

Abstract

Innovative and High Productivity Vehicles – The PBS Scheme in Australia from 2007 to 2011

Graduate of the Swinburne University of Technology, Melbourne. Completed a Master's degree in 2006 on Engineering Management and the effects of technology in organizations.

J. ARREDONDO

jarredondo@ntc.gov.au

Manager Heavy Vehicle Access

National Transport Commission

Australia



National Transport Commission

Abstract

The Performance Based Standards Scheme has been operating in Australia in its current form since 2007. The scheme allows operators to obtain mass and dimension concessions in exchange to voluntarily submitting their vehicle combinations for assessment against 16 standards, covering powertrain, low speed and high speed manoeuvres and infrastructure.

Issues like enforcement, access to the road network (infrastructure and road geometry), last kilometre issues (local governments) and consistent application of the scheme across Australia appears to be issues that can be potentially addressed by the implementation of a National Heavy Vehicle Regulator in 2013.

The future of the scheme rests with the asset owners and their realisation that those assets are there not to be preserved but to be used, however funding for maintenance is an ever present constraint in the expansion of the PBS network.

Keywords: Performance Based Standards, PBS, National Transport Commission, Freight Transport, HVTT12, Melbourne Australia, Heavy Vehicle, High Productivity Vehicles, CoAG, National Heavy Vehicle Regulator.

1. National Transport Commission

In the 1980s interstate trucking faced different road rules, driver licence categories, registration classifications, charges, vehicle mass and dimensions and driving hours. In 1991, heads of government stepped-in and created the National Road Transport Commission (NRTC) to ‘coordinate’ the regulation of road transport nationally.

The role of the organisation was extended into rail and inter-modal transport in 2004 when it became the National Transport Commission.

The National Transport Commission (NTC) is an inter-governmental agency charged with improving the productivity, safety and environmental performance of Australia’s road, rail and intermodal transport system.

State and territory governments contribute 65 per cent of the NTC’s funding, and the Commonwealth Government provides 35 per cent. The NTC has over 40 staff in its Melbourne office and is led by six Commissioners.

As an independent statutory body, the NTC develops and submits reform recommendations for approval to the Standing Council on Transport and Infrastructure (SCOTI) which comprises federal, state and territory transport, infrastructure and planning ministers. The NTC also plays an important role in implementation planning to ensure reform outcomes are realised on the ground, as well as coordinating, monitoring, evaluating and maintaining the implementation of approved reforms.

2. Performance Based Standards (PBS)

The Performance Based Standards (PBS) scheme is tailored to provide road network access to higher productivity vehicles by directly assessing their suitability for use in different environments. The key focus of the scheme is on how the vehicle behaves on the road, rather than its dimensions and mass (prescriptive limits), through a set of safety and infrastructure standards.

Heavy Vehicle operators who elect to participate on PBS and are successful in obtaining approval can increase their productivity as a result of dimensional or mass exemptions.

2.1 History

Performance based standards for heavy vehicle safety were first introduced by the Canadian Heavy Vehicle Weights and Dimensions Study in 1986.

In Australia the PBS scheme had its origins around 1999. The project was managed by the National Transport Commission (NTC) and was guided by a broadly based Specialist Advisory Committee and involving representatives of road authorities, vehicle and component manufacturers, transport associations, ARRB Transport Research, Roaduser International and Monash University.

The PBS project was segmented in six different aspects as per Figure 1 – PBS development phases.

A regulatory project of this magnitude required this approach to ensure that decision makers, industry and community were conformable with the methodology and end results of the proposed policy.

Table 1 – PBS Policy development faces

Phase	Activity
Policy Framework	Objectives Alternatives Evaluation framework
Standards & Performance	What is measured and how How standards are set How the fleet performs
Evaluation	Costs and benefits Macro evaluation Case studies
Regulatory & Compliance	How PBS proposals are approved Who makes assessments Compliance & enforcement
Assessment Guidelines	Guidelines for submitting proposals and making assessments
Legislation	Legislation and supporting codes Regulatory system, standards Accreditation of assessors Mutual recognition

The development of the policy and ancillary work took almost ten years, with many people doubting the viability of the scheme; however, as it stands today, Australia is a pioneer of the performance based concept applied to heavy vehicles.

