

**2007 HEAVY VEHICLE CHARGES
DETERMINATION
REGULATORY IMPACT
STATEMENT VOLUME 2
APPENDICES**

December 2007



**Prepared by
National Transport Commission**

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STATEMENT VOLUME 2 APPENDICES**

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A. PAYGO COST BASE

NTC's costing methodology consists of Pay-As-You-Go (PAYGO) cost estimates and a cost allocation model which allocates costs on the basis of vehicle characteristics and usage. The model works on an aggregate basis and is reliant on a system of averaging. It does not address the considerable diversity in fleet, usage and network. These characteristics of the model and the data collected also make it difficult to accurately disaggregate specific jurisdictional and Auslink heavy vehicle expenditure.

The Productivity Commission supported the continual use of PAYGO in the short term until a more appropriate alternative is developed. As part of its assessment, the Productivity Commission validated the current cost allocation methodology, although noted it was conservative in nature. Therefore the NTC's models have adopted (for the most part) the same PAYGO cost estimation and cost allocation methodology as applied in the Third Determination.

A.1 The PAYGO approach to determining the cost base

PAYGO is based on the idea that all expenditure, including capital expenditure, is fully recovered in the year it is incurred.

The current road network is the result of construction activity that occurred previously when traffic levels were lower. The amount spent now is based on expected traffic levels over the coming fifteen to thirty years, which can be expected to be higher – that is, it provides for both current and future traffic. Consequently, construction costs in the current year might be higher than those that are rightly the share of the current traffic.

The amount currently spent on maintenance is the result of accumulations in pavement and bridge wear over the past twelve months to twenty years, caused by past traffic which was less than at current levels. Consequently, maintenance costs attributed to the current year might be expected to be smaller than the true share of maintenance costs (which are yet to be incurred) resulting from the current traffic.

These two effects are taken to negate each other under the PAYGO approach, so that the amount spent in the current year approximates the true share of costs associated with the current traffic.

The PAYGO cost base is derived from reported road expenditure, which includes both arterial and local roads. Expenditure deemed not to be relevant to road use or which is recovered from other fees is first excluded from the cost base. Adjustments are also made to remove any double counting that may occur through the reporting process.

A.2 Deriving allocated road expenditure from reported road expenditure

The NTC uses two separate sources of road expenditure data. Arterial road expenditure is obtained directly from jurisdictions on an annual basis. The expenditure is reported in the format of a template developed by the NTC, which categorises expenditure specifically for the purposes of cost allocation modelling. The categories are shown in Table 1 (apart from categories G3 to G5 which are not included in NTC cost allocation). This data has been collected since the early 1990s and is the best series available on arterial road expenditure in Australia.

For the heavy vehicle charges determinations to date, the NTC has used three year averages of road expenditure in calculating the allocable cost base. The data is converted to real terms using BTRE Road Construction and Maintenance Price Index. The arterial road expenditure data comprises an average of the two latest completed financial years as well as the latest budget year. For local road expenditure there are lags in the availability of data, such that the most recent year for which data are available is 2004/05. The NTC is now proposing to use an average of seven years' worth of data as supported by the Productivity Commission in its Final Report on Road and Rail Freight Infrastructure Pricing, PC (2006). Consequently, the arterial road expenditure data relates to the years from 2001/02 to 2007/08, while the local road expenditure data relates to the years from 1998/99 to 2004/05.

A.3 Updated components using 2007 Determination costing model

A.3.1 Arterial road expenditure

From the arterial road expenditure collected by the NTC from jurisdictions, the amounts reported in categories G3 to G5 are excluded. Vehicle registration (G3) and driver licensing (G4) are excluded because administrative fees are already charged for these services. As such, including them could result in double counting. Including loan servicing expenditure (G5) would violate the PAYGO principle that all capital is recovered in the year it is incurred. Accordingly it is also excluded from the allocable cost base, see NTC (2005d) Section 3.3 for further detail on unallocated expenditure.

In the past the NTC has not included expenditure relating to heavy vehicle enforcement. However, in keeping with the findings of the Productivity Commission and a request from the ATC to review the appropriateness of recovering this cost the NTC has included this expenditure on an adjusted basis so that the proportion of the national total does not exceed that of a jurisdiction's proportion of heavy vehicle kilometres travelled. A more complete discussion of the principles for inclusion of this costs is in section 2.3.1 of Volume 1.

To estimate a common minimum level of enforcement the NTC has used a proxy for mass related enforcement and as NSW has a disproportionately large share of the national enforcement cost, this approach in effect reduces its enforcement expenditure from \$66.4 million to \$21.5 million. Total allocable enforcement expenditure is reduced from \$110 million to \$66 million (a reduction of \$44 million).

Allocable arterial road expenditure can therefore be expressed as the reported expenditure of \$7,210 million less the sum of categories G3 to G5 of \$709 million less \$44 million of category G2 for heavy vehicle enforcement expenditure, leaving \$6,457 million.

Table 1 below shows how arterial expenditure has moved over time since the second and third determinations. This table demonstrates that growth in expenditure between categories is not uniform across time. The rate of growth in total arterial expenditure masks a lot of variation between expenditure categories. This has implications for the amount of the expenditure that is allocated to the heavy vehicle fleet, since the cost allocation rules dictate that certain categories should be more attributable to heavy vehicle use than others.

Table 1. Arterial road construction and maintenance expenditure including 2007/08 budget data in 2007/08 \$m

Expenditure Category		2nd Det.	2007 Det.	Change 2007 Det./2nd Det.
A	Servicing and operating	450	711	58%
B	Road pavement and shoulder construction			
B1	Routine maintenance	386	425	10%
B2	Periodic surface maintenance	362	330	-9%
C	Bridge maintenance/ rehabilitation	141	172	22%
D	Road rehabilitation	750	477	-36%
E	Low-cost safety/traffic	291	383	32%
F	Asset extension/improvements			
F1	Pavement improvements	821	1,130	38%
F2	Bridge improvements	359	426	19%
F3	Land acquisition, earthworks/other	1,562	2,084	33%
G	Other miscellaneous activities			
G1	Corporate services	260	252	-3%
G2	Enforcement of heavy vehicle regulations	110	110	0%
Totals		5,492	6,501	18%

A.3.2 Local road expenditure

Local road expenditure data is obtained from the Australian Bureau of Statistics. It is the best available local road expenditure data available at present; however it is not reported in the categories required by the NTC for the purposes of cost allocation modelling. Rather, it is broken down by state and also capital/current expenditure. It is therefore necessary for the NTC to estimate the proportion of the expenditure in each of its categories. This is done by using the same proportions as for arterial road expenditure. The capital component of the reported local expenditure is apportioned on the basis of expenditure category F. The current component of the expenditure is apportioned based on expenditure categories A-E.

The NTC acknowledges the limitations of this method of disaggregating the expenditure. A project is currently being undertaken in conjunction with Austroads to obtain survey evidence from local councils of the true breakdown of their expenditure in the NTC classes. Unfortunately the results will not be available in time for use in the 2007 Determination.

A further adjustment that must be made to the local road expenditure relates to the elimination of double counting of inter-governmental grants. The ABS Government Financial Statistics reports expenditure by local councils on all roads, as opposed to all expenditures on local roads themselves.

It is therefore necessary for the NTC to make adjustments to the ABS data to account for:

- financial assistance to councils from state governments for work on council managed arterials;
- payments to councils from state governments for contract work on state managed roads;
- spending by state governments on local access roads in unincorporated areas;
- direct spending by state governments on council managed local access roads; and
- any other direct state spending on local access roads.

Estimates of these expenditure totals are provided by the states as part of the NTC's data collection process. Expenditure on the first two categories is included in the arterial categories A-G, however it is also separately identified so that it can be subtracted from total expenditure on roads by local governments which will assist in determining local road expenditure. Accordingly, the adjustment to the ABS data is done by subtracting the sum of the first two items and adding the final three.

The net effect of adjusting for these funding arrangements is that the reported local government expenditure estimate from the ABS is normally reduced by about \$300 million per annum.

In the case of the current determination, a seven year average of the reported ABS local government expenditure is \$5,440 million in 2007/08 dollars. The adjustment described above results in a reduction of this total by \$303 million, giving a revised estimate of \$5,137 million. This is made up of \$3,060 million in urban local road expenditure and \$2,076 million in rural local road expenditure.

Table 2 shows how local road expenditure has moved over time since the second and third determinations. As with arterial expenditure, the rate of growth in the total masks a lot of variation between expenditure categories. However, given that a significant proportion of this expenditure is excluded from the allocable cost base (see below), the impact on the heavy vehicle allocation is somewhat muted in comparison to that of arterial expenditure.

Table 2. Local road construction and maintenance expenditure in 2007/08 \$m

Expenditure Category		2nd Det.	2007 Det.	Change 2007 Det./2nd Det.
A	Servicing and operating	264	968	266%
B	Road pavement and shoulder construction			
B1	Routine maintenance	245	501	104%
B2	Periodic surface maintenance	230	392	70%
C	Bridge maintenance/ rehabilitation	88	221	152%
D	Road rehabilitation	450	593	32%
E	Low-cost safety/traffic	168	458	173%
F	Asset extension/improvements			
F1	Pavement improvements	833	585	-30%
F2	Bridge improvements	165	242	47%
F3	Land acquisition, earthworks/other	843	1,178	40%
Totals		3,286	5,137	56%

As in the Second Determination, the NTC has assumed (based on a survey of local government road engineers) that 75% of urban local road expenditure and 50% of rural local road expenditure exists solely to provide access, amenity, or provide for non-motorised road users. In addition, much of this expenditure is likely to be recovered by other fees such as council rates. Therefore allocable local road expenditure is expressed as 25% of urban local road expenditure, being \$765 million, and 50% of rural local road expenditure, being \$1,038 million. Total allocable local road expenditure is therefore equal to \$1,803 million. It is not considered necessary to deduct any expenditure from the arterial allocable cost base on these grounds. Arterial roads by definition do not serve functions of purely providing access to individual properties. They are defined as roads that link communities or other roads.

A.4 Summary of allocable expenditures

Combining the allocable local road expenditure (of \$1,803 million) with the allocable arterial road expenditure (of \$6,457 million) as determined above, total allocated road expenditure is therefore \$8,260 million.

Table 3 summarises the process whereby the amount of expenditure considered to be allocable for the purposes of heavy vehicle charging is derived from the data as it is collected.

Table 3. Expenditure excluded from allocation process including 2007/08 budget data in 2007/08 \$m

Expenditure Type	Arterial Roads	Local Roads	Total
Total road agency expenditure	7,210	5,137	12,347
Deductions			
Expenditure recovered through other fees			
Administration of vehicle registration	344		344
Administration of licensing	209		209
Loan interest	156		156
Council expenditure providing for all-weather access, amenity and non-motorised road users		3,334	3,334
Part of enforcement expenditure not included	44		44
Total deductions	753	3,334	4,087
Total allocated	6,457	1,803	8,260

A.5 Impact of seven versus three year averaging

As discussed, road expenditures have been taken as an average over seven years for this charges determination. For the purposes of comparison, the following table shows what the road expenditure figures would be if averaged over the most recent three years instead. This shows that using seven year averaging road expenditure is around 6% lower than if the traditional three year averaging is used. The lower road expenditure estimate under seven year averaging reduces the impact of the sharp increase that has occurred in recent years in arterial road expenditure since the Federal Auslink road funding program has come into effect. The Auslink program in particular has boosted capital expenditure in the F1 to F3 expenditure categories which is reflected by the much higher road expenditure estimates in the 3 year averaging data compared to the 7 year averaging.

Table 4. Total road expenditure, three year versus seven year averaging (\$2007/08 m)

Expenditure Category		3 year	7 year	Change 7 year/3 year
A	Servicing and operating	1,631	1,678	2.9%
B	Road pavement and shoulder construction			
B1	Routine maintenance	852	926	8.7%
B2	Periodic surface maintenance	676	721	6.7%
C	Bridge maintenance/ rehabilitation	372	394	5.9%
D	Road rehabilitation	990	1,070	8.1%
E	Low-cost safety/traffic	872	841	-3.6%
F	Asset extension/improvements			
F1	Pavement improvements	2,074	1,715	-17.3%
F2	Bridge improvements	735	668	-9.1%
F3	Land acquisition, earthworks/other	3,849	3,262	-15.3%
G	Other miscellaneous activities			
G1	Corporate services	251	252	0.4%
G2	Enforcement of heavy vehicle regulations	111	110	-0.9%
Totals		12,413	11,637	-6.3%

A.6 Estimating road use

Road use estimates for the cost allocation process are derived from ABS Survey of Motor Vehicle Use (SMVU) statistics. This data provides estimates of:

- numbers of vehicles;
- total and average travel (Vehicle Kilometres Travelled);
- average gross mass–km (gross tonne–km), including the weight of the truck itself;
- the loads it carries and the amount of travel empty and laden, and average gross mass per km (tonnes/km); and
- total fuel consumed (litres) and the rate of fuel consumed per 100 km (litres/100 km).

As with previous Determinations, trends in vehicle kilometres travelled, gross-tonne kilometres, numbers of vehicles and fuel consumed were estimated for each vehicle category. This determination incorporates an additional two year's SMVU data (compared to the Third Determination), meaning the trends are based on the years 1999 to 2005 (trends were estimated using linear least squares regressions). Using a trend allows fluctuations between individual years resulting from the survey sampling process to be minimised. Based on these trends, an estimate was made of road use in 2005. This was used in preference to the raw data for 2005 as there can be greater confidence that it reflects actual levels of use.

A.7 Road use changes since the Second Determination

The similarity of this process to that of the Second and Third Determination means that there have been few significant shifts in vehicle utilisation patterns. There are however, a couple of exceptions.

A.7.1 B-doubles

B-doubles have continued the strong growth rates evidenced since the Second Determination. For example 9 axle B-doubles have experienced a decline in average distance traveled and average gross mass of 12% and 9% respectively as these vehicles have now changed from long haul vehicle to now widespread use in both rural and urban areas.

A.7.2 Road train vkt modification and its impacts

Concerns were raised during the consultation process with the extent of the difference recorded for average distance traveled for double road trains versus triple road trains based on the results of the ABS Survey of Motor Vehicle Usage. As allocated cost per heavy vehicle type is very sensitive to the estimate of average VKT the NTC looked more closely at the SMVU data. The industry view was that in practice these two heavy vehicle types have similar annual average VKT.

The NTC investigation of the data found that there is small sample size used for vehicles in these two classes and the confidence levels in the survey data based on a 95% confidence interval resulted in an overlapping of the top end of the double road train annual average vkt and the lower end of the triple road train annual average VKT. Based on these findings the NTC concluded that it was reasonable to use a weighted average VKT for both of these heavy vehicle classes such that both the double and triple road train vehicle types are modelled on having the same annual average VKT. The impact of this is to increase the

allocated cost for double road trains and decrease the allocated cost for triple road trains due to the higher number of recorded double road trains relative to triple road trains.

A.7.3 Special purpose vehicles

Special purpose vehicles appear to have declined in most aspects of their utilisation. However they represent a very small proportion of the fleet and accordingly this does not strongly influence the overall distribution that much.

A.7.4 Heavy truck trailer combinations

It is noteworthy that the treatment of the heavy truck trailer category within the SMVU has resulted in some changes to the relative usage of those vehicles and the smaller rigid truck-trailer combinations. Previously there was no separate SMVU category for the heavy truck trailers, and numbers had to be estimated based on estimated proportions of the lighter rigid truck-trailers.

Now that this separate category is available, it seems that these trucks are utilised more widely than was indicated by the previous estimation methods. Therefore lighter truck trailer combinations are less prevalent. The flow-on effects of these parameter changes are not straightforward, since there is an interaction of these effects (as well as the changed expenditure profile). Table 5 illustrates these changes.

