations. This is because minor build anomalies add up to two weeks to the approval process.
- Payload height management plans have complying difficulties when dealing with sealed imported containers.
- Obtaining access involves liaising with too many levels of governments. This is because the NHVR call centre is providing inconsistent advice prompting industry to deal with road managers themselves.
- Nationally harmonised route assessment criteria/guidelines or principles would assist prospective PBS customers to work out the level of access available to their innovative vehicles.
- A centrally managed database for parts and components would assist the PBS scheme eliminate any inconsistencies in assessment outcomes.

3. Changes to promote innovation

- Remove a maximum limit on vehicle lengths or increase the level 1 length limit to 22m.
- Introduce maximum vehicle age as an entry requirement to the PBS scheme to eliminate old and unsafe heavy vehicles
- Improve and expand the blueprints to popular PBS vehicles to reduce the overall cost of running PBS vehicles. At the same time, governments should focus on strengthening infrastructure and improve access – leaving innovation to industry.
- Existing ADRs hinder innovation. Vehicles that pass PBS standards should be exempted from all ADRs and Vehicle Standards.
- Develop permanent infrastructure standards, especially for pavement horizontal/vertical loading standards.
- Include truck and dog combinations at PBS mass limits in the HVNL.
- Allow industry self-certification for popular vehicle types.
- NHVR should be a single governing body with consistent mass limits and vehicle designs. Currently VicRoads have their own A-Double dimensions for their recently released HPFV network.
- Declare PBS networks and eliminate permit requirements. PBS Level 1 network to be the as General Network.
- Obtain binding commitment to in-principle approvals by including the provisions in the HVNL with a mandatory 28 day turnaround.
- Local councils and NHVR call centre needs further education and training to manage PBS access requests.
- An open source tool to compare innovative PBS designs to mapped network. Existing NHVR Access Portal has limited capabilities with more 'indicative' networks and insufficient vehicle types.
- Industry is willing to comply with truck curfews if greater access is allowed to PBS vehicles.
- Non PBS manufacturers/operators think PBS is too constrictive and expensive for a regional operator to be able to interchange trailers regularly. The PBS process is too complicated and time consuming.

I.4 Heavy vehicle operators

1. PBS scheme's impact on your business/operations

The PBS scheme has improved the business efficiency by allowing more volume and mass to be carried. The scheme has improved fleet safety performance and reduced number of vehicles on the road thus saving on fuel and wages, reducing emissions, reducing supply chain costs. This has resulted in businesses to become more competitive.

One operator reported reduction in trips from 22 to 15 to deliver the same freight task. This has reduced total heavy vehicle travel, operating costs, registration, fuel and wages. This operator also mentioned that their business is 32% more efficient and carries same tonnage with 30% less trips. PBS also gives its customers a commercial advantage resulting in businesses to operate in profit mode. Initial costs were significant but subsequent PBS approvals were quick. Businesses had a growth in freight task without needing to buy additional vehicles.

On the flip side, some operators view PBS as expensive and onerous to comply. For some operators the initial costs have wiped out the profit. Additional operating conditions such as (On-Board Mass) OBM equipment is expensive and requires six monthly calibration in Queensland. Other similar monitoring devices are adding to the cost. Local Councils' lack of understanding causes of PBS vehicles delays obtaining permits. This results in purchased combinations often sitting in the back yard waiting for all approvals to come through. On-road inspectors are not trained to handle PBS vehicles.

Most operators have about three to four PBS designs. On average about 15% of their total fleet is PBS vehicles. 70% of responded operators believe they pay extra premium for a PBS vehicle (approximately $20,000 more than a prescriptive combination without counting additional administration expenses).

30% of respondents use PBS exclusive to access mass benefits, while 50% use the scheme for mass and other safety benefits. The remaining 20% use PBS for other reasons than mass (for volumetric loading or road agencies could've made PBS approval a requirement for their vehicle).

Of the additional mass limits available as part of the PBS scheme, operators, on average, use about 75% - 90% of the extra mass benefits.