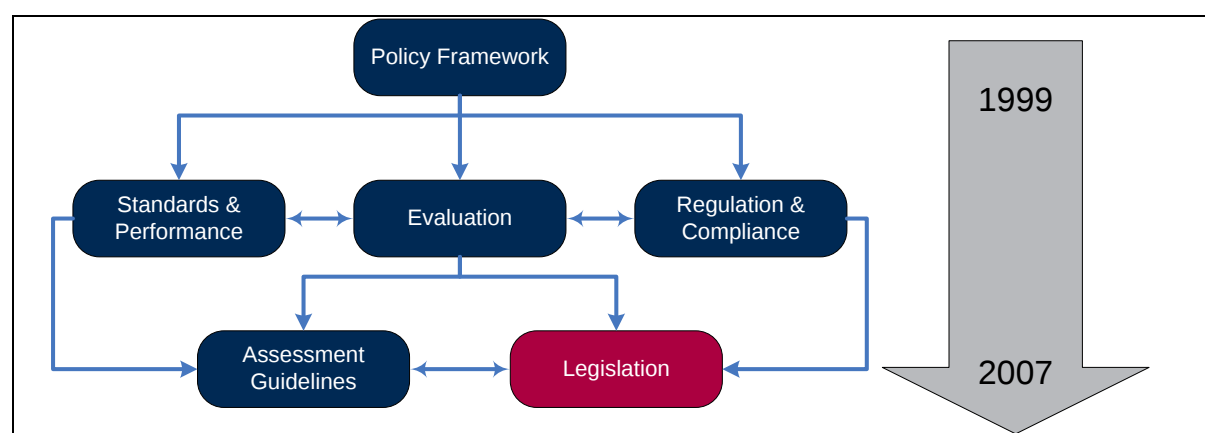


Figure 1 – PBS development phases time frame

As the reform matured an interim panel was established to evaluate vehicle applications under the PBS scheme. The role of the Interim Review Panel (IRP) was to provide the NTC with advice on:

- Relevance of each standard;
- Rules for conducting PBS assessments;
- Proposed operating conditions; and

- Enforcement guidelines.

The IRP was made up of a mixture of policy and engineering personal from the Australian state and territories.

This work allowed the NTC to present to Transport Ministers, through the Australian Transport Council (ATC) in 2007, a refined regulatory proposal including, standards, business rules and network classification guidelines.

The approval of this proposal by the transport Ministers saw the transfer of the review of PBS applications from the IRP to the PBS Review Panel which has been operating in its current form since then.

The standards used to assess vehicle combinations can be split into six categories as per Figure 2 – Performance Based Standards.

These standards are detailed in the PBS Scheme - The Standards and Vehicle Assessment Rules (NTC 2008).