Table 5. Changes in rigid truck trailer combination usage since the Second Determination

Vehicle type	Number vehicles	Total VKT	GVM.kms	Total Fuel Use (litres)
3 axle with trailer < 42.5t	-6%	-22%	-15%	-11%
4 axle with trailer <42.5t	59%	54%	67%	57%
Heavy truck trailer 42.5t and over	79%	63%	40%	40%

Table 6. Road use data by vehicle type

Vehicle class	Number Vehicles	Distance Travelled	Fuel Use	PCU-km	ESA-km	AGM-km
		(million km)	(million litres)	(million PCU-km)	(million ESA-km)	(million tonne-km)
Light vehicles						
Motor cycles	332,547	1,571	94	1,571		
Passenger cars	8,718,103	122,725	13,585	122,725		
Passenger vans & light buses	220,211	3,527	495	3,527		
4WDs: passenger	1,578,093	27,869	3,581	27,869		
4WDs: light commercial	701,330	12,901	1,689	12,901	566	25,034
Light commercial	1,285,000	23,326	3,114	23,326	958	37,057
Light rigid trucks	77,236	1,649	265	1,649	78	5,526
Rigid trucks						
2 axle rigid trucks						
No trailer: 4.5-7t	47,443	725	147	1,450	38	3,086
No trailer: 7-12t	85,975	1,949	464	3,899	337	13,591
No trailer: over 12t	44,899	968	281	1,936	951	10,558
With trailer	13,439	318	92	636	282	3,380
3 axle rigid trucks						
No trailer:4.5-18t	3,213	60	22	120	41	690
No trailer:over 18t	42,102	1,161	483	2,321	1,683	18,751
With trailer: <42.5t	6,402	307	139	921	361	8,069
4 axle rigid trucks						
No trailer:4.5-25t	1,120	13	5	26	16	250
No trailer: over 25t	4,571	151	70	301	213	3,036
With trailer: <42.5t	263	20	11	60	33	650
Heavy truck trailers over 42.5t	7,208	533	268	1,600	1,651	16,817
Articulated trucks						
3 axle rig	1,320	23	10	68	15	345
4 axle rig	4,186	182	71	545	219	3,989
3 axle trailer: 5 axle rig	1,541	69	31	207	157	1,959
2 axle trailer: 5 axle rig	4,783	304	151	911	540	7,864
6 axle rig	34,991	3,111	1,593	9,332	7,111	102,883
B-doubles < 9 axle rig	1,702	280	157	1,118	913	12,291
B-doubles 9 axles & >	7,862	1,407	835	5,629	4,994	72,476
Double road trains	3,098	414	279	1,657	1,897	24,793
Triple road trains	1,309	175	140	875	988	15,297
Artics > 6axle NEC	2,075	185	119	554	435	9,643
Special Vehicles	12,323	146	42	292	226	3,577
Buses						
2 axle 3.5-4.5t	5,833	126	20	252	6	403
2 axle 4.5-10t	11,847	298	61	595	23	1,607
2 axle over 10t	19,535	812	312	1,625	569	8,123
3 axle	2,215	125	46	375	155	1,899
Articulated	440	17	9	52	13	289
All vehicles	13,284,216	207,447	28,683	230,928	25,470	413,937
Heavy vehicles	365,861	13,752	5,839	37,107	23,862	345,916

Vehicle class	Number Vehicles	Number trailers	Distance travelled km/veh	Fuel Use l/100km	PCU's	ESA's	AGM
Light vehicles							
Motor cycles	332,547	0	4,725	6.0	1	0.00	0.00
Passenger cars	8,718,103	0	14,077	11.1	1	0.00	0.00
Passenger vans & light buses	220,211	0	16,018	14.0	1	0.00	0.00
4WDs: passenger	1,578,093	0	17,660	12.9	1	0.00	0.00
4WDs: light commercial	701,330	0	18,395	13.1	1	0.04	1.94
Light commercial	1,285,000	0	18,152	13.3	1	0.04	1.59
Light rigid trucks	77,236	0	21,354	16.1	1	0.05	3.35
Rigid trucks							
2 axle rigid trucks							
No trailer: 4.5-7t	47,443	0	15,284	20.3	2	0.052	4.26
No trailer: 7-12t	85,975	0	22,673	23.8	2	0.173	6.97
No trailer: over 12t	44,899	0	21,563	29.1	2	0.982	10.91
With trailer	13,439	20,158	23,676	29.0	2	0.887	10.62
3 axle rigid trucks							
No trailer:4.5-18t	3,213	0	18,743	37.1	2	0.685	11.46
No trailer:over 18t	42,102	0	27,567	41.6	2	1.450	16.16
With trailer: <42.5t	6,402	9,603	47,964	45.2	3	1.174	26.28
4 axle rigid truck							
No trailer:4.5-25t	1,120	0	11,400	40.4	2	1.277	19.56
No trailer: over 25t	4,571	0	32,971	46.7	2	1.416	20.15
With trailer: <42.5t	263	394	76,626	54.2	3	1.637	32.29
Heavy truck trailers over 42.5t	7,208	10,811	73,983	50.3	3	3.096	31.54
Articulated trucks							
3 axle rig	1,320	1,981	17,074	43.5	3	0.676	15.32
4 axle rig	4,186	6,279	43,358	39.0	3	1.205	21.97
3 axle trailer: 5 axle rig	1,541	2,312	44,848	44.7	3	2.271	28.35
2 axle trailer: 5 axle rig	4,783	7,174	63,509	49.7	3	1.776	25.89
6 axle rig	34,991	52,487	88,900	51.2	3	2.286	33.07
B-doubles < 9 axle rig	1,702	5,105	164,307	56.2	4	3.265	43.96
B-doubles 9 axles & >	7,862	23,587	178,988	59.4	4	3.549	51.50
Double road trains	3,098	13,940	133,750	67.3	4	4.578	59.84
Triple road trains	1,309	9,814	133,750	80.0	5	5.647	87.41
Artics > 6axle NEC	2,075	3,112	89,038	64.4	3	2.357	52.21
Special Vehicles	12,323	0	11,850	28.4	2	1.546	24.50
Buses							
2 axle							
3.5-4.5t (light vehicle)	5,833	0	21,598	15.5	2	0.05	3.20
4.5-10t	11,847	0	25,119	20.5	2	0.077	5.40
over 10t	19,535	0	41,585	38.4	2	0.701	10.00
3 axle	2,215	0	56,398	37.1	3	1.239	15.20
Articulated	440	0	39,553	51.9	3	0.746	16.60
All vehicles	13,284,216						
Heavy vehicles	365,861	166,757					

B. COST ALLOCATION

The initial approach taken in establishing options for the 2007 Determination has been to largely adopt the Third Determination methodology.

B.1 Local road use

Local road use estimates have historically been one of the weakest areas of research for the estimation of heavy vehicle cost responsibilities, but as part of the Third Determination, a major study was undertaken which has provided far more defensible data.

The key finding from this study on local road use (NTC 2005b) is that there is a much higher percentage of travel on local roads than was previously assumed.

- Light vehicles undertake 37% of their travel on local roads, compared with the Second Determination estimate of 35%.
- Rigid trucks and buses travel 30% on local roads compared with a Second Determination average of 25%.
- Heavy vehicles travel 16% on local roads compared with an average of 5% in the Second Determination.

These estimates provide a useful indication of the proportion of travel on local and arterial roads for different vehicle classes, which is vital in apportioning road expenditure to each vehicle class.

Some commentators believe that the approach used, while a significant improvement on the previous estimates, will systematically over-estimate use of the larger heavy vehicles on local roads. This is because the selection of traffic count sites is believed to be likely to be biased towards sites where there are more of the larger vehicles. Consequently the cost base used in this determination uses a lower estimate of local road use for the larger vehicles of 10%.

The NTC has completed a program of work to verify the findings of the study through a larger survey. The results of this work verified the earlier study's results. However, the methodology for capturing survey results was still subject to the same over-estimation bias and the 10% share used in the Third Determination has continued to be used in this Determination.

B.2 Update of ESA relationships

Measures of deep pavement wear are determined using the Equivalent Standard Axle (ESA) measure. Average ESA's for the heavy vehicle charging categories used in the charges determination are calculated using a series of predictive equations developed through regression analysis relating gross vehicle mass and weigh in motion (WIM) data. The equations used in the Second Determination were based on the best available information at the time. However this was considered to be far less comprehensive and statistically reliable compared to the updated analysis conducted for use in the Third Determination.

While some stakeholders have outlined how this analysis could be improved, it is still thought that these results are the most robust available. Accordingly, the NTC proposes to continue to use the ESA equations used in the Third Determination. More detailed discussion on the ESA work commissioned by the NTC during the Third Determination

and the results are provided in the following NTC reports: (2005b), (2005d) Appendix E and (2006a) Section 6.3.

B.3 Cost allocation rules

Heavy vehicle cost allocations are derived through a series of rules. These describe the basis upon which each of the expenditure categories should be distributed across vehicle classes. The rules are based on the best available scientific information on the relationships between road use and road expenditure needs. In a number of cases, these relationships are not well understood. Nevertheless, compared to other countries, Australia has gone to some effort to attempt to establish well-founded relationships on which to base its cost allocation rules.

In addition, some expenditure categories, or proportions thereof, are not considered to be directly related to vehicle use. However it is thought that they should be recoverable on the grounds that they are common, fixed or non-attributable costs.

The cost allocation rules are based on the following measurements of vehicle use, which are either provided by or derived through the SMVU data series discussed in Appendix B:

- VKT: vehicle kilometres travelled;
- ESA-kms: Equivalent Standard Axle kilometres travelled, which is a measure of deep pavement wear;
- PCU-kms: Passenger Car Unit kilometres travelled, which is a measure of relative road space requirements based on the size of the vehicle;
- AGM-kms: Average Gross Mass kilometres travelled, which is a measure of the mass impacts on the road pavement in general.
- HV VKT: Heavy vehicle kilometres travelled, which is a measure of the relative amount of heavy vehicle travel.

A summary of how these vehicle use parameters inform the cost allocation rules is provided in Table 7.

In general, road expenditure categories that are highly relevant to heavy vehicle use are allocated on the basis of ESA-km, AGM-km, PCU-km or HV VKT. Where expenditure is allocated on the basis of VKT, the light vehicles fleet will absorb most of the apportioned expenditure since it represents the bulk of total kilometres travelled.

Table 7. Allocation of attributable costs to measures of road use

Expenditure Category	Percentage of cost that varies with:						Non-attrib. (VKT)
	Attributable costs					Heavy Vehicle VKT	
	VKT	PCU-km	ESA-km	AGM-km			
A Servicing and operating expenses	100	0	0	0	0	0	0
B Road pavement and shoulder maintenance							
B1 Routine maintenance	0	38	0	38	0	24	24
B2 Periodic maintenance	0	10	0	60	0	30	30
C Bridge maintenance and rehabilitation	0	0	0	33	0	67	67
D Road rehabilitation	0	0	45	0	0	55	55
E Low cost safety/traffic improvements	80	20	0	0	0	0	0
F Asset extension/improvements							
F1 Pavement components	0	0	45	0	0	55	55
F2 Bridges	0	15	0	0	0	85	85
F3 Land acquisition, earthworks, other extension improvement expenditure	0	10	0	0	0	90	90
G Other miscellaneous activities							
G1 Corporate services	0	0	0	0	0	100	100
G2 Enforcement of heavy vehicle regulations	0	0	0	0	100	0	0

While there remains some debate on the finer points of these cost allocation rules, the NTC considers that its judgements on the application of the research outcomes underpinning them represent the most defensible approach to cost allocation. The Productivity Commission has acknowledged the acceptability of these judgements, noting that they fall at the conservative end of the acceptable range. Given this endorsement and the COAG timetable of delivery of this Determination the NTC proposes to continue with these cost allocation parameters. Further detail on cost allocation by the NTC is provided the following Third Determination publications: NTC (2005d) Chapter 5 and NTC (2006a) Chapter 6.

B.4 Cost allocation results before road train adjustment

The result of this cost allocation process is that total allocated costs come to \$8,260 million with \$1,977 million allocated to heavy vehicles and \$6,283 million to light vehicles.

From this process unit cost rates for the two measured road types can be calculated as shown in Table 8. These are calculated by taking the expenditure allocated using each measure of road use and dividing it by the total amount of road use, based on that measure.

For example, arterial road expenditure allocated using distance travelled (i.e. VKT) on arterial roads is divided by the total VKT on arterial roads. This gives the cost per kilometre travelled for arterial roads. The same process was used to calculate unit rates for other cost allocation parameters, for each of arterial roads, local roads and the total.

It is clear from these results that the expenditure allocated per ESA-km and AGM-km is greater on local roads than on arterial roads, but expenditure allocated per kilometre travelled and per PCU-kilometre is lower on local roads than on arterial roads. This is because some types of vehicles spend more time on local roads than others. Consequently, the share of total ESA-km, AGM-km, VKT and PCU-km for each vehicle type varies between local roads and arterial roads. Although the proportion of expenditure allocated using each parameter is the same on each road type, these shares are allocated between vehicle types differently because of the difference in local road use.

Table 8. Unit costs for heavy vehicles by road type including 2007/08 budget data

Unit Parameter	Arterial	Local	Total
Vehicle Kilometres Travelled (c/km)	1.39	0.58	1.22
Passenger Car Units (c/PCU-km)	0.37	0.23	0.34
Equivalent Standard Axles (c/ESA-km)	3.41	4.50	3.58
Average Gross Mass (c/tonne-km)	0.12	0.31	0.14
Non-attributable costs (c/km)	2.80	1.10	2.44

B.4 Cost allocation results after road train adjustment

The allocated cost results above are modified marginally to accommodate some special circumstances concerning road trains which are explained in detail below. The net result is that there is re-distribution of total allocated costs with heavy vehicle allocated cost falling by \$24 million to \$1,953 million and light vehicle allocated cost increasing by \$24 million to \$6,307 million.

B.4.1 Adjustment for road train travel on unsealed roads

The \$1,977 million of allocable heavy vehicle expenditure is adjusted to take account of road train travel on unsealed roads. The aggregate model used to allocate costs to vehicle classes has two limitations that are problematic for road train costs, but are not a significant factor for other vehicle types. The model treats all roads the same – it does not reflect the differing factors impacting on costs on unsealed roads; and it does not take account of the fact that some arterial road expenditure is not warranted by traffic levels but is necessary to support remote or small regional communities.

The cost allocation process assumes that all roads deteriorate or wear out in the same way as sealed roads, and that the contribution of different vehicles to this wear is measured by equivalent standard axles (ESAs). However, unsealed roads deteriorate with the effects of rainfall, wind, wheel passes and to some extent the tonnes carried. Allocating pavement wear costs to road trains using ESA-km that include their use of unsealed roads will therefore overestimate their share of costs.

Road train operators have indicated that a significant amount of their travel is on unsealed roads. The NTC undertook a process of gathering information from operators and associations on the extent to which this is so, see NTC (2006a) Appendix F for further

detail on the results of this survey. The values tend to be focused around 30-35%, with double road trains falling towards the lower end of this estimate, and triple road trains toward the higher. Therefore, respective reductions of 30 and 35% were made to the costs allocated to double and triple road trains based on their ESA-km. This expenditure was re-allocated to the fleet on the basis of vehicle kilometres travelled (VKT). This is consistent with treating the expenditure that was inappropriately allocated to road trains as either a servicing and operating cost for the network or as a non-attributable cost. Since light vehicles travel significantly greater distances in total than heavy vehicles, this re-allocation resulted in proportionately more costs being allocated to light vehicles than heavy vehicles. The net result is that heavy vehicle allocated costs are reduced from \$1,977 million to \$1,953 million.

In the absence of any better information, the NTC has applied these assumptions in the development of options for the 2007 Determination.

B.4.2 Road train community service obligation

The issue of dealing with road expenditure in remote areas based on community needs was raised in the Third Determination consultation process. The NTC sought responses from road authorities regarding the level of road expenditure that falls into this category. Road authorities were unable to provide an accurate estimate of this expenditure due to definitional issues, but available estimates were generally in the range of 2 to 7%. The NTC used an estimate of 5% to be used in the absence of any firmer indication of the size of this factor. This was applied as a way of reducing the recoverable allocated costs of road trains, since these are the only vehicles whose access is restricted such that they travel exclusively in these areas. This amounts to \$7.6 million across the road train vehicle classes.

Typically, the decision to grant Community Service Obligations is made by central agencies in light of full information of funding arrangements. Since it is not the role of the NTC to make funding decisions, it has determined that this \$7.6 million should be recoverable by other vehicles within the fleet, and as such has no impact on the total heavy vehicle allocated cost.

B.4.2 Adjustments made to allocated cost due to road train factors

The impact of the road train adjustments are to modify attributable costs as shown in Table 9

**Table 9. Costs allocated to each vehicle class after road train adjustments
\$m**

	Old Attributable	New attributable	Non- attributable	New Total Allocated Cost
Motor cycles	15.7	15.9	33.9	49.7
Passenger cars	1225.1	1240.4	2644.4	3884.8
Passenger vans & Light buses	35.2	35.7	76.0	111.7
4WDs: passenger	278.2	281.7	600.5	882.2
4WDs: light commercial	192.2	193.8	278.0	471.8
Light commercials & Other	331.4	334.3	502.6	836.9
Light rigid trucks	28.6	28.8	35.5	64.4
Rigid trucks				
2 axle no trailer: 4.5-7t	19.1	19.2	16.5	35.7
2 axle no trailer: 7-12t	68.6	68.9	44.3	113.2
2 axle no trailer: over 12t	69.9	70.0	22.0	92.0
2 axle with trailer	21.7	21.7	7.2	29.0
3 axle no trailer: 4.5-18t	3.7	3.7	1.4	5.1
3 axle no trailer: over 18t	114.1	114.3	26.4	140.7
3 axle with trailer < 42.5 t	32.8	32.9	7.0	39.9
4 axle no trailer: 4.5-25t	1.2	1.2	0.3	1.5
4 axle no trailer: over 25t	15.6	15.6	3.4	19.0
4 axle with trailer: < 42.5t	2.7	2.7	0.5	3.2
Heavy truck trailers over 42.5t	100.5	100.6	12.1	112.7
Articulated trucks				
3 axle rig	1.5	1.5	0.6	2.1
4 axle rig	17.5	17.5	4.7	22.3
3 axle trailer: 5 axle rig	9.9	9.9	1.8	11.7
2 axle trailer: 5 axle rig	37.2	37.3	7.9	45.2
6 axle rig	468.8	469.2	81.1	550.4
B-doubles < 9 axle rig	57.1	57.2	7.3	64.5
B-doubles 9 axles & >	316.4	316.6	36.7	353.3
Double road trains	107.1	90.6	10.8	101.4
Triple road trains	57.4	48.0	4.6	52.6
Artics > 6axle NEC	33.1	33.1	4.8	37.9
Special Purpose	17.7	17.8	2.8	20.6
Buses 2 axle 3.5 to <4.5t	2.5	2.6	2.9	5.4
Buses 2 axle 4.5 to 10.0 t	8.7	8.7	6.8	15.5
Buses 2 axle >10t	48.8	48.9	18.5	67.4
Buses 3 axles	11.1	11.1	3.3	14.3
Articulated	1.3	1.3	0.5	1.7
All Vehicles	3752.7	3752.7	4506.9	8259.6
Heavy Vehicles Only	1643.6	1619.5	333.2	1952.7

B.4.3 Allocated cost by road type

Table 10 shows the breakdown of allocated cost by road type and split between attributable and non attributable costs.