Table 10. Customer satisfaction – operators

Criteria	Satisfaction level
Access certainty to your PBS vehicle	**Dissatisfied** (60% reported dissatisfied or very dissatisfied)
Network available to your PBS vehicle	**Dissatisfied** (66% reported dissatisfied or very dissatisfied)
Overall satisfaction of the permit process	**Dissatisfied** (71% reported dissatisfied or very dissatisfied)
Time taken to obtain access (permits and route assessments)	**Very Dissatisfied** (83% reported dissatisfied or very dissatisfied)
Information about PBS in the NHVR website	**Satisfied** (62% reported satisfied or very satisfied)
Information about PBS in the road agencies website	**Neither satisfied nor dissatisfied** (30% dissatisfied, 35% neutral and 35% satisfied)
PBS application/assessment process and dealing with the NHVR PBS team	**Satisfied** (Over 63% reported satisfied or very satisfied)
Time taken to obtain PBS Review Panel voting	**Dissatisfied** (72% reported dissatisfied or very dissatisfied)
Time taken for NHVR to issue design and vehicle approvals	**Satisfied** (70% reported satisfied or very satisfied)
Time taken to obtain permit without bridge assessment	From 1 week/$70 to up to three months
Time taken to obtain permit with bridge assessment	From 6 weeks/$210 to **over 2 years and >$200,000**
Average success rate of in-principle approvals resulting in permits	50-75% (Operators **dissatisfied with this rate**)
Average success rate for access to new routes	About 50% (Operators **dissatisfied with this rate**)
Average success rate for access approval for PBS approved vehicles	About 75% (Operators are **satisfied with this rate**)

2. Process improvement between the applicant–assessors–NHVR–PBS review panel

- Simplify the PBS application and certification forms.
- Organise PRP meetings more often.
- Reduce compliance cost.
- Improve tyre choices available to PBS vehicles.
- Implement ways to offer low cost entry to PBS scheme (>90% say yes).
- Assist local councils to improve their knowledge about the PBS scheme and their infrastructure quality.

3. Changes to promote innovation and PBS access issues

Access continues to be an issue for PBS vehicles with 33% of operators not obtaining the requested level of access for their vehicles. The concept of access to PBS vehicles is misunderstood among the governments. The PBS network guidelines suggests to restrict access only if there is evidence of increased damage to infrastructure. But in practice most access applications to innovative vehicles are initially denied. It then takes significant effort to turn that around resulting in jobs often completed before the access is approved. In these cases PBS vehicles carry reduced (general) payload, basically nullifying the purpose of PBS vehicles.

More than half of PBS operators are subject to additional operating conditions. These conditions can be anything from dedicated lane travel, OBM, restricted time of travel, reduced payload in certain bridges, chargeable road repairs, NHVAS-Mass Management for a light product, IAP, Restricted mass (reduced to general mass) in some councils, cannot operate during winter months at full weights and route restrictions. These conditional are imposed because local councils don't want trucks in their areas, mass limits and road geometry makes the vehicle unsuitable to some roads, potential overloading, intersections, accelerated road wear, damage to underground infrastructure, bridge limitations.

- The current PBS process is very painful. It involves obtaining PBS approval, permits, IAP, OBM and other operating conditions. The amount of time, money and effort investment is significant.
- Operators believe networks must be declared for all PBS levels at GML, CML and HML and maps published. Level 1 and 2 networks must be the same as general network and the B-Double network.
- Proven combinations should be treated as the normal heavy vehicles without the need for additional operating conditions and route restrictions.
- Local councils and NHVR call centre needs further education and training to manage PBS access requests.
- Operators would like to obtain clarity on:
    - Infrastructure standards and their impact on structures/roads.
    - Bridge assessment method.
    - The need for IAP for B-triples and A-doubles when road trains don't need them.
    - Need for permits for PBS vehicles.
- The NHVR should lead and control access applications – currently operators are bouncing between states, local councils and the NHVR.
- Hume and pacific highways must be opened up for more HPV access.