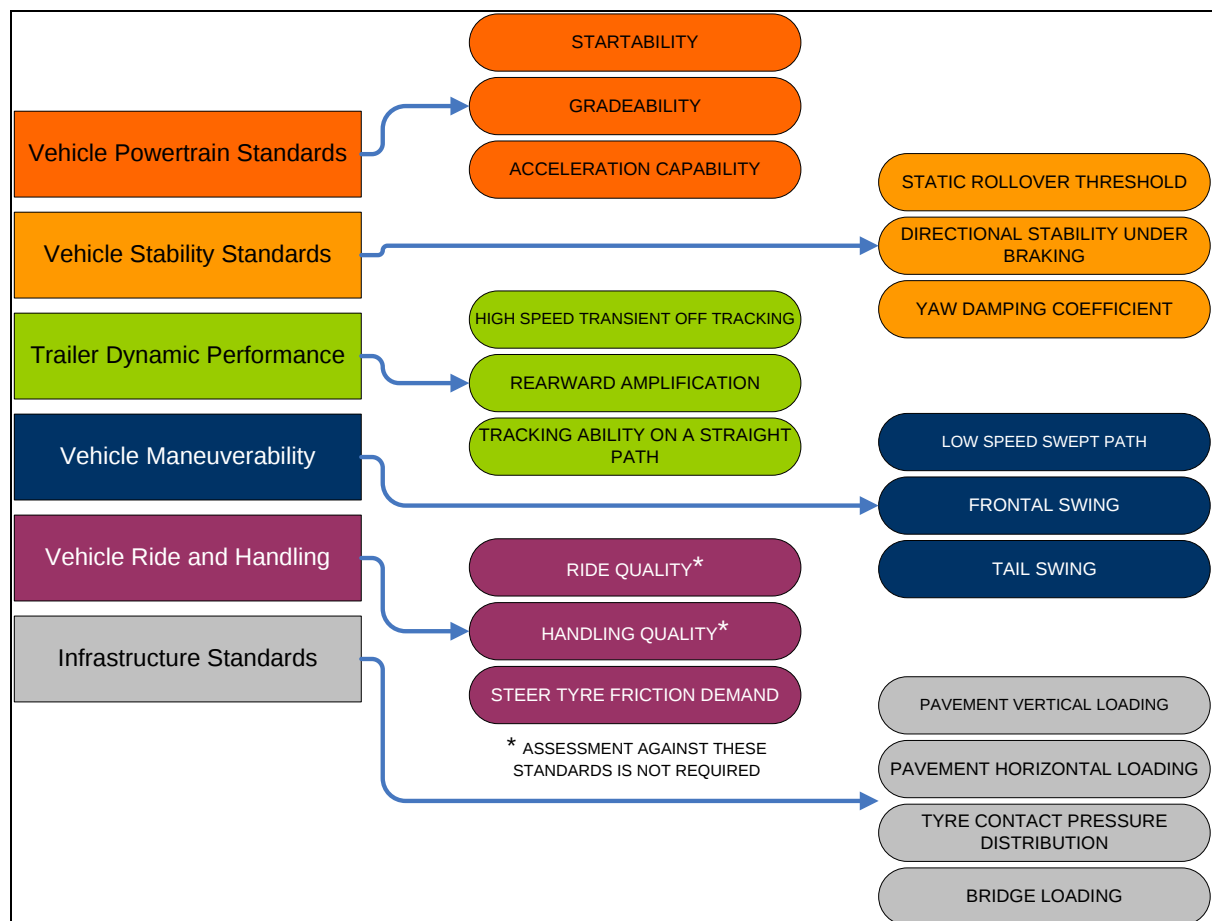


Figure 2 – Performance Based Standards

2.2 The PBS Review Panel (PRP)

Operators wishing to participate in the PBS scheme can apply to the PBS Review Panel which, based on the panel's Secretariat recommendations makes a decision on whether the vehicle combination complies with the standards, and applies operating conditions relevant to the usage of the vehicle.

Examples of such operating conditions are:

- a) Applicable to all vehicles with tri axles requesting Higher Mass Limits:
Higher Mass Limits (HML) requires National Heavy Vehicle Accreditation Scheme (NHVAS)¹ – Mass Management Module and road friendly suspensions.
- b) Applicable to all vehicles with tandem axles requesting HML
Higher Mass Limits (HML) requires road friendly suspensions to be fitted to all tandem axle groups.
- c) Applicable to all vehicles requesting CML:
Concessional Mass Limits (CML) requires National Heavy Vehicle Accreditation Scheme (NHVAS) – Mass Management Module
- d) Applicable to vehicles with components that might require specific routine maintenance to ensure that PBS compliance is maintained, e.g. steerable axles
National Heavy Vehicle Accreditation Scheme (NHVAS) – Maintenance Management Module
- e) All Class '2' vehicles over 22 m in length must display a "LONG VEHICLE" sign at the front and rear of the vehicle.
- f) For the 6.5 tonnes² steer axle concession the prime mover must:
 - Be fitted with an engine that complies with the engine emission standards of Australian Design Rule (ADR) 80/01 (Euro 4); and
 - Be fitted with a Front Underrun Protection Device (FUPD) that complies with UN ECE Regulation 93; and
 - Have a cabin that complies with the strength requirements of UN ECE Regulation 29.
- g) For all trucks and dog trailers:
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.
- h) Obtain accreditation for mass management under the National Heavy Vehicle Accreditation Scheme (NHVAS). This condition may be applied when vehicle combinations operate under the Concessional Mass Limits Scheme or when the manner in which the distribution of the load of the vehicle may have a significant impact on performance.

In some circumstances Australian road authorities may also require the vehicle to operate under the Intelligent Access Program (IAP)³ and/or to fit the vehicle with on board mass monitoring.

¹ The National Heavy Vehicle Accreditation Scheme (NHVAS), agreed to by Ministers in 1997, was designed to provide assurance that scheme members were complying with transport regulations through a quality systems approach to their operations. The Mass Management Module was one part of NHVAS, the other two parts being Maintenance Management and Fatigue Management

² In Australia the general mass for a steer axle is 6.0 tonnes.

³ For information on IAP refer to <http://www.tca.gov.au>.

2.3 Composition of the PBS Review Panel (PRP)

The PBS Review Panel (PRP) is made up from a representative from each Australia state and territory, the commonwealth and an independent chairperson and deputy person; in total 11 people.

The PRP can approve vehicle applications in or out of session.

In Figure 3 – PBS vehicle application process, the PBS application process is shown in simple terms as well as describing the different roles that each of the different bodies play as part of the approval process. A more detailed process flowchart is included in APPENDIX A.

Permits are issued by each road authority based on each states and territories conditions of access.