Table 10. Costs allocated by road type: attributable and non-attributable costs after road train adjustments in 2007/08 \$m

Vehicle Type	Road Type		Total
	Arterial	Local	
Allocated Expenditure			
Light vehicles	4,866	1,441	6,307
Heavy vehicles	1,590	362	1,953
All vehicles	6,456	1,803	8,260
Non-Attributable			
Light vehicles	3,389	785	4,174
Heavy vehicles	301	33	333
All vehicles	3,690	817	4,507
Attributable			
Light vehicles	1,477	656	2,133
Heavy vehicles	1,289	331	1,620
All vehicles	2,766	987	3,753

B.4.4 Allocated cost changes since the Second Determination

Since the Second Determination there has been considerable change in heavy vehicle allocated by vehicle type both in nominal and real terms, with most heavy vehicle types experiencing a real fall in allocated cost, see Table 11.

However, despite most heavy vehicle types having a lower real allocated cost in aggregate heavy vehicle allocated cost has risen marginally by 3% in real terms, see Table 12. The reason for this is that where real increases have occurred they have tended to be in vehicle categories with a relatively large number of vehicles. In particular the overall result is influenced by the 53% real increase in allocated cost for the 2 axle no trailer rigid truck in the 7 to 12 tonne GVM range which has by far the largest number of heavy vehicles accounting for 23% of the total.

The differing movements between categories are due to various factors in particular movements in annual average VKT, with the increase in annual average VKT of 52% for the 2 axle no trailer rigid truck 7 to 12 tonne vehicle types, the main factor in the 53% increase in allocated cost in real terms.

Table 11. Heavy vehicle allocated cost per vehicle - changes since the Second Determination

Vehicle Class	2nd Det.		2007 Det	2007 Det/2 nd Det	2007 Det/2 nd Det
	\$/vehicle nominal	\$/vehicle real 2007/08	\$/vehicle	Nominal change	Real change
Rigid trucks					
2 axles					
No trailer: 4.5-7t	540	802	751	39%	-6%
No trailer: 7-12t	580	861	1,316	127%	53%
No trailer: over 12t	1,540	2,287	2,050	33%	-10%
With trailer	1,070	1,589	2,155	101%	36%
3 axles					
No trailer: 4.5-18t	1,060	1,574	1,586	50%	1%
No trailer: over 18t	2,470	3,668	3,341	35%	-9%
With trailer < 42.5t	5,630	8,361	6,226	11%	-26%
4 axles					
No trailer: 4.5-25t	2,190	3,252	1,368	-38%	-58%
No trailer: over 25t	3,390	5,034	4,162	23%	-17%
With trailer: <42.5t	8,490	12,608	12,025	42%	-5%
Heavy truck trailers over 42.5t	9,660	14,345	15,634	62%	9%
Articulated trucks					
3 axle rig	2,910	4,321	1,614	-45%	-63%
4 axle rig	5,160	7,663	5,322	3%	-31%
3 axle trailer: 5 axle rig	17,080	25,364	7,624	-55%	-70%
2 axle trailer: 5 axle rig	7,970	11,835	9,446	19%	-20%
6 axle rig	15,940	23,671	15,729	-1%	-34%
B-doubles < 9 axle rig	30,630	45,486	37,883	24%	-17%
B-doubles 9 axles & >	36,630	54,396	44,932	23%	-17%
Double road trains	32,050	47,594	31,091	-3%	-35%
Triple road trains	46,090	68,444	38,192	-17%	-44%
Artics > 6axle NEC	18,550	27,547	18,286	-1%	-34%
Special Vehicles	2,090	3,104	1,670	-20%	-46%
Buses					
2 axle					
4.5 to 10.0 t	850	1,262	1,304	53%	3%
>10t	2,500	3,713	3,449	38%	-65%
3 axles					
Articulated	4,620	6,861	3,909	-15%	-6%

Table 12. Summary of heavy vehicle allocated cost changes since the Second Determination

Costs	Second Determination		2007 Determination	Change	
	(\$m nominal terms)	(\$m real terms 07/08)	(\$m)	Nominal	Real
Total Road Agency Expenditure	6,423	9,538	12,347	92%	29%
All Vehicle Allocated Costs	4,570	6,786	8,260	81%	22%
Attributable Costs	1,860	2,762	3,753	102%	36%
Non-Attributable Costs	2,710	4,024	4,507	66%	12%
Heavy Vehicle Allocated Costs	1,283	1,905	1,953	52%	3%
Attributable Costs	1,065	1,582	1,620	52%	2%
Non-Attributable Costs	218	324	333	53%	3%

Table 13 shows the changes in some of the relativities between various aspects of allocated costs since the Second Determination.

Table 13. Key changes in proportions of costs allocated since the Second Determination

	Second Determination	2007 Determination
All vehicle allocated costs/total road expenditure	71%	67%
All vehicle attributable costs/all vehicle allocated costs	39%	45%
Heavy vehicle allocated costs/all vehicle allocated costs	28%	24%
Heavy vehicle attributable costs/heavy vehicle allocated costs	83%	83%

C. METHODOLOGY FOR CALCULATING CHARGE RECOVERY

Meyrick and Associates were asked to assess the NTC and ATA methodologies for calculating heavy vehicle charge revenues. The revenue estimate is compared against the expenditure estimate to determine whether heavy vehicle charges over or under recover expenditure. The remainder of this section is the final Meyrick report which NTC in response to the request.

C.1 Introduction

The prime focus of this study is on explaining the differences between the NTC and ATA approaches to heavy vehicle charge revenue estimates and making an assessment of which approach is more valid.

The ATA put forward two approaches in response to the NTC Heavy Vehicle Charges Draft RIS. The discussion of figures and methods outlined in this study relate to these.

The initial approach was provided to the NTC (in the form of a spreadsheet) prior to the ATA's formal submission. This is referred to as 'the initial approach'. The approach discussed in the formal ATA submission to the NTC of 8 August 2007 is referred to as 'the submission approach'.

In the initial approach and, it is assumed in the submission approach, the ATA uses the cost allocation base that is the preferred option in the draft RIS. This option includes adjusted enforcement and has a total heavy vehicle allocated cost of \$1,828 million.

However, in the initial approach, the ATA estimates heavy vehicle charge recovery at \$2,118 million compared to the NTC estimate of \$1,697 million. This divergence is reduced in ATA's submission approach to \$1,959 million.

As outlined below, the differences are due to the ATA's broader definition of relevant fuel charge revenues for inclusion, and its methods of indexing charge revenue to put into 2006-07 terms.

This report details:

1. The NTC approach to estimating heavy vehicle charge revenue
2. The ATA approaches to estimating heavy vehicle charge revenue
3. A comparison of the three methods to determine the points at which divergence in the heavy vehicle charge estimates occur.
4. A critique of the elements of the ATA method which differ from the NTC method including:
 - The inclusion of an estimate of the costs recovered through the now defunct low sulphur diesel excise in the fuel excise revenue element of the calculation
 - The inclusion of petrol excise cost recovery in the fuel excise revenue element of the calculation
 - The inclusion of the metropolitan boundaries excise differential cost recovery in the fuel excise revenue element of the calculation
 - The use of the Road Construction and Maintenance Price Index (RCMPI) or CPI to index revenue figures.

- NTC approach to estimating heavy vehicle charge revenue

In determining heavy vehicle charge revenue the NTC:

- takes the road usage data for the year that falls in the middle of the cost allocation period — in 2007, the arterial road expenditure period was 2000/1 to 2006/07 and thus the middle year was 2003/04
- multiplies 2003/04 road usage data by current registration and fuel charges of 19.633 cents per litre¹ to determine revenue estimate in 2006/07 prices.

The 2006/07 heavy vehicle charge recovery in total equals \$1,697 million, comprised of \$558 million in charges from registration and \$1,109 million in fuel charges.

C.2 ATA initial approach to estimating heavy vehicle charge revenue

C.2.1 Revenue from fuel

In addition to the diesel excise cost recovery amount (calculated by taking 03/04 vehicle profile fuel consumption, multiplied by the proportion of heavy vehicles using diesel (98.25%), multiplied by the diesel excise recovery amount, which is as in NTC method, 19.633 cents per litre (for 2003/04)). the ATA added the following elements to determine a nominal fuel cost recovery figure for the year ending October 2003/04:

- A petrol excise cost recovery amount (calculated by taking 03/04 vehicle profile multiplied by the proportion of heavy vehicles using petrol (1.26%), multiplied by the general excise rate of 38.143 cents/litre)
- A low sulphur diesel excise differential cost recovery (calculated by assuming 50 % of all diesel sold during the period of the differential (July 2003 to June 2006) in question was low sulphur diesel (year ending 31 October 2005))
- A ‘metropolitan boundaries excise differential cost recovery’ (estimated at \$130 million in 06/07) derived from the cost of removing the revenue measure calculated by the Australian Government.

C.2.2 Revenue from vehicle registrations

To determine heavy vehicle charge revenue, the ATA combined registration revenue for the year ending October 03/04, and fuel charges for the year ending October 03/04 (as described above), and indexed this by RCMPI to determine revenue estimate in 2006/07 prices.

Under this method, the 06/07 heavy vehicle charge recovery in total equals \$2,118 million comprised of \$662 million in charges from registration and \$1,456 million in fuel charges.

¹ Since March 2001, the diesel excise cost recovery amount has been the net of the general excise rate of 38.143 cents/litre less the heavy vehicle diesel fuel rebate of 18.51 cents/litre = 19.633 cents/litre.

C.3 ATA submission approach of estimating heavy vehicle charge revenue

Following advice from the Allen Consulting Group, the ATA made the following changes to the initial approach as described above:

- The RCMPI was replaced by the CPI in order to index the year ending October 03/04 usage data
- A ‘petrol excise cost recovery amount’ was incorporated into the \$130 million (2006/07) cost recovery amount for the metropolitan vehicles exempted from the on-road diesel grant.

This reduces the total 06/07 heavy vehicle charge recovery to \$1,959 million, comprised of \$617 million in charges from registration and \$1,342 million in fuel charges.

C.4 Comparison of methods

Figure 1 and Figure 2 illustrate the points in the NTC and ATA approaches where the value of the revenue estimate differs. Comparing Figure 1 with Figure 2 reveals the changes between the ATA’s initial and submission approaches.

Figure 1. Figure 1 NTC approach contrasted with ATA initial approach

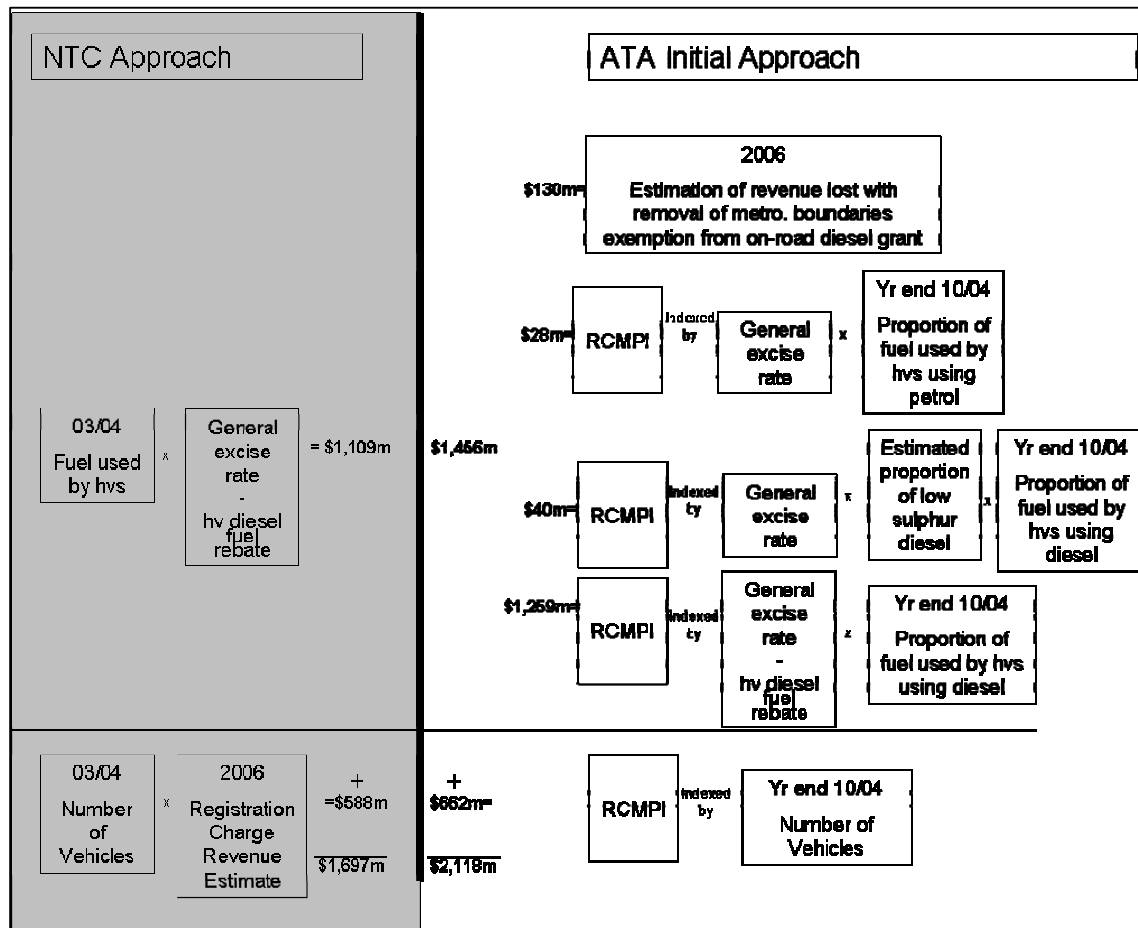
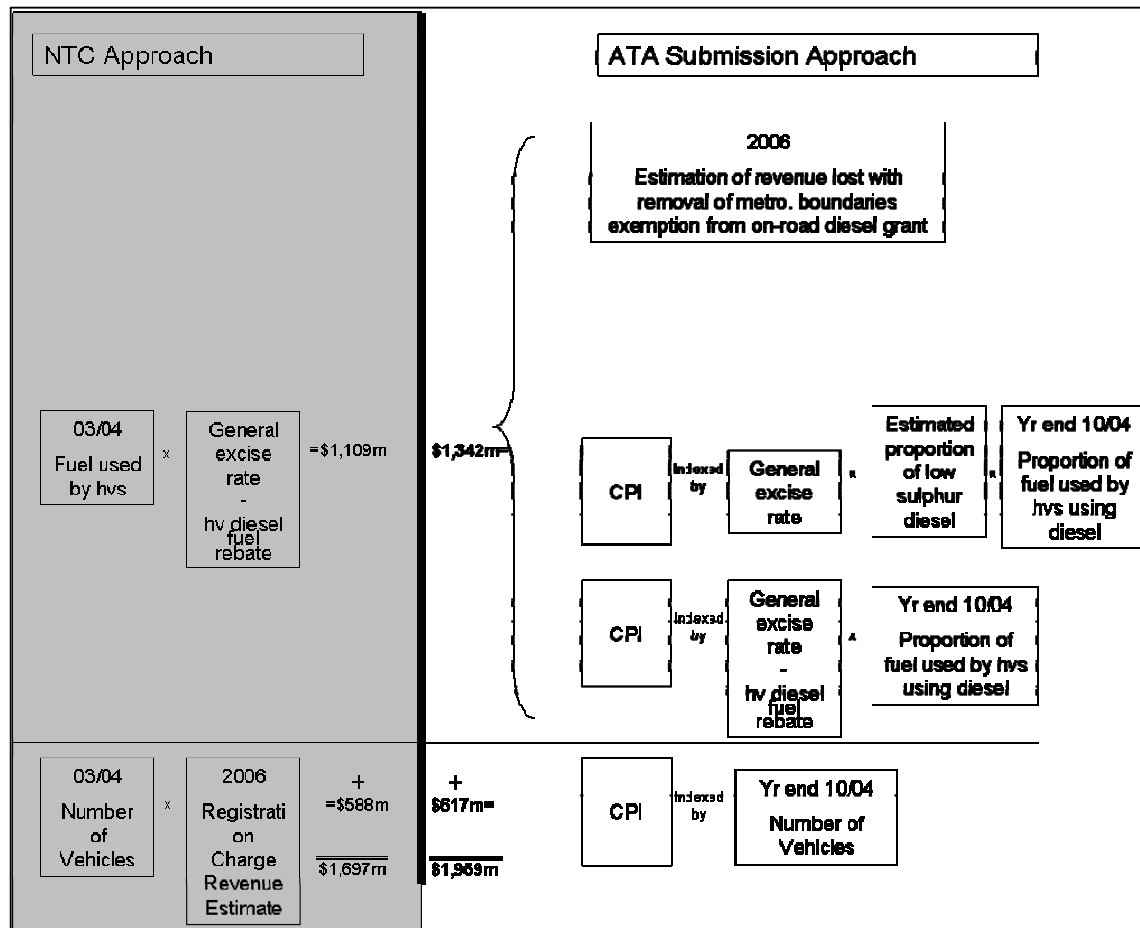


Figure 2. NTC approach contrasted with ATA submission approach



C.5 Critique

The ATA approach results in significant divergences between its heavy vehicle charge recovery figures and those of the NTC. The elements of divergence that demand critical attention are:

- The inclusion of an estimate of the costs recovered through the now defunct low sulphur diesel excise in the fuel excise revenue element of the calculation
- The inclusion of petrol excise cost recovery in the fuel excise revenue element of the calculation
- The inclusion of the metropolitan boundaries excise differential cost recovery in the fuel excise revenue element of the calculation
- The use of the Road Construction and Maintenance Price Index (RCMPI) and the CPI to index revenue figures.