Appendix J: Vehicle types excluded from the range of PBS vehicle types

Table 11 provides a list of vehicle types that are excluded from the basket of vehicle types that can be PBS approved in the present time. These vehicle types are excluded from the analysis.

Table 11. List of heavy vehicle types not included in the analysis

Description	Charge code	Sub category (generally based on axles)
Prime Mover for single-trailer application	SP	2,3,4,5
Rigid Truck (GVM ≥ 4.5t)	2R	2,3,4,5
Special Purpose Machine (GVM ≥ 4.5 t) & is not a truck.	SV	2,3,4,5,6,7,8,9
Special Purpose Truck	TSV	1,2,3,4,5,6,7,8
Articulated passenger Bus (GVM ≥ 4.5t)	AB	2,3,5
Pig (Centre-axle group) Trailers. One axle group approximately in the centre of the load-carrying space)	TP	1,2,3,4,5,6,7
Other Trailers – Mainly Special Purpose Trailers.	TO	1,2,3,4,5,6,7,8

Appendix K: Australian Tyre Industry Council proposal

K.1 A database for PBS tyres

- A database with all necessary technical data will be established and administered by ATIC.
- Participating ATIC Members will have the ability to upload their products and the system will automatically attribute a unique code.
- Status and life-cycle of each product will be updated as necessary and NHVR notified of these updates.
- Accredited Assessors (and NHVR) will have the ability to access the database and compile standard queries based on the characteristics and application of the vehicle/s they are assessing.
- Products selected via the Assessor query are attributed a new, unique code and full query details and related results are stored for historical purposes.
- Once Assessors determines suitability of individual products for the application, they are to select these from the list provided and notify ATIC and NHVR.
- Assessors have no visibility over Brands selected and results remain anonymous.
- NHVR issues certificate including all Tyres which meet the requirements.

K.2 Benefits of this system

- Database ensures a level playing field among all participating Members.
- NHVR has the ability to issue certificates with multiple Brands and Patterns combinations thus facilitating replacement and competition.
- NHVR will have the ability to use information on product life-cycles to amend certificates and/or notify operators as it deems appropriate.
- Assessors will require only one main interface to procure the data they require and will potentially be able to provide their Customers with a wide number of fitment options.

Figure 7 provides an example of the record layout and access legend.

Figure 7. ATIC PBS tyres record layout and access legend

		Visibility ATIC	Visibility NHVR	Visibility ASSESSORS
ATIC CODE	ABC33454848848882	☑		
PRODUCER CODE	XXXXYYYY123456789	☑		
Manufacturer	MICHELIN	☑	☑	
Brand	BF Goodrich	☑	☑	
Size Description	315/80R22.5	☑	☑	☑
Pattern	XZ995	☑	☑	
Service Description	158/156 K	☑	☑	☑
Application/s	ON/OFF OFF	☑	☑	☑
Position	Trailer	☑	☑	☑
Product Status	Phase-In	☑	☑	☑
Status Date	Aug-16	☑	☑	☑
CS 50 0		☑	☑	☑
CS 50 1		☑	☑	☑
CS 50 2		☑	☑	☑
CS 50 3		☑	☑	☑
CS 50 4		☑	☑	☑
CS 50 5		☑	☑	☑
CS 50 6		☑	☑	☑
CS 75 0		☑	☑	☑
CS 75 1		☑	☑	☑
CS 75 2		☑	☑	☑
CS 75 3		☑	☑	☑
CS 75 4		☑	☑	☑
CS 75 5		☑	☑	☑
CS 75 6		☑	☑	☑
CS 100 0		☑	☑	☑
CS 100 1		☑	☑	☑
CS 100 2		☑	☑	☑
CS 100 3		☑	☑	☑
CS 100 4		☑	☑	☑
CS 100 5		☑	☑	☑
CS 100 6		☑	☑	☑

Appendix L: Consultant report – Quantifying the benefits of PBS vehicles

Attached separately