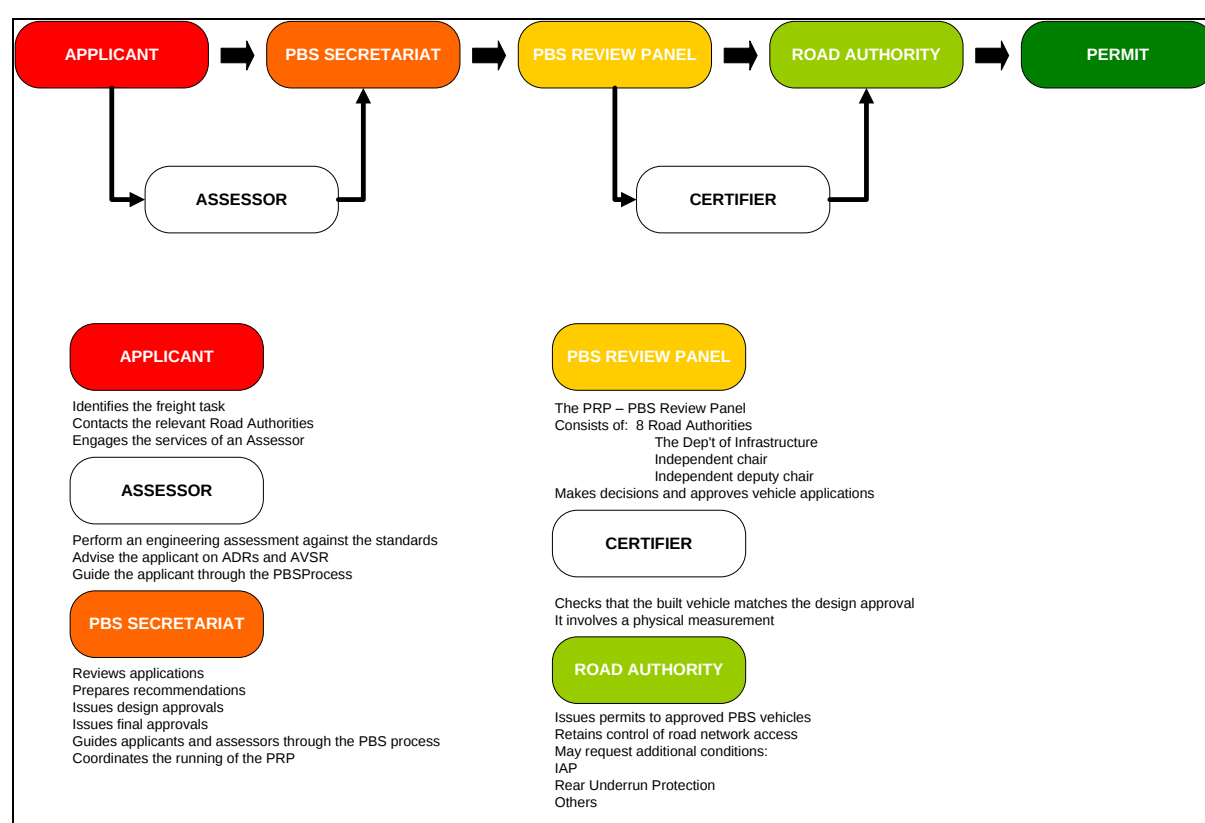


Figure 3 – PBS vehicle application process

2.4 PBS In numbers:

In order to provide a perspective on how Australia is implementing the PBS scheme, the following numbers show the status of the scheme:

Table 2 - PBS in Numbers

Number of Meetings	21 (inaugural meeting October 2007)
Number of Applications	308 (as of 15 June 2012)
Number of Vehicles built	~750
Predominant vehicle combination type	Truck and Trailer.
State in which most of the vehicles operate	Victoria

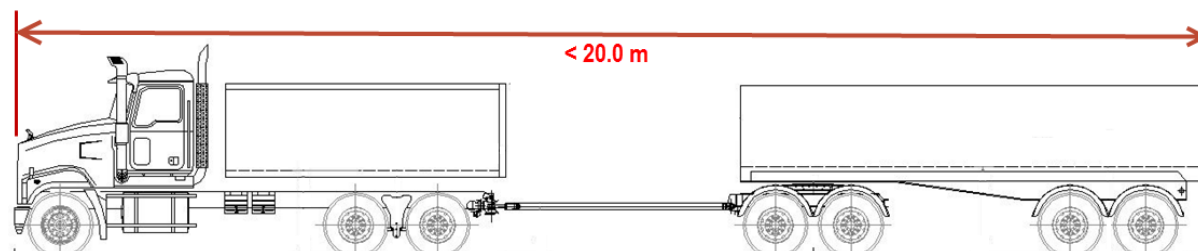


Figure 4 – Truck and quad axle trailer

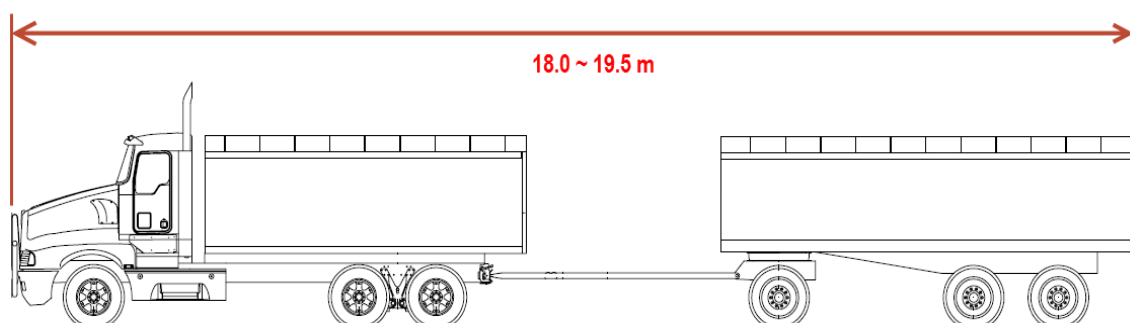


Figure 5 – Truck and tri axle trailer

Five and six axle trailers are also common to a maximum length of 26 metres.