C.5.1 Inclusion of low sulphur diesel cost recovery charge

The NTC has sought previous advice regarding this issue (van Geldermalsen, May 2007), which concludes that the inclusion of the cost is inappropriate and inconsistent with the objectives of the NTC pricing work because:

1. the objective of the excise differential was to encourage the early production and consumption take-up of low-sulphur diesel. The government mandated the use of low sulphur diesel (\leq sulphur content of 50ppm) for its environmental benefits over traditional diesel fuel sulphur content standards (sulphur content of 500ppm). As such the differential supports environmental objectives and provides support for industry in a transitional phase. In other words, the differential is not related to recovery of road expenditure. In fact, in announcing the measure the then Minister for Environment and Heritage Dr David Kemp noted "This is the first time that government excise credits have been directly tied to environmental performance," (Federal Minister for the Environment and Heritage 2004).
2. This was a transitional charge only and was dissolved as of 1 January 2006. Therefore, using it within a base that determines future charges is inappropriate.

It is our view that these arguments are both sound.

Furthermore, it would be inappropriate for the 2007 Determination to incorporate into the revenue base revenue which is related to an environmental externality, given the COAG road reform plan to review PAYGO and the application of externalities being undertaken post this Determination (NTC, 2007).

Under the current ATA methodology this charge is only incorporated into the cost recovery side of the charging equation. If it could be justified that the sulphur diesel cost recovery charge was related to the provision of infrastructure, and we argue above that it cannot, and then the argument could follow that the value of sulphur emissions should be added to the allocated cost base. A first cut estimate is outlined in Table 14. In this estimate the cost of high sulphur diesel emissions is calculated at approximately \$1 million in the inner areas of larger capital cities (06/07) whilst the use of ultra low sulphur diesel reduces this figure tenfold to approximately \$100,000.

Table 14. Calculation of the value of sulphur emissions

	Band 1 [†]	Band 2 [†]	Band 3 [‡]	Band 4 [£]
06/07 AUD\$ per 100 million litres of high sulphur diesel (500ppm) used	\$1,033,665	\$397,843	\$54,329	\$4542
06/07 AUD\$ per 100 million litres of ultra low sulphur diesel (50 ppm) used	\$103,366	\$39,784	\$25,433	\$454
* Inner areas of larger capital cities (Sydney, Melbourne, Brisbane, Adelaide and Perth).				
† Outer areas of large capital cities.				
‡ Other urban areas, including other capital cities (Canberra, Hobart and Darwin) and other urban areas				
£ Non-urban areas.				
Worked example (Band 1 High sulphur diesel \$ per 100,000,000)				
The worked example below outlines the method used to determine Band 1 \$ per hundred million				

litres of high sulphur diesel used			
Step	Assumption	Result	Numeric
1 Determine pollutants from Sulphur	All pollutant is in the form of SO ₂		
2 Determine sulphur content of 1 tonne of pollutant	Using the atomic weight of sulphur (32) and molecular weight of oxygen (32), 0.5 tonne of sulphur results in 1 tonne of sulphur dioxide.	0.5	
3 Determine equivalent tonnage of fuel for tonnage of Sulphur	Sulphur content of 500ppm	1000	
4 Determine equivalent cost for a kg of fuel	Using banded health costs of Sirikijpanichkul, A, Iyengar, M and Ferreira L (2006)**	0.01138	
5 Determine cost in 2003 AUD per litre of fuel	Assume diesel density of 0.835 grams per milliliter as per Apelbaum 2005)	0.95023	cents per litre 03/04 prices
6 Index to 2006/07	Use CPI increase in absence of further analysis of appropriateness of index	1.034	cents per litre 06/07 prices
7 Convert cents per litre to \$ per hundred million litres		\$1,033,665	Dollars per 100 million litres 06/07 prices
**Assumed Unit Health Costs for Pollutant Emissions in 2003 AUS \$ per Tonne of SO _x from Sirikijpanichkul, A, Iyengar, M and Ferreira L (2006)		Band 1	\$11,380
		Band 2	\$4,380
		Band 3	\$2,800
		Band 4	\$50

Even if this method of calculation is considered appropriate, we argue that the temporal nature of the excise differential (2004-2006) and the fact that the cost of sulphur emissions has been effectively external to the operational decisions for the history of pricing apart from 2004-06 results in it being inappropriate to retrospectively implement a value on the allocated cost base.

C.5.2 Treatment of petrol fuelled heavy vehicles and metropolitan heavy vehicles less than 20 tonnes

It is our understanding that the ATA initial approach of incorporating the petrol excise cost recovery differs from the NTC in that it multiplies the petrol driven heavy vehicle fuel consumption by the general excise rate of 38.143 cents per litre, rather than the NTC excise cost recovery amount of 19.633 cents per litre. In its working spreadsheet the ATA notes that this approach is used because 'prior to 1 July 2006 petrol (sic) was not eligible for the on-road diesel grant'.

The ATA has similarly argued that the cost recovery from fuel excise should also incorporate a particular line to account for the revenue received from metropolitan heavy vehicles less than 20 tonnes, given that they were not eligible to receive the 18.51 cents per litre rebate. To estimate this element ATA has utilised a figure of \$130 million for the 2006/07 year, a figure sourced from a Federal Government 2004 estimate of the reduction in Federal Government revenue that would occur by incorporating these vehicles into the rebate scheme.

Providing or not providing a rebate is a government taxation issue rather than a road pricing issue per sé. The diesel rebate of 18.51 cents per litre is effectively a rebate of a tax on diesel fuel to heavy vehicle operations. Whether the government chooses to allow some vehicles to request a rebate while excluding others, in itself does not change the agreed element of the fuel cost that is attributable to road costs (i.e., the 20 cents agreed to as the fuel charge in the Second Determination which, given lack of indexation, has fallen to the nominal figure 19.633 cents.)

Further to this argument is the fact that, like the sulphur diesel rebate, these rebate exemptions only applied within the period of the determination. The inclusion of temporal and historic exemptions does not improve the calculation of future heavy vehicle recovery levels.

Although the treatment of the petrol excise issue changes in the ATA Submission approach (whereby they appear to incorporate the petrol excise revenue estimate within the total estimate of \$130 million that they previously had for the metropolitan heavy vehicles) the arguments above still hold.

C.5.3 Indexation of fuel charges

Although the current annual adjustment process allows for a certain level of indexation of vehicle registration, the fuel charge has not been revised since agreed to in the second determination. This charge of 20 cents has decreased in both nominal and real terms since the second determination. Therefore, it can be argued that determining a fuel charge and then using a price index to bring it to 2006/07 prices is highly inappropriate.

C.5.4 Using the RCMPI as an index

In its initial approach the ATA argues that the use of the RCMPI to index nominal cost recovery values for the year ending October 2004 into 2006-07 prices is appropriate, given that this index is utilised in the road expenditure side of the pricing determination. Therefore, it argues, road costs and heavy vehicle revenue ought to be indexed using the same approach.

It is our view that the use of the RCMPI to index any of the revenue elements is inappropriate. The RCMPI does not reflect the change in the real value of money, nor is it an index that tracks actual change in the cost of fuel or vehicle registration costs vis-à-vis the other costs incurred by heavy vehicle transport operators.

A comparison of using the RCMPI's predecessor, the Road Construction Price Index (RCPI), to adjust heavy vehicle registration charges, was undertaken in the development of the Annual Adjustment process. It was found that of six options considered (including the current 'Adjustment formal approach') it was the least favourable across a number of equity and efficiency objectives (NRTC, 2001).

The NTC method of indexation of vehicle registration charges through the annual adjustment process is capped at the rate of CPI (and has a floor of current nominal registration charges for each vehicle type). This method is considered more appropriate and was endorsed at the meeting of the Australian Transport Council in May 2001, where it was agreed that heavy vehicle registration charges would be adjusted annually by a formula based on changes in road expenditure, modified to reflect changes in road use by heavy vehicles.

C.5.5 Using CPI as an index

In the ATA submission approach the RCMPI is replaced with the CPI as index method for both vehicle registration and fuel excise revenue. In calculations undertaken by the NTC it was found that this indexing method yields over-estimates of the 2006/07 revenue for both fuel excise and vehicle registration costs. In terms of fuel, the ATA submission approach yields a road user charge of 21.143 cents. This is not in line with the actual value of 19.633 cents. As discussed in section C.5.3, the application of any index on such a real value figure is economically inappropriate and, in this case inflates the charge recovery levels significantly above those in the NTC Method.

In terms of the vehicle registration the application of the CPI index on 2003/04 figures outstrips the pace of the real increase in registration under the annual adjustment formula.

C.6 Conclusion

In critiquing the ATA approaches to estimating heavy vehicle charge recovery this paper finds that:

- It is inappropriate to incorporate an estimate of the costs recovered through the now defunct low sulphur diesel excise in the fuel excise revenue element of the calculation, given the temporal nature of the element, the fact that it is not related to road construction or maintenance and the COAG direction that this determination should not incorporate externality costs.
- The ATA approach of incorporating revenue from the metropolitan boundaries excise and the petrol excise cost recovery in the fuel revenue element is not justified, given that the agreed to element of the fuel revenue that is related to the cost of road provision is 19.633 cents.
- The ATA use of the Road Construction and Maintenance Price Index (RCMPI) or CPI to index either the vehicle registration or fuel revenue does not result in a more accurate representation of the actual revenue accrued from these charges than the NTC approach. This is particularly the case with fuel revenue which has not been inflated with price movements over the period of the determination.

D. THE NTC CHARGING MODAL

D.1 Current structure of charges

The current charging system comprises:

1. a fuel charge levied by the Australian Government through fuel excise (with the diesel fuel rebate set so that the effective level of excise paid by heavy vehicles matches the fuel charge agreed through the NTC's processes by the ATC); and
2. annual registration charges that vary by vehicle size (Gross Vehicle Mass), number of axles and trailer configuration and which are levied by State and Territory governments.

D.2 Major factors that determine heavy vehicle charges within the NTC charge modal

The pricing principles require that the combination of the fuel charge and annual registration charges are set so that, on average, each class of heavy vehicle pays its share of allocated road expenditure minimising under and over-recovery.

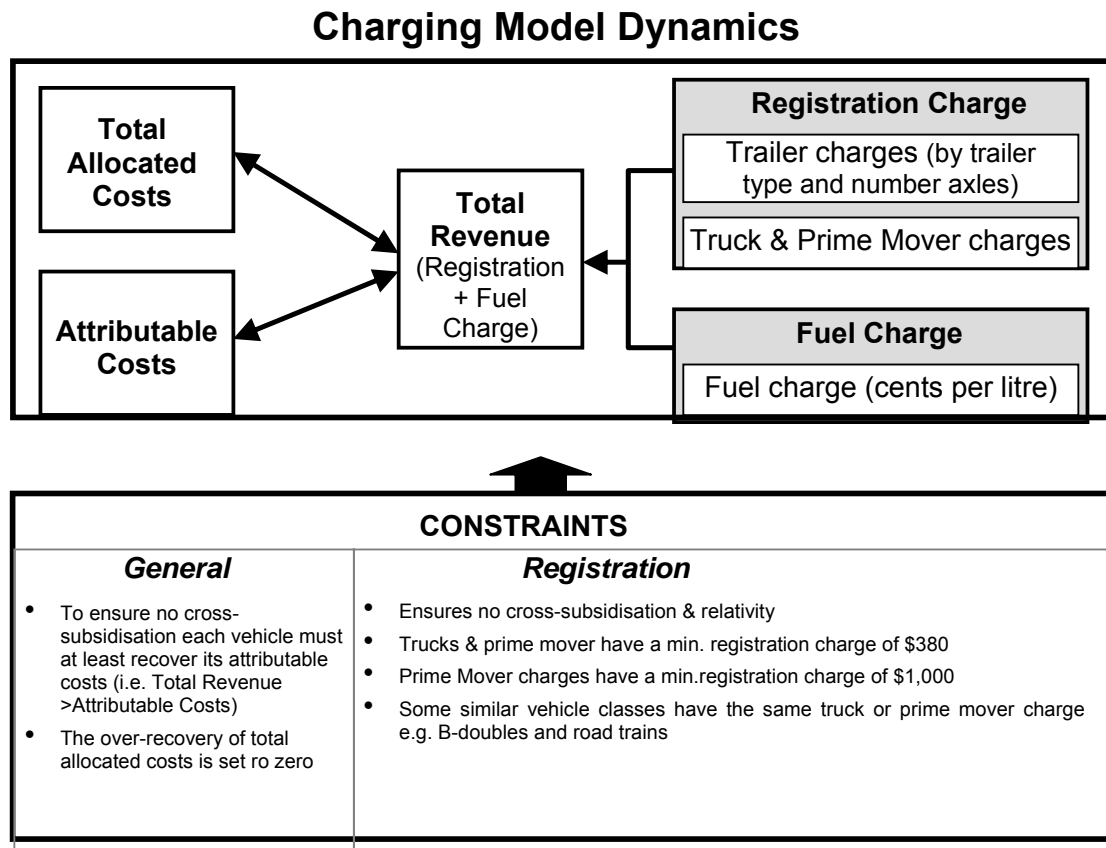
The major factors and constraints that influence heavy vehicle charges are summarised in Figure 3. For each heavy vehicle type an allocated cost is derived which consists of both an attributable and non-attributable or common cost. That allocated cost is recouped through both the fuel charge and the registration charge which consists of both a vehicle and trailer component.

In past Determinations the registration charge on the truck or prime mover was a residual that resulted from subtracting from allocated cost an independently set fuel charge and trailer axle charge. However, various constraints applied such as minimum access and prime mover charges and rules that maintained an appropriate relativity between vehicles of gradually higher mass and a general rule that no charges were allowed to fall below current levels. In addition B-doubles were given a subsidy which resulted in over recovery in aggregate in the 2nd and 3rd Determination with rigid trucks and buses over recovering and B-doubles under recovering.

In the current Determination some of these constraints have been removed such as the inability to decrease registration charges whilst other have been added such as all vehicle types must at least cover their attributable costs and there must be zero over recovery in aggregate (see the constraints listed in Figure 3). In addition the fuel charge is now dynamically established within the model but does not change radically from current levels due to the past structure of charges which has resulted in roughly a third of allocated cost being distributed to registration and two thirds to fuel. Also, the introduction of differential trailer charges rather than the same per axle charge for all trailer types has added a new dimension of flexibility to establishing the best charge mix which covers attributable costs for all heavy vehicle types.

The fuel charge goes through two main iterations in the first run of the charging model a fuel charge is derived based on all of the constraints except for the constraint to have zero over recovery in aggregate. This provides a fuel charge very close to the final result. Then a goal seek function is used to achieve zero over recovery which provides the final fuel charge and registration charges.

Figure 3. Charge modal flow chart



E. ANNUAL ADJUSTMENT

E.1 Current annual adjustment methodology

Annual adjustment Options 1 and 2 involve using the current annual adjustment mechanism (as per the *Automatic Annual Procedure for Heavy Vehicle Charges Regulatory Impact Statement*, September 2001). This mechanism adjusts annual charges in accordance with the main influences on the level of charges, namely: changes in road expenditure and expected changes in road use (via the number of heavy vehicles and expected change in their use (VKT)).

This process can be summarised as:

$$\text{The Annual Adjustment (\%)} = \text{Road Expenditure Factor} + \text{Road Use Factor}$$

The **road expenditure factor** is the impact on total heavy vehicle cost/vehicle due to a change in the four different types of road expenditure (arterial urban and rural; and local urban and rural) whilst the **road use factor** is the impact on total heavy vehicle cost/vehicle due to a change in road use. The second part of this equation has traditionally been represented as “minus the road use factor”, in which the road use factor is a positive value. This is consistent with the equation above since the calculation of the “road use factor” itself will be a negative number.

The change in road expenditure (%) refers to the change in seven year moving average road expenditure while “road use” refers to the change in vehicle kilometres travelled and vehicle numbers.

The annual adjustment calculation relies on having an understanding of the sensitivity of heavy vehicle cost/vehicle to changes in each of the four types of road expenditure and also road use.