Other less common types of vehicles, but increasing in numbers are what in Australia are referred to as super B-doubles. These vehicles are up to 30 metres in length and are operated on the PBS road network level 2 and 3.

The following photographs show these types of vehicles in operation, the vehicles carry woodchips in the Portland area in Victoria Australia. (Photographs courtesy of Mr T. Noske, Noske Logistics Australia):



Figure 6 - Super B-double



Figure 7 – Super B- double – Loading. Please note it is resting on weighing scales



Figure 8 - Super B-double Turning

In remote areas of Australia road trains are used to carry ores. These vehicles can be longer than 56.5 metres. Photograph courtesy of Mr D. Whyte. Kalari Pty Ltd.



Figure 9 - Kalari B-triple

2.5 PBS Benefits

The most recent data in regards to the growth of the freight task in Australia is from a report conducted by IBIS world for Infrastructure Partnerships Australia in 2009. It states that the Australia's freight task will triple by 2050 – from 503 billion tonne kilometres in 2008 to 1,540 billion tonne kilometres in 2050.

The PBS scheme is producing tangible results that are part of the answer to alleviate this increased road transport issue.

PBS vehicles offer productivity improvements ranging from ~5% to ~20% when compared to their prescriptive counterparts and in some cases like the A-doubles it can allow a 100 per cent increase in productivity as it has been demonstrated in the Toowoomba to the Port of Brisbane run in Queensland in which A-doubles are transporting 40 foot containers which previously was done by two semi-trailers.

2.5.1 PBS and the environment

One of the obvious benefits of PBS resides in the reduction of kilometres travelled and the associated reduction in the consumption of fuel.

The calculations below use estimates unless stated otherwise.

Number of litres of diesel used in Australia by heavy vehicles (Rigid and Articulated):
(HD) = 6.403×10^6 litres⁴

Percentage of the heavy vehicle fleet that is PBS:
(NP) = 0.13 % (approximately)

Assuming an average of 10% productivity (in relation to kilometres travelled)

Assuming 2.63 kilograms of CO₂ per litre of diesel.

Then the number of CO₂ saved by PBS vehicles is:

$$HD \times NP \times 10\% \times 2.63 = 2.22 \times 10^6 \text{ kilograms of CO}_2 \quad (1)$$

2.5.2 Other PBS benefits

The reduction in vehicles used to perform the same freight task presents further benefits to industry and the community where they operate.

Some of these benefits include:

- a) a way in for transport companies can address an extreme shortage of truck drivers
- b) reduced road exposure to passenger vehicles
- c) PBS vehicles tend to be newer vehicles with better braking and handling characteristics.

Further studies are being conducted as part of an Austroads project (Quantification of benefits resulting from use of High Productivity Vehicles). This study will quantify the safety, productivity and environmental effects achieved as the result of the introduction of high productivity vehicles.

⁴ Figures are based on data from the Australian Bureau of Statistics for the year 2010.

It will be interesting to see how the different states which their varying degrees of support for the PBS scheme will come up when compared with each other. It is expected that this study will be completed by mid 2013.

3. Infrastructure

In Australia there are three levels of government. The Commonwealth, the State and Territory and Local Governments are tasked with different financial responsibilities concerning the building, expansion and maintenance of infrastructure.

The development of the PBS network has been done by states and territories by either the migration of their networks as per Table 3 – Road classes for access by BPS scheme vehicles, or by physically assessing their roads against the PBS Scheme Network Classification Guidelines.

Table 3 – Road classes for access by BPS scheme vehicles

Road class	Scheme vehicle level	Close present vehicle description
Level 1 access (L1)	1	From passenger cars to single articulated
Level 2 access (L2)	2	B-double
Level 3 access (L3)	3	Double road train (Type I)
Level 4 access (L4)	4	Triple road train (Type II)

In Australia, through the NTC website, a PBS network is displayed, with the option to select any of the PBS levels, see Figure 10 – Australian PBS network.

The colours represent the type of PBS network that a particular road has been classified as. Refer to

Table 4 – PBS Network colour codes.

Table 4 – PBS Network colour codes

Vehicle Performance Level		Network Access by Vehicle Length, L (m)	
		Access Class 'A'	Access Class 'B'
Level 1	Blue	$L \leq 20$ (General Access)	
Level 2	Red	$L \leq 26$	$26 < L \leq 30$
Level 3	Green	$L \leq 36.5$	$36.5 < L \leq 42$
Level 4	Magenta	$L \leq 53.5$	$53.5 < L \leq 60$

The general access classification is subject to a 50 tonne gross mass limit, posted local restrictions and restrictions or limitations specified by the jurisdiction.

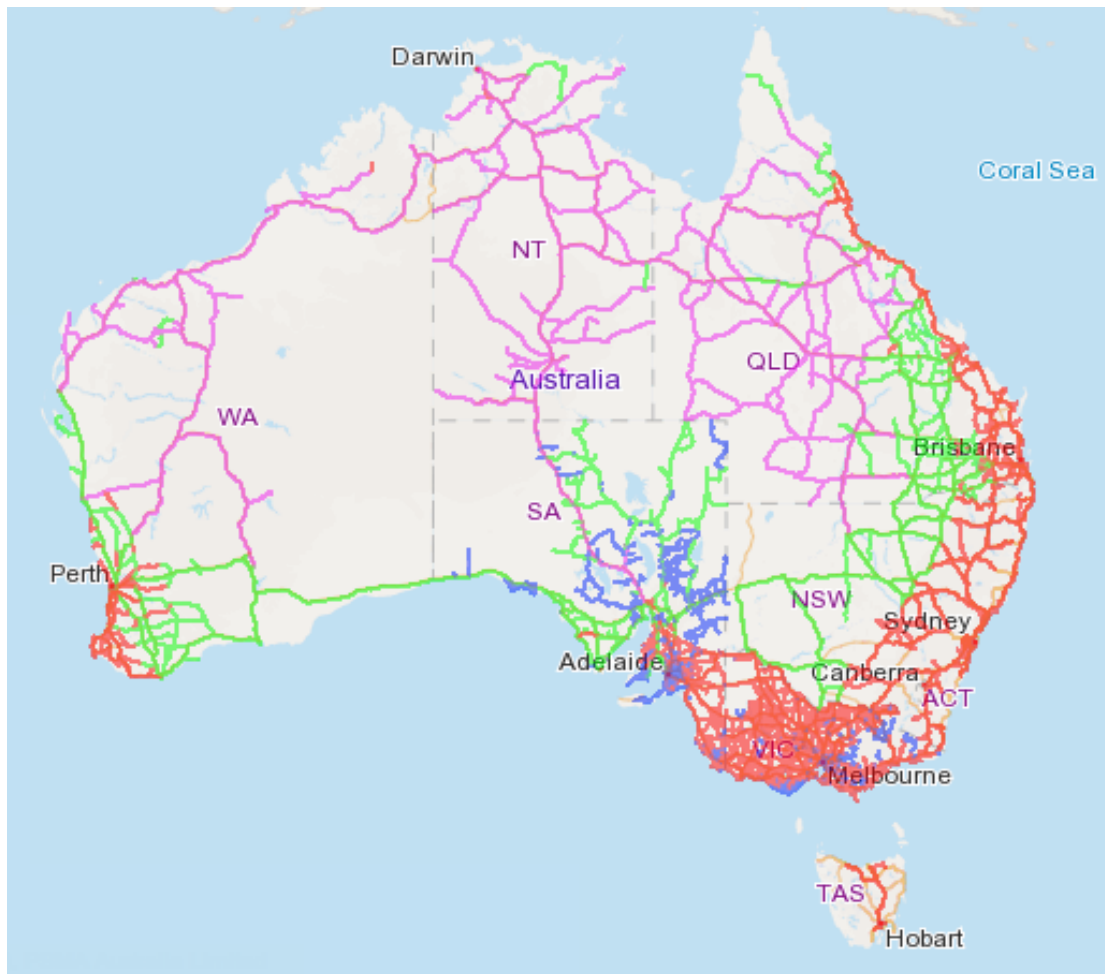


Figure 10 – Australian PBS network

4. PBS Issues

4.1 Funding

Usually the PBS network is expanded when operators want to use their PBS vehicles on non PBS roads, so when a new section of the road needs to be added to the maps, the issue of who pays arises.

This issue has been tackled in different ways by different road authorities, in some cases, it would be a “user pays” model, or in some cases depending on whether the particular road segment may be of “national freight interest” the road agency covers the costs. To date there has not been a constant approach to deal with issue across Australia.

Road authorities have to a high degree accepted the geometrical recommendation of the Network Classification Guidelines; however infrastructure standards, Bridge and Vertical Pavement Loading, are by far the standards that create the most controversy.

While these standards were approved by the Australian Transport Ministers, some road authorities have different views concerning the application of these standards. This inconsistency creates a lot of headaches for operators and vehicle designers since axle spacings and/or weights may differ from state to state.

State road agencies tend to have the resources and knowledge of the road network that they are responsible for and have a good grasp of the network limitations, but operators need to still deal with local governments in regards to the “last kilometre” issue.

4.2 Local governments

According to the Australian Bureau of Statistics there are over 559 local government areas in Australia. It is estimated that over 75 per cent of the road network falls under the responsibility of local governments; as such they represent one of the most important stakeholders in the PBS scheme because they control access to their roads.