Therefore, based on the cost allocation model, sensitivity factors are established based on the impact on heavy vehicle costs of a 1% change in each of these variables – “A” Factors for the road expenditure types and “B” Factors for road use.

⇒ Road Expenditure “A” Factors

- Rural Arterial (A1 Factor)
- Rural Local (A2 Factor)
- Urban Arterial (A3 Factor)
- Urban Local (A4 Factor)

⇒ Road Use “B” Factors – Vehicle Kilometres Travelled (VKT)

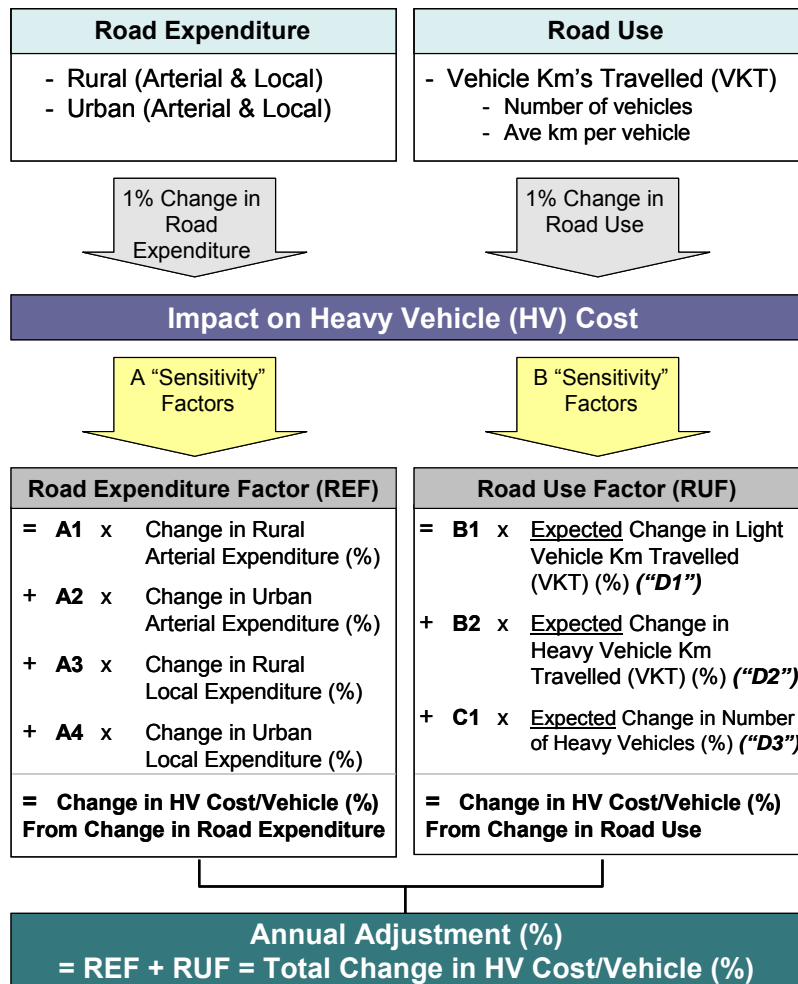
- Light Vehicle Km Travelled (B1 Factor)
- Heavy Vehicle Km Travelled (B2 Factor)

⇒ Road Use “C” Factor – Number of Vehicles

- C is set at -1 since a 1% increase in the number of vehicles decreases
- the ratio (cost/vehicle) by 1%.

Subsequently, a more detailed outline of the process is outlined below:

Figure 4. Current annual adjustment methodology (developed in 2001)



The D Factors (D1, D2 and D3) from this annual adjustment equation refer to the expected change in light and heavy vehicle kilometres travelled and the expected change in the number of heavy vehicles. The current values for the A and B Factors (as established in the 2001 Determination process) are outlined below:

Figure 5. Current sensitivity factor values

Road Expenditure Factor		
A1	Rural Arterial	0.60
A2	Urban Arterial	0.21
A3	Rural Local	0.17
A4	Urban Local	0.02
Road Use Factor		
B1	Light Vehicle VKT	-0.21
B2	Heavy Vehicle VKT	0.22

In the 2001 Annual Adjustment Procedure, the expected change in Vehicle Kilometres Travelled and Number of Vehicles was set at:

- Light Vehicle VKT Growth
= 70% of GDP = 2.1% p.a. = **D1 in Figure Above**
- Heavy Vehicle VKT Growth
= 80% of GDP = 2.4% p.a. = **D2 in Figure Above**
- Number of Heavy Vehicles Growth
= 1% slower than HV VKT = 1.4% = **D3 in Figure Above**
- GDP = 3.0% p.a.

E.2 Updated components using 2007 Determination costing model

New A and B Factors have been generated using the 2007 Determination cost allocation model by analysing the sensitivity of total allocated costs to changes in road expenditure and vehicle kilometres travelled (VKT). The C Factor remains equal to -1.

D Factors (D1, D2 and D3) rely on the relationships between:

- The growth rate of light and heavy vehicle VKT and the growth rate of GDP.
- The number of heavy vehicles growth rate and the growth rate of heavy vehicles VKT.

Based on historical data for VKT, number of vehicles (sourced from ABS Survey of Motor Vehicles Use - SMVU) and Gross Domestic Product (GDP), cumulative average growth rates (CAGR) values have been generated for the period 1998–2005 (refer to Table 15). GDP refers to GDP chain volume, which is the ABS method of establishing real GDP (sourced from ABS National Accounts). Cumulative Average Growth Rate (CAGR) is the underlying annual compound growth rate over this period based on the starting and ending values of these variables. The period (1998–2005) was chosen since 1998 is the start of the new SMVU methodology based on annual surveys.

Table 15. Cumulative average annual growth rates to generate D factors

	CAGR
	Cumulative Annual Growth Rate (1998–2005)
Light Vehicles VKT	3.03%
Heavy Vehicles VKT	2.48%
Number of Heavy Vehicles	0.80%
GDP Chain Volume (Seasonally Adjusted)	3.35%

New values for D1 and D2 have been calculated based on this table:

- $D1 = (\text{CAGR for Light Vehicle VKT})/(\text{CAGR for GDP})$
 $= 3.03\%/3.35\% = 90\%$ (rounded)
- $D2 = (\text{CAGR for Heavy Vehicle VKT})/(\text{CAGR for GDP})$
 $= 2.48\%/3.35\% = 74\%$ (rounded)
- $D3 = (\text{CAGR for Number of Heavy Vehicles})/(\text{CAGR for Heavy Vehicle VKT})$
 $= 0.8\%/2.48\% = 32\%$ (rounded)

A comparison of the “Old Values” for D1, D2 and D3, which were developed part of the 2001 Annual Adjustment Procedure, to the new values, as calculated above, can be seen below:

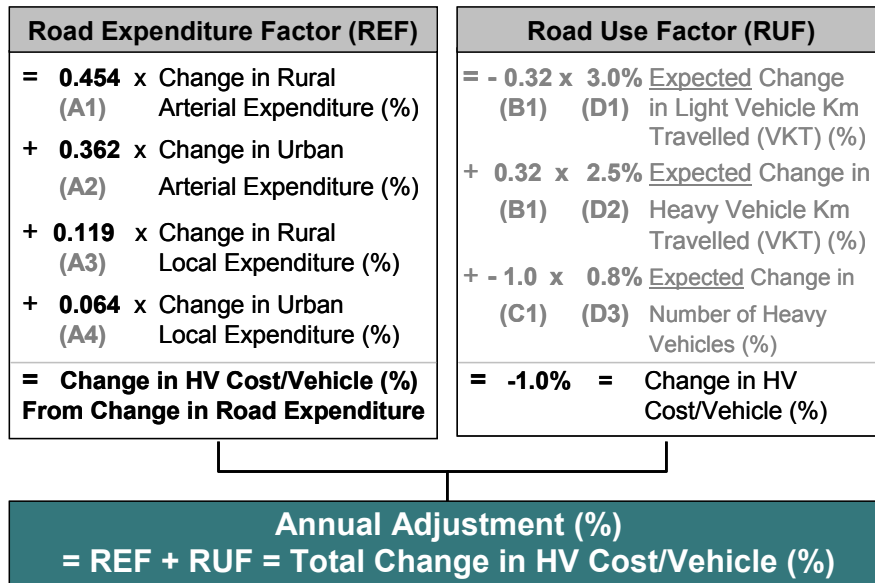
Figure 6. Comparison of old and new D values

		Old Values	New Values
Q	Light Vehicle VTK Growth as % of GDP	70%	90%
R	Heavy Vehicle VTK Growth as % of GDP	80%	74%
S	GDP Growth	3%	3.35%
T = Q x S	D1 Light Vehicle VTK Growth	2.1%	3.0%
U = R x S	D2 Heavy Vehicle VTK Growth	2.4%	2.5%
V	Number of Heavy Vehicles Growth as % of VTK Growth		32%
W	Number of Heavy Vehicle Growth % Slower than VTK Growth	1%	
	D3 Growth in Number of Heavy Vehicles	1.4%	0.8%

Old Values = U - W
 New Values = U x V

The results of these new A, B and D Factors is summarised below. The Road Use Factor becomes set equal to -1.0% based on the new values for D1, D2 and D3.

Figure 7. New annual adjustment formula

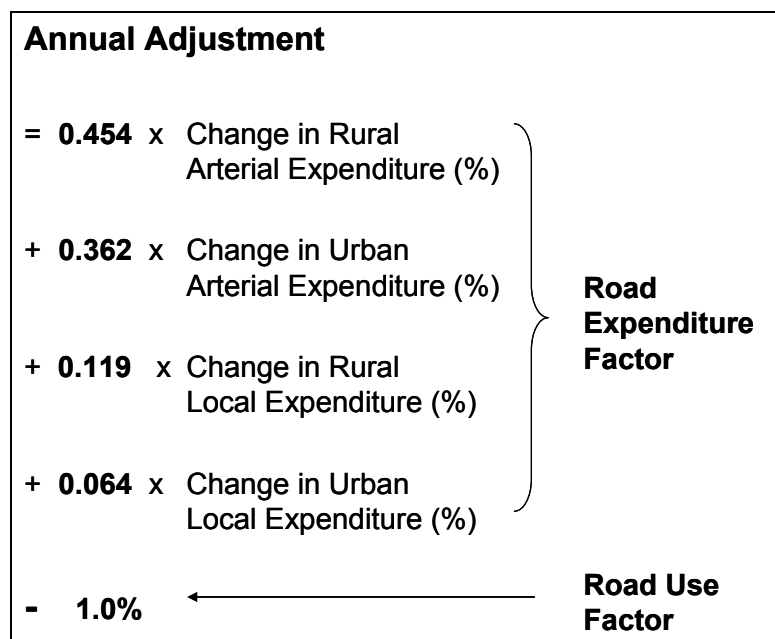


Note: C1 is set = -1% since number of vehicles is on the denominator of HV Cost/Vehicle

Note that the A Factors have been set based on three decimal places since this is required to ensure that the sum of the A Factors adds up exactly equal to 1 (which is not the case at two decimal places).

Therefore, the new formula can be simplified to:

Figure 8. New simplified annual adjustment formula



A comparison of the “old” (2001 Determination) and new A Factors and Road Use Factor is outlined below:

Figure 9. Comparison of old and new adjustment factors

		Old Values	New Values	Change
Road Expenditure Factor (REF)				
A1	Rural Arterial	0.60	0.454	-0.15
A2	Urban Arterial	0.21	0.362	0.15
A3	Rural Local	0.17	0.119	-0.05
A4	Urban Local	0.02	0.064	0.04
Road Use Factor (RUF)		-1.5%	-1.0%	0.5%

Finally, it is important to clarify the distinction of rural arterial compared to urban arterial expenditure. This is relevant to two types of expenditure data:

1. Enforcement expenditure
2. Other non-allocated expenditure

In terms of enforcement expenditure, the recommended option in the 2007 determination is to use partial enforcement. In this circumstance, the following adjustments will need to be made to allocate total enforcement expenditure into rural arterial versus urban arterial expenditure categories (if jurisdictional data has not already done so):

- a. A revised or partial enforcement cost is determined by multiplying the total enforcement cost by 59.5%. This proportional adjustment of 59.5% is equal to the 2007 determination proportion of partial enforcement (\$66m) to total enforcement (\$111m).
- b. The revised or partial enforcement cost is then allocated on the basis of 53% rural arterial and 47% urban arterial. This proportional allocation is based on the 2007 determination split of \$35m rural arterial and \$31m urban arterial.

In terms of non-enforcement expenditure that has not been allocated by jurisdictions to rural arterial versus urban arterial, the allocation of this expenditure will be made on the basis of 50% rural arterial and 50% urban arterial. These proportions are consistent with those used in the 2007 determination for expenditure that has not been allocated by jurisdictions.

F. COST BASE FOR THE ANNUAL ADJUSTMENT

As explained in Appendix C, the annual adjustment formula includes the impact of changes in seven year moving average road expenditure (%) by expenditure type (arterial urban and rural; and local urban and rural). This means that changes in road expenditure are measured as percentage changes between the average of the seven most recent years of expenditure compared to the equivalent period one year later.

Therefore, as an example, the change in road expenditure (%) for each expenditure type for 2008/09 would equal the following:

$$\text{Change in Road Expenditure (\%)} = \left[\left(\frac{\text{7 Year Average of Road Expenditure from 2001/02 to 2007/08 (A)}}{\text{7 Year Average of Road Expenditure from 2000/01 to 2006/07 (B)}} \right) - 1 \right] \times 100$$

This assumes for the 2008/09 annual adjustment that only road expenditure data up to 2007/08 is available (for all types of road expenditure).

F.1 Seven versus three year average of road expenditure

The annual adjustment formula has traditionally been calculated using a three year average of expenditure. The move to a seven year average is because the NTC costing model under the 2007 Determination will also be based on a seven year average. This should lead to a less volatile change from year to year in terms of charges. This is especially the case, under the three year average, since there has been a large increase in arterial expenditure over the last three years which would have led to large increases in charges in the short term.

F.2 Real versus nominal road expenditure

The annual adjustment formula has traditionally been calculated using an average of nominal expenditure. However, in order to be consistent with the PAYGO approach to calculating the cost base, based on a seven year average of real expenditure, and the COAG directive to fully recover costs in aggregate the most appropriate approach is to use an average of real expenditure. The real expenditure approach involves establishing the base year of the real expenditure series to be the most recent year of the seven year average (an example is outlined below).

There is a noticeable difference between using either a seven year average of nominal expenditure compared to real expenditure. An example of this can be seen by calculating the 2008/09 adjustment for rural arterial expenditure under the following assumptions:

- The most recent available year of road expenditure data is 2007/08.
- Nominal rural arterial road expenditure grows by 5% from 2006/07 to 2007/08.
- RMCPI (which is used to create real expenditure) increases by 0.82 times the road expenditure growth of 5% (which is consistent with historical cumulative average growth rates across all road types).

This scenario results in a change in arterial rural expenditure of 4.9% using a seven year average of nominal expenditure compared to 4.0% using a seven year average of real expenditure (see below). Note that under the real expenditure approach the first series (row A) is based on 2006/07 dollars and the second series (row B) is based on 2007/08 dollars.

F.3 Calculation of change in rural arterial expenditure %

USING NOMINAL EXPENDITURE

2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Average
1	2	3	4	5	6	7		
2,632	2,634	2,433	2,600	3,028	2,950	3,436		2,816 B
	1	2	3	4	5	6	7	
	2,634	2,433	2,600	3,028	2,950	3,436	3,608	2,955 A

% Change = 4.9% (A/B-1)

USING REAL EXPENDITURE

2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	Average
1	2	3	4	5	6	7		
3,483	3,409	2,988	3,053	3,337	3,040	3,436		3,249 B
	1	2	3	4	5	6	7	
	3,549	3,111	3,179	3,474	3,165	3,577	3,608	3,380 A

% Change = 4.0% (A/B-1)

G. ANNUAL ADJUSTMENT - MONITORING OF CHANGES IN KEY VARIABLES

This section outlines the types of measures that should be monitored as part of the annual review process.

The monitoring process has two broad objectives:

1. Objective 1: To highlight when a vehicle class is no longer recovering its attributable costs. In this circumstance, the vehicle class is being cross-subsidised by other vehicles.
2. Objective 2: The ongoing validity of the assumed values for the “D” road use factors which relate to growth in light and heavy vehicle VKT and growth in heavy vehicle numbers. The costing model uses 7 year trend road use data to establish data on VKT and vehicle numbers. This may diverge over time from the assumed “D” road use factors.

It is important to note that this analysis is intended to highlight some of the estimated impacts of different variables on charges under certain scenarios and it should be recognised that the costing and charging models are dynamic in nature with many different variables interacting with each other to produce an outcome. Therefore, the sensitivity analysis in the following sections is intended to be indicative of the likely impact on charges of changes in key variables.

A more detailed discussion of the types of analysis involved as part of achieving objective 1 will be analysed in more detail in the following section.

G.1 Key variables

Three key variables have been identified to be monitored. These variables are:

- Road expenditure
- Vehicle kilometres travelled (VKT)
 - heavy vehicles
 - light vehicles
- The number of heavy vehicles

Variations in average gross mass (AGM) and fuel consumption have been excluded from this list since they are not considered to have a substantial impact on of heavy vehicle charges as the cumulative average growth rate of these variables is typically less than 1% in magnitude.

G.2 Recovery of attributable costs

If the key variables vary by a certain amount this may result in a vehicle class is no longer recovering its attributable costs. In order to determine the likelihood of this occurrence, it is necessary to display to the over-recovery above the attributable cost based on the proposed registration and fuel charges. Table 16 illustrates that some vehicles, such as B-doubles are just recovering their attributable costs (0.1% above the attributable cost for B-doubles). This table highlights those vehicles that contribute 80% of the total VKT of all vehicle classes, accounting for the top nine vehicle classes.

Most of the other top nine vehicles have a reasonable distance between the attributable cost and total revenue from registration and fuel charges. For example, single axle articulated

trucks have a total revenue for fuel and registration that is 10.9% above the attributable cost.

Table 16. Over-recovery of attributable costs

	Vehicle Classification	Over-recovery of Attributable Cost	2007 Determination	
			VKT - Distance Travelled ('000)	Cumulative %
1	Articulated trucks: single trailer: 6 axle rig	15.0%	3,110,748	22.6%
2	Rigid trucks: 2 axle: no trailer: GVM 7.0 - 12.0 tonne	88.7%	1,949,291	36.8%
3	Articulated trucks: B-double: 9+ axle rig	0.1%	1,407,240	47.0%
4	Rigid trucks: 3 axle: no trailer: GVM over 18.0 tonne	20.4%	1,160,611	55.5%
5	Rigid trucks: 2 axle: no trailer: GVM over 12.0 tonne	26.2%	968,177	62.5%
6	Buses: 2 axle: GVM over 10.0 tonne	49.2%	812,349	68.4%
7	Rigid trucks: 2 axle: no trailer: GVM 4.5 to 7.0 tonne	155.0%	725,115	73.7%
8	Rigid trucks: Heavy Truck/Trailer Combination	12.0%	533,244	77.6%
9	Articulated trucks: Road train: 2 trailers	12.2%	414,314	80.6%
TOP 9 (80% of total VKT)			11,081,088	

Based on Table 16, of the top nine vehicle classes, the B-double is most susceptible to changes in the key variables impacting the ability of this vehicle class to recover attributable costs. With this in mind, the sensitivity of over-recovery for a B-double vehicle has been analysed based on changes in its VKT and number of vehicles at varying levels of road expenditure.

Two different types of scenarios have been undertaken:

- Scenario 1: The VKT and number of vehicles varies by the same percentage for all vehicles at different levels of variation in road expenditure.
- Scenario 2: Only B-Double VKT and number of vehicles is varied (with road expenditure held constant), assuming all other vehicles have constant VKT and number of vehicles.

Scenario 1: Constant changes across the vehicle fleet

This scenario explores the impact of the same change in the key variables across all vehicle classes. In particular, this scenario assumes that all vehicles experience the same proportional change in VKT and number of vehicles at differing levels of change in road expenditure. The results of this scenario are outlined in Table 17. For example, if there is a:

- 5% increase in heavy vehicle VKT (same change for all vehicles)
- 5% increase in light vehicle VKT
- 5% increase in number of vehicles
- 10% increase in road expenditure

the impact of these changes is to increase B-double over-recovery from 0.1% to 4.1%. The reason for the increase in over-recovery is as follows:

- Total revenue from fuel and registration charges per vehicle increases as a result of an annual adjustment of 9% (that is, (10%-1%) as per due to changes in road expenditure.
- Attributable costs increase by approximately 4.8%. This is roughly the difference between the increase in road expenditure (10%) and the increase in number of vehicles (5%).
- Therefore, the difference between the increase in total revenue (9%) and attributable costs (4.8%) is approximately equal to the increase in over-recovery of around 4%.

Therefore, in summary, positive percentage figures in Table 17 indicate that there is over-recovery of attributable costs for B-doubles. This table highlights some interesting results for the annual monitoring review:

- Higher levels of VKT for all vehicles should result in more over-recovery for B-doubles but lower VKT should result in under-recovery of attributable costs.
- One factor driving this impact is that the road use factor is set at 1% (as per figure 4) in the annual adjustment formula based on the assumption that heavy vehicle VKT increases by 2.5%, light vehicle VKT increase by 3% and number of vehicles increases by 0.8%. However, if the light vehicle to heavy vehicles vary in the future a different proportions to these assumed variations, the impact on over-recovery will be different. Therefore, the relative change in light to heavy vehicles should be monitored.

Table 17. Over-recovery of B-double attributable cost with constant variation in key variables across vehicle classes

Change			Change in Road Expenditure					
Heavy vehicle VKT	Light vehicle VKT	No of Vehicles	-10%	-5%	0%	5%	10%	
A	-15%	0%	0%	-6.6%	-6.6%	-6.5%	-6.5%	-6.4%
	-10%	0%	0%	-4.8%	-4.7%	-4.7%	-4.6%	-4.6%
	-5%	0%	0%	-2.9%	-2.9%	-2.8%	-2.8%	-2.7%
	0%	0%	0%	-1.1%	-1.0%	-0.9%	-0.9%	-0.9%
	5%	0%	0%	0.8%	0.9%	0.9%	1.0%	1.0%
	10%	0%	0%	2.7%	2.8%	2.8%	2.9%	2.9%
B	-15%	-15%	0%	-9.3%	-9.2%	-9.2%	-9.1%	-9.1%
	-10%	-10%	0%	-6.5%	-6.5%	-6.4%	-6.4%	-6.3%
	-5%	-5%	0%	-3.8%	-3.7%	-3.7%	-3.6%	-3.6%
	0%	0%	0%	-1.1%	-1.0%	-0.9%	-0.9%	-0.9%
	5%	5%	0%	1.7%	1.7%	1.8%	1.8%	1.9%
	10%	10%	0%	4.4%	4.5%	4.5%	4.6%	4.6%
C	-15%	-15%	-15%	-15.9%	-15.8%	-15.8%	-15.8%	-15.7%
	-10%	-10%	-10%	-11.0%	-10.9%	-10.9%	-10.8%	-10.8%
	-5%	-5%	-5%	-6.0%	-5.9%	-5.9%	-5.9%	-5.8%
	0%	0%	0%	-1.1%	-1.0%	-0.9%	-0.9%	-0.9%
	5%	5%	5%	3.9%	4.0%	4.0%	4.1%	4.1%
	10%	10%	10%	8.8%	8.9%	9.0%	9.0%	9.1%
	15%	15%	15%	13.8%	13.9%	13.9%	14.0%	14.0%

A	Variation in Heavy Vehicle VKT with no change in Light Vehicle VKT and number of Vehicles
B	Same Variation in Heavy Vehicle and Light Vehicle VKT with no change in number of Vehicles
C	Same Variation in Heavy Vehicle and Light Vehicle VKT and number of Vehicles

Scenario 2: Only B-double road use is varied

This scenario explores the impact of a change in road use data for only B-doubles. In particular, this scenario assumes that only B-Double VKT and number of vehicles is varied, assuming that VKT and number of vehicles for all other vehicle classes is constant.

The results of this scenario are outlined in Figure 10. For example, if there is a:

- 40% increase in B-double VKT, and a
- 40% increase in B-double number of vehicles
- No change in road expenditure
- No change in road use data (e.g. VKT) for other vehicle classes

the impact of these changes is to increase B-double over-recovery from 0.1% to approximately 7.8%. The reason for the increase in over-recovery is as follows:

- Total revenue from fuel and registration charges per vehicle remains unchanged (since average kilometres has not changed as VKT and number of vehicles have increased in the same proportion).
- Attributable costs fall by over 7%.

This increase to 7.8% assumes that there is no annual adjustment occurring at the same time. If we assume that the annual adjustment is 3% the impact on B-double over-recovery

is outlined in Figure 10. The impact of the annual adjustment is to reduce the amount of over-recovery.

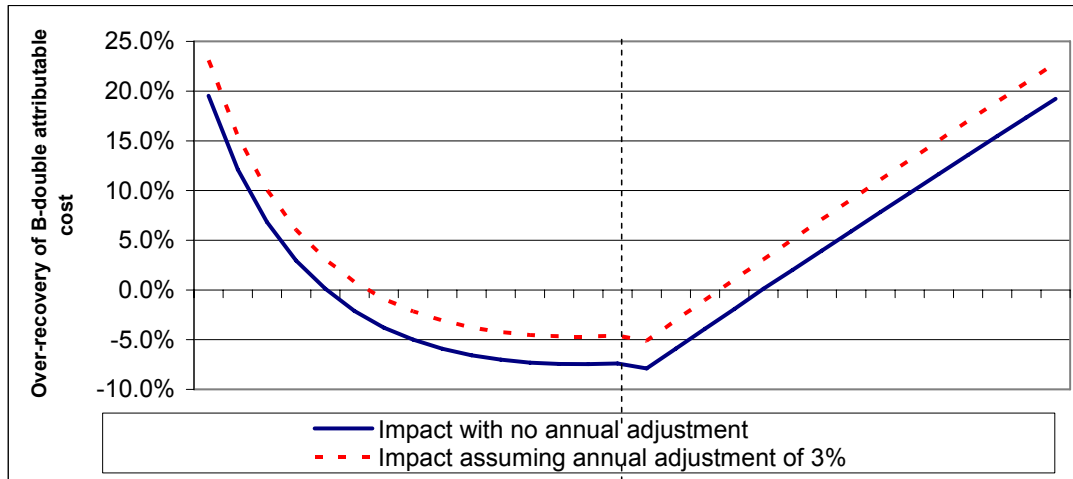
Therefore, if the over-recovery is negative this indicates under-recovery. This figure scenario highlights some interesting results for the annual monitoring review:

- If B-double VKT is growing but B-double average VKT is increasing (that is, number of vehicles is constant) it is likely that attributable costs are increasing for B-doubles and therefore the current charges will be under-recovering for B-doubles
- If B-double VKT is growing but average B-double VKT is constant (that is, number of vehicles is growing at the same rate as VKT) and this growth is greater than for other vehicles it is likely that the over-recovery for B-doubles will be increasing

For monitoring purposes, a vehicle will be considered to be in an under-recovery situation if the under-recovery is more than 8.5% of attributable costs. The reason for this allowance is based on the following logic:

- Historically, the annual movement in these variables is quite volatile up and down. This indicates that a one year (trend) decline or increase could be quite deceptive of the underlying growth, especially since the road use data is sourced from ABS survey data. Therefore, standard deviation could be used as an indication of the volatility.
- The historical standard deviation of growth in heavy vehicle numbers and VKT from 1998 to 2005 is 2.5% and 4.4% respectively. Assuming a 95% confidence interval results in two standard deviations which is equal to 5% and 8.8% respectively. Therefore, to simplify the analysis if all vehicles (heavy and light) numbers falls by 5% and VKT falls by 10% this will result in between 6 and 11% under-recovery – the average of which is 8.5%.

Figure 10. Over-recovery of B-double attributable cost with variation in B-double road use variables



Change (%)

B-Double VKT	-40%	-20%	0%	20%	40%	60%	80%	100%	-40%	-20%	0%	20%	40%	60%	80%	100%
B-Double No of Vehicles	0%	0%	0%	0%	0%	0%	0%	0%	-40%	-20%	0%	20%	40%	60%	80%	100%

H. High productivity vehicles

With the introduction of a revised registration charging schedule, which allows for modularisation of the trailer component of the registration charge into different components based on the type and number of axle groups, there is no need for the higher productivity formula to be used as the basis for establishing a registration charge for new “higher productivity” vehicle types. Further explanation can be found in section 4.4.4. of the RIS Volume 1.

However, the higher productivity formula has been used to validate the modular approach to setting the trailer component of the registration charge, especially for the B-triple vehicle configuration, which consists of an additional Lead Trailer on a B-Double. In this context, the higher productivity formula was revised based on feedback received during public consultations in order to conduct a comparison of the modular approach to the higher productivity formula approach for the B-triple vehicle.

Therefore, this section outlines the estimation of a registration charge for a B-triple vehicle under the higher productivity formula taking into account of feedback from the public consultations, with regard to the input values into the formula (such as annual VKT, ESA value, PCU value and fuel usage) and other aspects of the formula to ensure that the registration charge is estimated in a way that is relative to existing vehicle classes whilst at the same time being simple to calculate.

The allocated cost formula (see below) will still be used as the basis to develop a charge. However, the following adjustments will be made to address the issue of ensuring that an appropriate degree of relativity is maintained with existing charges, for similar vehicles compared to new higher productivity vehicles, and also to ensure that it is relatively simple to administer:

- The formula inputs relating to AGM tonnes, ESA rate, PCU value and fuel usage per kilometre will be estimated in a way that ensures an appropriate relativity with the current charges for a vehicle that is the most similar to the new higher productivity vehicle and in a way that is simple and precise. The new way of calculating these input values is outlined below.
- The non-attributable costs for vehicle configurations that have a lead trailer will be excluded from the higher productivity formula. This is because the current charges for B-doubles do not include almost all of the non-attributable or common costs. This adjustment is necessary to ensure that new vehicles that have a lead trailer (such as a B-triple or a variation of a normal B-double) will have an estimated registration charge that is appropriately relative to the existing B-double registration charge.
- The higher productivity formula for new vehicle configurations that have trailer converter dolly's and consist of two or more trailers will be adjusted to allow for the CSO subsidy and unsealed adjustment that is made for double and triple road trains. These adjustments are outlined below.

H.1 Allocated cost formula

The allocated cost formula is outlined below:

$$\begin{aligned}
 \text{Allocated cost} = & [(AGM \text{ unit cost} * AGM \text{ value}) \\
 & + (ESA \text{ unit cost} * ESA \text{ value}) \\
 & + (PCU \text{ unit cost} * PCU \text{ value}) \\
 & + (VKT \text{ unit cost}) \\
 & + (\text{non attributable unit cost})] \\
 & * \text{annual VKT.}
 \end{aligned}$$

The estimation of the different components of this formula is explained below.

H.1.1 Unit costs

The unit costs have been redefined to be dependent on the type of vehicle configuration according to the following categories:

1. Vehicles that have no trailers (column A in Table 18)
2. Vehicles that have trailers
 - a. All vehicles excluding those with a lead trailer (e.g. B-double and B-triple) and road trains (column B in Table 18)
 - b. Vehicles with a lead trailer (column C in Table 18)
 - c. Road trains (column D in Table 18)

Table 18. Unit costs for revised formula

	Vehicles with No Trailers	Vehicles with Trailers			
	A	B	C	D	
		All Vehicles (Excluding Vehicles with a Lead Trailer & Road Trains)	Vehicles with a Lead Trailer (e.g B-Doubles and B-Triples)	Road Trains	
AGM unit cost	0.142	0.135	0.131	0.141	cents per tonne km
ESA unit cost	3.684	3.510	3.393	2.696	cents per ESA km
PCU unit cost	0.328	0.310	0.302	0.521	cents per PCU km
VKT unit cost	1.200	1.140	1.105	1.579	cents per km
Non-attributable unit cost	2.414	2.300	2.223	2.486	cents per km

Noting the following:

- AGM is average gross mass
- ESA is equivalent standard axles
- PCU is passenger car unit
- VKT is vehicle kilometres travelled

These unit costs are still based on the average unit costs derived from the cost allocation model.

The reason for different unit costs for different vehicle types is because of the desire to maintain relativity with existing vehicle classes. There is a need to have different unit costs for vehicles with trailers compared to vehicles with no trailers because the cost of spare trailers should not be included in the calculation of the allocated cost.

H.1.2 Other adjustments to costs

In the costing model an adjustment is made to the allocated cost for road trains to take into account travel on unsealed roads and a 5% community service obligation. As a result, in order to retain appropriate relativities between new higher productivity vehicles and existing vehicle classes the following adjustments are recommended to be made for new vehicles with two or more trailers and trailer converter dolly's:

- The ESA unit cost for road trains is revised to be equal to :
Revised ESA unit cost = ESA cost x (1-0.3)
- The ESA unit cost for road trains is revised to be equal to :
Revised ESA unit cost = ESA cost x (1-0.35)
- The total allocated cost for double and triple road trains is revised to be equal to:
Revised total allocated cost = Total allocated cost x (1-0.05).

H.1.3 Non-attributable cost

The non-attributable costs for vehicle configurations that have a lead trailer (e.g. B-double and B-triple vehicles) are excluded from the higher productivity formula.

H.1.4 AGM value

In the draft regulatory impact statement it was stated that the AGM value would be estimated with reference to both laden and unladen tonnes. The draft RIS outlined a different approach for average utilisation based on level of PBS access and whether vehicles operated in mining and remote areas and the degree of backloading. However, based on the objective of providing a clear, administratively simple and reasonably precise calculation of each input variable, the formula below has been created to calculate the AGM value for a new higher productivity vehicle.

$$\begin{aligned} \text{AGM value in tonnes} &= (1-0.62) \times (\text{Total permitted mass of vehicle}) \\ &+ 0.62 \times (\text{Tare mass of vehicle}) \end{aligned}$$

The weighting factor of 0.62 is an estimate of the average utilisation of heavy vehicles (in particular, trucks) in terms of space on the truck that is available to carry freight. The average utilisation has been estimated through the following formula:

Average utilisation = (Proportion of trips that a truck is laden x Proportion of truck space taken up when truck is laden)

where Proportion of Trips that a truck is laden = 73%, based on a five year average of SMVU data for trucks

and Proportion of truck space taken up when truck is laden has been estimated at 85%.