In general terms, one of the obstacles for an increased uptake of the PBS scheme has been the lack of knowledge on what PBS is and its potential benefits to the local government’s industry and their community. Furthermore, there is a wide spectrum in the ability of local governments to assess their infrastructure assets, in particular roads and bridges. Furthermore, even if the local government has a good idea about the condition of their infrastructure; they may struggle with maintenance costs associated with increased traffic.

From a local government point of view, the NTC has collaborated toward the funding of a PBS route assessment tool (developed by ARRB group) to assist local governments with the PBS classification a consistent and transparent manner.

This tool is a web based application that allows local governments to assess their local network for classification under the PBS.

4.3 Enforcement

As PBS vehicles become more common on the Australian roads, the issue of enforcement becomes more important. The NTC in conjunction with road agencies is working towards improving the information provided to permits departments to ensure that road side enforcement officers can check with compliance to the PBS design requirements.

In addition, it has been determined that education on important vehicle characteristics and the PBS scheme in general, are crucial factors in ensuring the cooperation of enforcement agencies.

5. The future

After five years of the PBS scheme being run in its present form, a review of the scheme in 2001 made two main recommendations, which were approved by the transport Ministers:

- a) Incorporate the PBS Review Panel into the National Heavy Vehicle Regulator⁵ (NHVR).
- b) Implement operational improvements to the scheme such as:
 - i. Establish the PBS network as of right (i.e. a PBS vehicle would have as of right access to the appropriate PBS network, rather than seeking permission from each road agency)
 - ii. Allow manufacturers’ to certify their own vehicles
 - iii. Allow for the modular assessment (independently assess the prime mover and trailer and then matching the two).

⁵ The NTC is undertaking the legislation work stream for the National Heavy Vehicle Regulator project. This involves consolidating existing legislation, resolving outstanding policy issues to support the establishment of the new regulator and finalising the Heavy Vehicle National Law.

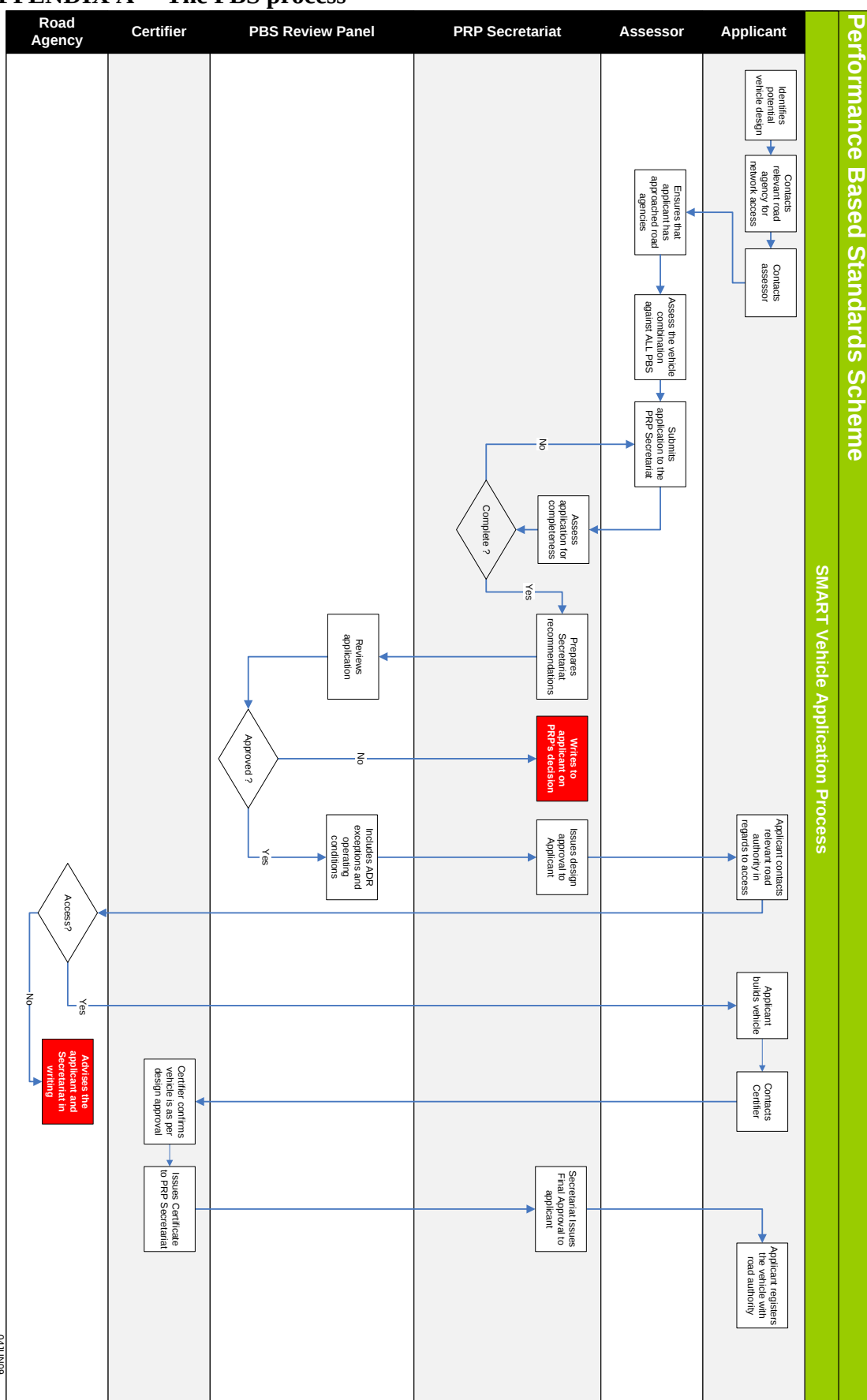
Further to these changes, there appears to be an appetite to review the standards taken into account what we have learned so far.