Therefore, 73% multiplied by 85% equals 62%.

H.1.5 ESA value.

In the draft regulatory impact statement it was stated that the equivalent standard axle (ESA) value of the vehicle would be based on a first principle calculation based on:

- The expected distribution of the load across the axles using the 4th power rule
- The averaging of the ESA's that result from the proportion of travel that is fully loaded, partly loaded and unloaded.

These general statements are still the chosen approach to estimating the ESA value under the higher productivity formula. However, based on the revised approach to developing a charge for higher productivity vehicles, a formula to calculate the ESA value has been developed ensures an appropriate relativity with the ESA values of the existing vehicle classes. This approach involves estimating the ESA at maximum mass and tare mass separately and then estimating the overall ESA by giving an appropriate weighting to each approach (via the 62% fully loaded, 38% no load assumption). This ESA value is then adjusted to ensure relativity with the existing ESA values used to determine the registration charges for existing vehicle classes. This adjustment is necessary since the chosen approach produces higher ESA values, in general, than the predictive formula approach used in the current costing model.

An alternative approach is to estimate the ESA based on the average mass of the vehicle, which would involve determining the average mass by axle group. The chosen approach has been used since it is relatively simple (compared to the alternative approach) since no assumptions need to be made regarding the average mass of each axle group. However, it should be noted that because the approach outlined in this section assumes that for 62% of distance travelled the vehicle is fully loaded, the chosen or revised approach is most appropriate for vehicles that are fully loaded one way and empty on return.

Therefore, the ESA of the new vehicle will be estimated through the following formula

ESA value =	(New Vehicle ESA using SAR Formula / Closest Like Vehicle ESA using SAR Formula) x Closest Like Vehicle Model ESA
--------------------	---

The ESA of the new and closest like vehicles using the SAR formula is estimated through the following process:

1. The ESA is estimated based on the vehicle being full 62% of the time ("fully loaded") and empty 38% ("tare weight") of the time:

$$\text{ESA} = (\text{FL}\% \times \text{ESA with vehicle fully loaded}) + ((1-\text{FL}\%) \times \text{ESA with vehicle empty})$$

where FL% = 0.62

1. *ESA with vehicle fully loaded* is estimated using the standard axle repetition formula (SAR) with the load mass carried by each axle grouping equal to the maximum permitted mass for that axle group.
 - a. The ESA is estimated (see below) using these masses.

2. *ESA with vehicle empty* is estimated through the following process:
 - a. The front axle grouping (steer axle) will have the mass set at 90% of the maximum permitted load for the steer axle grouping.
 - b. the total gross mass of all the axle groups is equal to 65% of the total vehicle permitted axle loading
 - c. The mass for each of the remaining axle groupings will equal to:

$$\frac{\text{(total gross mass of all axle groups – front axle group mass)}}{\text{(maximum permitted load of the axle group / (total maximum permitted load of all axle groupings for the vehicle – maximum permitted load of the steer axle group))}$$
 - d. The ESA is estimated using the standard axle repetition formula (SAR) (see below) using these masses.

3. The SAR formula is as follows:

$$\text{SAR} = \sum_{i=1}^{i=m} (L_i / SL_i)^{\text{LDE}}$$

where L_i = load carried by axle group type i (kN)
 SL_i = standard load for axle group type i
 LDE = 4 = load damage exponent,
 m = number of axle groups

4. The standard loads for each axle type is as follows:

Axle/Tyre Type	Load equivalencies
single axle single tyres SAST	5.40
single axle dual tyres SADT	8.16
tandem axle single tyres - twinsteer TAST (non load sharing)	9.18
tandem axle single tyres - twinsteer TAST (load sharing)	9.18
tandem axle dual tyres TADT	13.77
triaxle dual tyres TRDT	18.46
Quad axle with dual tyres QADT	22.50

The closest like vehicle model ESA is set through the following process:

- Determine the closest like vehicle to the new higher productivity vehicle by finding the existing vehicle class whose AGM value is closest to the AGM of the new vehicle. The reference table used to find the closest like vehicle will depend on whether the new vehicle has more than one trailer.
 - If the new vehicle has one trailer or no trailers the relevant reference table is matching table 1 in Table 19.
 - If the new vehicle has more than one trailer and has trailer converter dolly's the relevant reference table is matching table 3 in Table 19.
 - For all other new vehicles with more than one trailer the relevant reference table is matching table 2 in Table 19.
- The ESA value for the closest like vehicle is also set out in Table 19.

Table 19. Closest like vehicle matching tables**Matching Table 1**

Existing Vehicle Classes	AGM Value	ESA Value
Rigid trucks: 2 axle: no trailer: GVM 4.5 to 7.0 tonne	4.3	0.05
Rigid trucks: 2 axle: no trailer: GVM 7.0 to 12.0 tonne	7.0	0.17
Rigid trucks: 2 axle: no trailer: GVM over 12.0 tonne	10.9	0.98
Rigid trucks: 2 axle: with trailer	10.6	0.89
Rigid trucks: 3 axle: no trailer GVM 4.5-18	11.5	0.68
Rigid trucks: 3 axle: no trailer GVM >18	16.2	1.45
Rigid trucks: 3 axle: with trailer >18	26.3	1.17
Rigid trucks: 4 axle: no trailer GVM 4.5-25	19.6	1.28
Rigid trucks: 4 axle: no trailer GVM >25	20.1	1.42
Rigid trucks: 4 axle: with trailer >25	32.3	1.64
Truck trailers	31.5	3.10
Articulated trucks: single trailer: 3 axle rig	15.3	0.68
Articulated trucks: single trailer: 4 axle rig	22.0	1.21
Articulated trucks: single 3 axle trailer: 5 axle rig	28.4	2.27
Articulated trucks: single 2 axle trailer: 5 axle rig	25.9	1.78
Articulated trucks: single trailer: 6 axle rig	33.1	2.29
Articulated trucks: > 6 axle rig (not elsewhere classified)	52.2	2.36
Other trucks	24.5	1.55

Matching Table 2

Existing Vehicle Classes	AGM Value	ESA Value
Articulated trucks: B-double: <9 axle rig	44.0	3.27
Articulated trucks: B-double/triple: 9 axle rig & above	51.5	3.55

Matching Table 3

Articulated trucks: Road train: 2 trailers	59.8	4.58
Articulated trucks: Road train: 3 trailers	87.4	5.65

H.1.6 PCU value.

The draft regulatory impact statement defined Passenger Car Unit (PCU) value of the vehicle as a road capacity measure based on relative length of a heavy vehicle compared to a medium size passenger car. Based on the objective of establishing a value for PCU that provides a precise and simple calculation for this value whilst at the same time maintaining an appropriate degree of relativity with the PCU values for existing vehicles, the PCU value has been defined as:

$$\text{PCU} = (\text{Actual Vehicle Length}/6 \text{ metres}) \times \text{Relative PCU Factor}$$

The relative PCU Factor adjusts the actual PCU value so that it maintains relativity to the PCU values in the current costing model for the existing vehicle classes (refer to Figure 11 below for relative PCU factor values).

Figure 11. Relative PCU factor

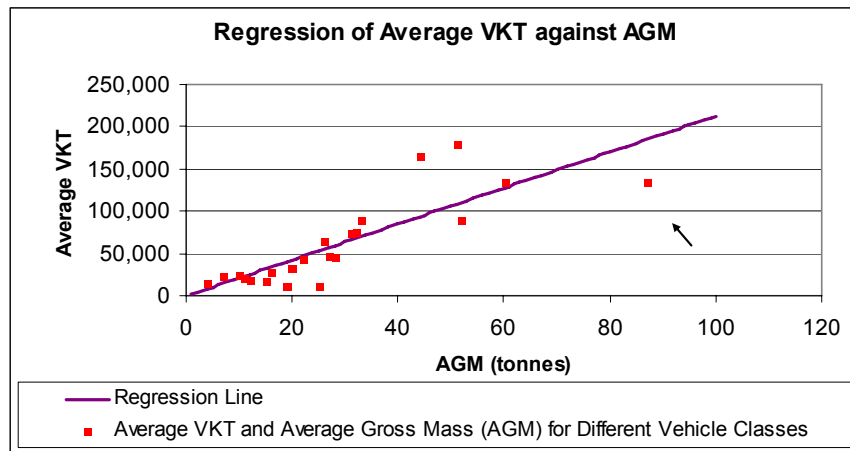
	G (=D/E) Relative PCU Factor
Rigid	0.990
Articulated (1 trailer) or Rigid(>=3axle)/Truck & Trailer	1.003
B-Double	1.089
Double Road Train	0.963
Triple Road Train	1.018

H.1.7 Annual VKT

In the draft regulatory impact statement it was stated that annual VKT was to be equal to the expected annual travel or vehicle kilometres travelled of the vehicle concerned. This approach to estimating annual VKT is an individualised approach and could result in a high charge relative to existing vehicle classes if the expected annual VKT of the new vehicle is quite high compared to average VKT used to generate registration charges for existing vehicle classes. As a result, the revised approach seeks to maintain an appropriate degree of relativity between the new vehicles and existing vehicle classes.

Therefore, the annual VKT calculation has been revised to be based on a regression equation which links VKT to the AGM of a vehicle. A plot of average VKT against AGM for existing vehicle classes is shown in Figure 12.

Figure 12. Regression of average VKT against AGM



The regression equation of VKT against AGM for existing truck vehicle classes (excluding buses) provides the following result:

$$VKT = - 484.0 + (2132.5 \times AGM)$$

However, as can be seen in the plot of VKT against AGM graph, the regression line is not a good fit for B-doubles (which are the two dots well above the line) and the triple road train (which is the road train dot that is well below the line), although reasonably good for other vehicles.

Therefore, if this regression equation is used to estimate VKT for each new vehicle, adjustments should be made to allow for the fact that the equation is not a good predictor

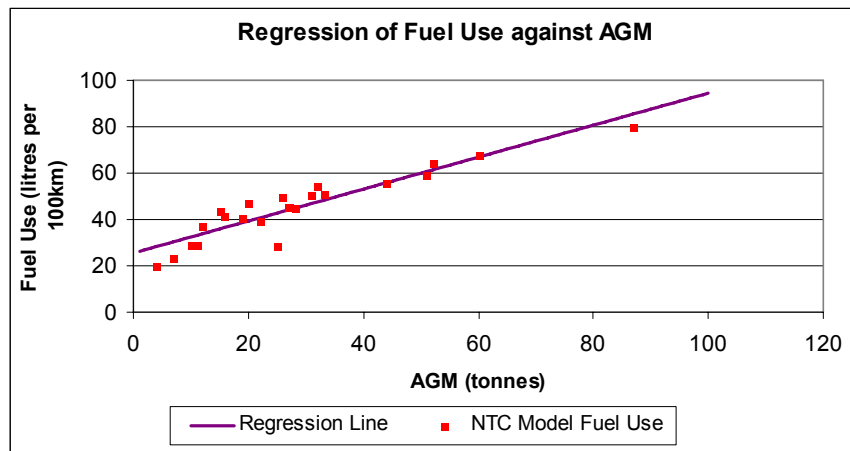
of B-double and road train VKT. In this context, the estimated VKT's for B-double and road trains are based on the current average VKT for their respective vehicle class with an adjustment up or down depending on whether a particular vehicle is at the average mass for the vehicle class:

- (1) use the regression equation for all vehicles other than vehicles that have either a lead trailer configuration (which takes into account B-double and B-triples) and road train configurations, and
- (2) adjustments will be made for lead trailer and road train configurations:
 - a. the annual VKT for vehicles with one lead trailer (which is the front trailer in a B-double) will be equal to:
 - i. B-double (≥ 9 axle): $178,988 + 2,384.4 \times (\text{AGM}-44.0)$.
 - ii. B-Double (< 9 axle): $164,307 + 2,384.4 \times (\text{AGM}-51.5)$.
 - iii. The figure of 178,988 is the average kilometres travelled in the cost allocation model for B-doubles (≥ 9 axle) and 164,307 is figure for B-doubles (< 9 axle).
 - iv. The figure of 51.5 is the average gross mass in the cost allocation model for B-doubles (≥ 9 axle) and 44.0 is the figure for B-doubles (< 9 axle).
 - b. the annual VKT for road trains will be equal to:
 - i. Double Road Train (≥ 9 axle): $133,750 + 2,384.4 \times (\text{AGM}-59.8)$.
 - ii. Triple Road Train (< 9 axle): $133,750 + 2,384.4 \times (\text{AGM}-87.4)$.
 - iii. The figure of 133,750 is the average kilometres travelled in the cost allocation model for both double and triple road trains.
 - iv. The figure of 59.8 is the average gross mass in the cost allocation model for double road trains and 87.4 is the figure for triple road trains.
 - c. The annual VKT for a vehicle with more than one lead trailer (e.g. B-triple) will set equal to 178,922 since this vehicle will be treated as a substitution for B-double.
 - d. The annual VKT for a vehicle with more than three trailers as part of a road train configuration will set equal to 133,750 since this vehicle will be treated as a substitution for B-double.

H.1.8 Fuel use

In the draft regulatory impact statement, it was not specifically outlined how fuel usage (litres per 100 km) of the vehicle per annum was to be estimated. Based on the objective of establishing a value for fuel usage that provides a precise and simple calculation for this value whilst at the same time maintaining an appropriate degree of relativity with the fuel usage values for existing vehicles, it is recommended that the fuel usage value is estimated through a regression equation which links fuel usage to AGM.

A plot of fuel usage against AGM for existing vehicle classes is shown in Figure 13.

Figure 13. Regression of fuel use against AGM

The regression equation of fuel usage against AGM for existing truck vehicle classes (excluding buses) provides the following result:

$$\text{Fuel Use} = 25.7 + (0.688 \times \text{AGM})$$

This regression equation is a reasonably good fit of ABS SMVU data of fuel use plotted against AGM. Note that buses have not been used to derive this equation.

H.2 B-triple example calculation

This section provides a comparison of the higher productivity calculation for the B-Double compared to a B-triple. Note that the B-Double and B-triple excludes non-attributable costs are per the revised higher productivity formula. The difference in the registration charge between the two calculations is around \$5,500 (refer to Figure 14), reflecting the greater impact on road wear caused by the B-triple, longer length and greater average mass.

Figure 14. B-Double and B-triple example calculation

		Standard B-Double	B-Triple
Vehicle Characteristics			
Annual VKT	km	178,918	178,988
Average Gross Mass (AGM)	tonnes	51.47	67.70
Equivalent Standard Axles (ESA)	Units	3.55	4.43
Passenger Car Unit (PCU)	Units	4.00	5.13
Fuel Charge	c/l	21.0	21.0
Fuel Usage per Km	l/100km	60.8	72.1
Fully Loaded %	of travel	62%	62%
Unit Costs			
AGM unit cost	cents per tonne km	0.131	0.131
ESA unit cost	cents per ESA km	3.393	3.393
PCU unit cost	cents per PCU km	0.302	0.302
VKT unit cost	cents per km	1.105	1.105
Non-attributable unit cost	cents per km	2.223	2.223
Proposed B-Triple Registration Charge			
= AGM unit cost * AGM in tonnes* annual VKT		\$12,064	\$15,874
+ ESA unit cost * ESA rate* annual VKT		\$21,544	\$26,903
+ PCU unit cost * PCU value* annual VKT		\$2,161	\$2,773
+ VKT unit cost * annual VKT		\$1,977	\$1,978
+ non-attributable unit cost * annual VKT		\$0	\$0
A	Total Allocated Cost	\$37,746	\$47,528
B	Fuel Revenue = Fuel charge * Fuel usage per km * annual VKT	\$22,833	\$27,110
= A - B Registration Charge		\$14,913	\$20,418
DIFFERENCE			\$5,505

I. FULL SCHEDULE OF REGISTRATION CHARGES

Options C1 and C3 in this schedule assume adjusted enforcement costs have been included in the cost base.