More immediately, the “deem to comply” provisions for the braking standard and a review of the PBS levels 3 and 4 are scheduled to be conducted during 2012/2013.

It is expected that the research conducted will assist in demonstrate that the PBS Scheme continues to have the potential to allow for the smarter use of existing roads and bridges and address some of the freight transport constraints, such as limited funding for new infrastructure.

As a complementary measure to increase productivity, projects like the Council of Australian Governments (CoAG) Road Reform Plan which seeks to address road use pricing and infrastructure funding will influence how State and Local Governments deal with High Productivity Vehicles and access to their roads.

APPENDIX A – The PBS process



APPENDIX B – PBS Design Approval – sample

Once the PRP approves a vehicle application, a design approval contains the operating conditions and vehicle dimensions that are reflected in the operators permit is issued to the applicant.



National Transport Commission

Level 15 / 628 Bourke Street
Melbourne VIC 3000

P 61 3 9236 5000
F 61 3 9642 8922

RE-PF-C-000028-01
06 03 2012

Notification of PBS Design Approval

Applicant Details	NTC National Transport Commission Level 15 / 628 Bourke Street Melbourne, Victoria 3000
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Application Number	V120110	Vehicle Type	Truck and Dog
Load Information	Quarry and Bulk	Length (m)	≤ 19.0
Assessor	Paul Tully	Overall Height (m)	≤ 4.3

Mass Limits	Level 1	Level 2
GML (t)	48.0	48.5
CML (t)	48.5	49.5
HML (t)	48.5	49.5
Bridge Assessment	Tier 1	

Recommendations

That the Panel approves this application for the limits provided in above "Mass Limits" table with the following operating conditions.

- Payload Heights: Payload must be contained within the bins. Maximum bin heights are,
 - Level 1: 2.36m for truck and the trailer
 - Level 2: 2.98m for the truck and 2.8m for the trailer
- Higher Mass Limits (HML) requirements
 - For tandem axles groups, road friendly suspensions
- Concessional Mass Limits (CML) requirements
 - National Heavy Vehicle Accreditation Scheme (NHVAS) – Mass Management Module.
- 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.
- 6.5 tonnes steer axle concession requirements:
 - An engine that complies with the engine emission standards of Australian Design Rule (ADR) 80/01 (Euro 4); and
 - Front Underrun Protection Device (FUPD) that complies with UN ECE Regulation 93; and
 - A cabin that complies with the strength requirements of UN ECE Regulation 29

Exemptions	
ADR	• None
AVSR	• None

APPENDIX C PBS Final Approval

The final approval contains the same operating conditions as the design approval and includes the actual vehicle critical components as built. This is issued to the applicant once certification of the vehicle shows compliance to the design approval.

Details of Truck(s) or Prime Mover(s) Inspected

Make	Kenworth
Model	T403
VIN(s)	
Engine Make / Model	Cummins / ISX-EGR 450hp / 2237Nm (ADR80/03)
Transmission Make / Model	Eaton Fuller / RTLO18918B
Differential Make / Model / FD Ratio	Meritor / RT46-160GP / FDR – 4.30:1
Suspension Make / Model (Steer)	Kenworth / Leaf Spring 7.2t
Suspension Make / Model (Drive)	Kenworth / Airglide 460
Tyres Make / Size / Model (Steer)	Michelin / XZE2+ – 295/80r22.5
Tyres Make / Size / Model (Drive)	Michelin / XDE2+ – 11r22.5
Brakes (Load Proportioning, ABS, ECB, etc)	ABS
Tow Coupling Make / D Rating	Ringfeder / 35,000 kg
Wheelbase (m)	4,800mm
Bin Height (Measured from the ground) (m)	2,730mm
Number of Axles	3
ADR category	NC
GVM (kg)	26,500kg
GCM (kg)	70,000kg

Details of Trailer(s) Inspected

Type	Drawbar Trailer
Make	Hercules Engineering
Model	3 Axle Dog Tipper
VIN(s)	
Suspension Make / Model	Hendrickson / Intaax Air Suspension
Tyres Make / Size / Model	Michelin / XTE2 11r22.5

6. References

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