Table 20. Schedule of registration charges for the 2007 Determination

	2007/08 Charges		Option C1 – from Draft RIS		Option C3 Recommended	
	Prime Mover (\$ per vehicle)	Total (\$ per vehicle)	Prime Mover (\$ per vehicle)	Total (\$ per vehicle)	Prime Mover (\$ per vehicle)	Total (\$ per vehicle)
Rigid trucks						
2 axles						
No trailer: 4.5-7t	355	355	365	365	380	380
No trailer: 7-12t	355	355	365	365	380	380
No trailer: over 12t	592	592	634	634	652	652
With trailer	651	1,184	634	1,182	652	1,222
3 axles						
No trailer: 4.5-18t	710	710	634	634	652	652
No trailer: over 18t	946	946	827	827	859	859
With trailer < 42.5 t	2,365	3,430	827	1,922	859	1,999
4 axles						
No trailer: 4.5-25t	1,065	1,065	634	634	652	652
No trailer: over 25t	2,365	2,365	827	827	859	859
With trailer: <42.5t	2,365	3,430	1,534	2,629	1,593	2,733
Heavy truck trailers	4,494	5,737	5,794	7,071	5,828	7,158
Articulated trucks						
Single trailer						
3 axle rig	1,537	1,892	1,000	1365	1,000	1,380
4 axle rig	1,537	2,247	1,000	1730	1,000	1,760
3 axle trailer: 5 axle rig	1,537	2,602	1,000	2095	1,000	2,290
2 axle trailer: 5 axle rig	4,019	4,729	4,060	4790	3,930	4,690
6 axle rig	4,019	5,084	4,060	5,155	3,930	5,220
B-doubles						
<9 axle rig	5,911	7,686	13,796	15,621	7,050	12,140
9 or more axle rig	5,911	8,041	13,796	15,986	7,050	14,340
Road trains						
2 trailers	5,911	8,751	7,531	10,451	7,050	10,390
3 trailers	5,911	10,526	8,292	13,037	7,050	12,440
>6 axle rig (NEC)	5,201	6,266	4,440	5,535	4,322	5,612
Other trucks	919	919	952	952	963	963
Buses						
2 axle						
4.5 to 10.0 t	355	355	365	365	380	380
>10t	592	592	365	365	380	380
3 axles	1,478	1,478	2,024	2,024	2,087	2,087
Articulated	592	592	365	365	380	380

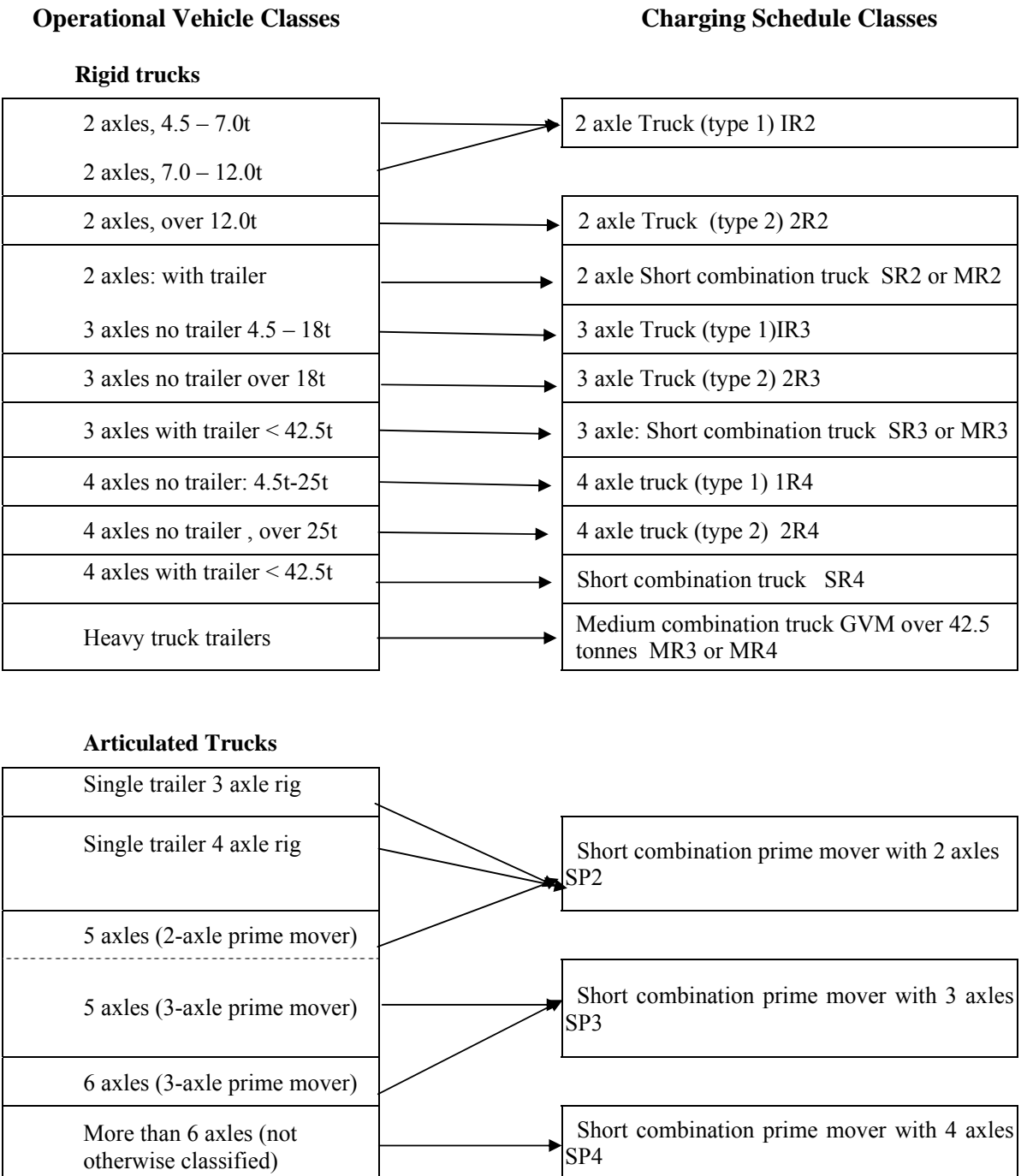
Table 21. Current charges schedule 2007/08

DIVISION 1 - LOAD CARRYING VEHICLES (\$)				
Vehicle Type	2 axle	3 axle	4 axle	5 axle
Trucks				
Truck (type 1)	355	710	1,065	1,065
Truck (type 2)	592	946	2,365	2,365
Short combination truck	651	2,365	2,365	2,365
Medium combination truck	4,494	4,494	4,848	4,848
Long combination truck	6,208	6,208	6,208	6,208
Prime Movers				
Short combination prime mover	1,537	4,019	5,201	5,201
B-double prime mover	4,729	5,911	6,503	6,503
Road train prime mover	5,911	5,911	6,503	6,503
DIVISION 2 - LOAD CARRYING TRAILERS				
Calculated using the formula:	$\$355 \times \text{Number of Axles}$			
DIVISION 3 – BUSES (\$)				
Bus Type	2 axle	3 axle	4 axle	
Bus (type 1)	355			
Bus (type 2)	592	1,478	1,478	
Articulated bus		592	592	
DIVISION 4 - SPECIAL PURPOSE VEHICLES				
Special purpose vehicle (type P)	No charge			
Special purpose vehicle (type T)	237			
Special purpose vehicle (type O)	Calculated using the formula: $296 + \$296 \times \text{Number axles over 2}$			
PERMIT FEES				
The charge for the grant of permit to operate a vehicle over 125 tonnes carrying an indivisible load is to be calculated as				
:	4 cents x ESA-km			

Table 22. Option C3 charges schedule at the end of phase in excluding annual adjustment

DIVISION 1 - LOAD CARRYING VEHICLES (\$) – July 2010				
Vehicle Type	2 axle	3 axle	4 axle	5 axle
Trucks				
Truck (type 1)	380	652	652	652
Truck (type 2)	652	859	859	859
Short combination truck	652	859	1593	1593
Medium combination truck	5828	5828	6295	6295
Long combination truck	8036	8036	8036	8036
Prime Movers				
Short combination prime mover	1000	3930	4322	4322
Multi-combination prime mover	7050	7050	7755	7755
DIVISION 2 - LOAD CARRYING TRAILERS (\$)				
Axle group type (per axle charge (\$))				
Trailer type	Single axle	Tandem axle	Tri-axle	Quad-axle and above
Pig Trailer	380	380	380	380
Dog Trailer	380	380	380	380
Semi Trailer	380	380	430	430
B-Double lead trailer and B-triple lead and middle trailers	1900	1900	2000	2000
Converter dolly or low loader dolly	380	380	380	380
DIVISION 3 – BUSES (\$)				
Bus Type	2 axle	3 axle	4 axle	
Bus (type 1)	380			
Bus (type 2)	380	2087	2087	
Articulated bus		380	380	
DIVISION 4 - SPECIAL PURPOSE VEHICLES (\$)				
Special purpose vehicle (type P)	No charge			
Special purpose vehicle (type T)	248			
Special purpose vehicle (type O)	Calculated using the formula: $310 + (310 \times \text{Number axles over } 2)$			
PERMIT FEES				
The charge for the grant of permit to operate a vehicle over 125 tonnes carrying an indivisible load is to be calculated as				
:	4 cents x ESA-km			

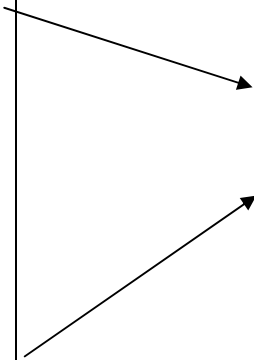
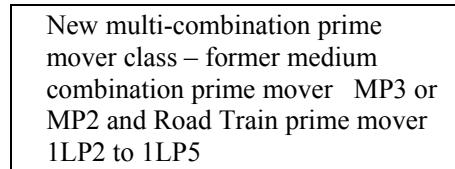
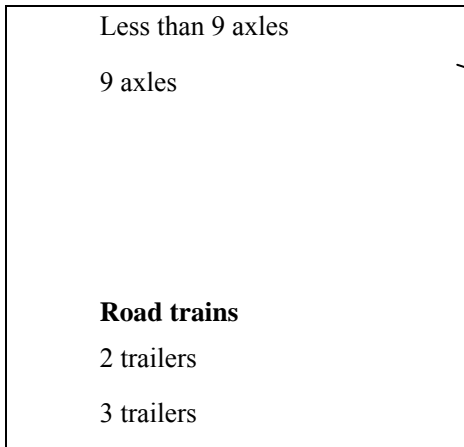
Table 23. Mapping vehicle categories to the charging schedule



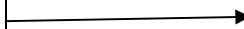
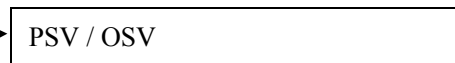
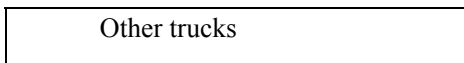
Operational Vehicle Classes

Charging Schedule Classes

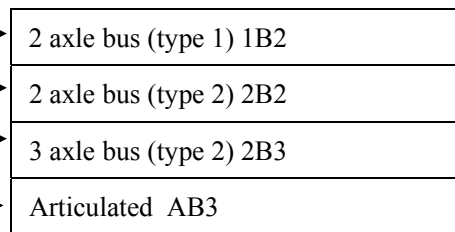
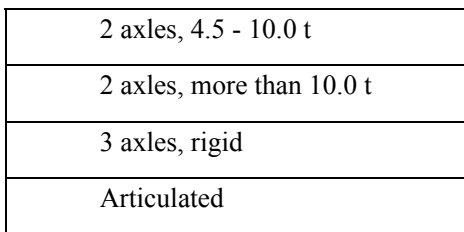
B-doubles



Special Purpose Vehicles



Buses



J. IMPACTS ON STATE/TERRITORY REVENUES

J.1 Registration revenue implications of recommended option

The following tables are all based on the preferred NTC 2007 Determination charge option which includes budgeted 2007/08 arterial road expenditure and partial enforcement expenditure. All tables exclude post 2007/08 annual adjustment impacts and assume constant usage figures.

Table 24. Registration revenue by jurisdiction (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue 2008/09	Proposed Revenue 2009/10	Proposed Revenue 2009/10	Change in revenue 2009/10 compared to 2007/08
NSW	150,313	150,144	159,228	166,778	11.0%
Vic	171,433	172,147	185,841	197,894	15.4%
Qld	146,881	149,445	160,107	169,816	15.6%
SA	57,859	58,750	64,478	69,982	21.0%
WA	86,169	87,452	90,940	94,113	9.2%
Tas	14,940	14,864	15,726	16,503	10.5%
NT	7,972	8,421	8,651	8,858	11.1%
ACT	2,860	2,806	2,961	3,084	7.8%
Total	638,428	644,030	687,933	727,028	13.9%

Table 25. All jurisdiction registration revenue by vehicle class (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	219,384	216,664	-1.2%
Articulated Trucks	252,589	257,538	2.0%
B-Doubles	85,489	164,540	92.5%
Road Trains	50,336	59,709	18.6%
Special Purpose Trucks	11,325	11,862	4.7%
Buses	19,305	16,715	-13.4%
Total	638,428	727,028	13.9%

Table 26. NSW revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	58,812	59,112	0.5%
Articulated Trucks	64,008	65,498	2.3%
B-Doubles	17,080	32,297	89.1%
Road Trains	1,796	2,134	18.9%
Special Purpose Trucks	2,061	2,159	4.7%
Buses	6,556	5,578	-14.9%
Total	150,313	166,778	11.0%

Table 27. Vic revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	58,307	58,063	-0.4%
Articulated Trucks	74,238	74,829	0.8%
B-Doubles	30,398	56,715	86.6%
Road Trains	954	1,135	18.9%
Special Purpose Trucks	3,499	3,665	4.7%
Buses	4,037	3,488	-13.6%
Total	171,433	197,894	15.4%

Table 28. Qld revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	48,949	48,425	-1.1%
Articulated Trucks	57,183	59,086	3.3%
B-Doubles	18,800	37,618	100.1%
Road Trains	16,188	19,200	18.6%
Special Purpose Trucks	2,222	2,327	4.7%
Buses	3,540	3,159	-10.8%
Total	146,881	169,816	15.6%

Table 29. SA revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	17,150	16,284	-5.0%
Articulated Trucks	22,138	22,715	2.6%
B-Doubles	11,989	23,757	98.2%
Road Trains	3,962	4,702	18.7%
Special Purpose Trucks	1,106	1,158	4.7%
Buses	1,515	1,367	-9.8%
Total	57,859	69,982	21.0%

Table 30. WA revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	27,765	26,422	-4.8%
Articulated Trucks	25,435	25,564	0.5%
B-Doubles	5,231	10,257	96.1%
Road Trains	23,818	28,256	18.6%
Special Purpose Trucks	1,605	1,681	4.7%
Buses	2,315	1,933	-16.5%
Total	86,169	94,113	9.2%

Table 31. Tasmania revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	5,311	5,236	-1.4%
Articulated Trucks	6,970	7,201	3.3%
B-Doubles	1,490	2,965	99.0%
Road Trains	0	0	
Special Purpose Trucks	576	603	4.7%
Buses	594	498	-16.1%
Total	14,940	16,503	10.5%

Table 32. NT revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	1,807	1,841	1.9%
Articulated Trucks	1,762	1,787	1.4%
B-Doubles	156	311	100.0%
Road Trains	3,599	4,259	18.4%
Special Purpose Trucks	190	200	4.7%
Buses	458	460	0.4%
Total	7,972	8,858	11.1%

Table 33. ACT revenue from registration charges (\$000)

State/Territory	Current 2007/08 Revenue	Proposed Revenue after full implementation 2009/10	Change in revenue 2009/10 compared to 2007/08
Rigid Trucks	1,283	1,281	-0.1%
Articulated Trucks	856	859	0.3%
B-Doubles	346	620	79.2%
Road Trains	19	23	18.9%
Special Purpose Trucks	67	70	4.7%
Buses	289	232	-19.9%
Total	2,860	3,084	7.8%

K. PRIMARY PRODUCER CONCESSIONS

Table 34. Primary producer heavy vehicle registration concessions

Jurisdiction	General rate of concession	Other concession rates	Heavy vehicles which do not qualify for a concession
Vic	80% for most heavy vehicles types.	50% for 2 or 3 axle rigid trucks with no trailers and all 2 axle short combination trucks. 55.56% for 4 axle rigid trucks with no trailer.	None.
NSW	Pay the lower of the national heavy vehicle charge or the NSW determined motor vehicle registration. This would appear to benefit larger truck trailer combinations and prime movers.		If the NSW determined motor vehicle registration fee is higher than the applicable national heavy charge. This would appear to provide no concession to smaller rigid truck types without trailers.
Qld	Rates of 25% to 50% apply to all heavy vehicles which have a Gross Vehicle Mass of 6 tonnes or more and to all trailers with an Average Gross Mass of 4.5 tonnes.	50% applies to all 2 and 3 axle rigid trucks without trailers, all 2 axle trucks with trailers, and all 2 axle prime movers except long combinations and all 1 axle trailers. 25% applies to all rigid trucks with 4 or more axles, all 2 axle long combination prime movers, all prime movers with 3 or more axles and all special purpose vehicles. 35% applies to all 2 axle trailers. 30% applies to all 3 or more axle trailers.	Prime movers or rigid trucks with a Gross Vehicle Mass less than 6 tonnes.
SA	40% for most heavy vehicle types.		All rigid trucks with no trailers and all special vehicles.
WA	50% for all heavy vehicle types plus up to one trailer.		All multiple trailer combinations after the first trailer.
Tas	40% for all heavy vehicle types.		None.
NT	50% for all heavy vehicle types.		None.
ACT	0%		All.

L. NON PRIMARY PRODUCER REGISTRATION CONCESSIONS

Jurisdiction	Concession type	General rate of concession
NSW	Pensioner concession for rigid heavy vehicles up to 16t GVM (not prime movers).	100%
Qld	Concessions apply for heavy vehicles and trailers which are classified as:	
	<ul style="list-style-type: none"> • Pensioner, Seniors Card & Veteran Affairs benefit recipients 	25 to 50%
	<ul style="list-style-type: none"> • Local Government , Community Service Organisation, Special Purpose 	25 to 50%
SA	A reduction in the registration fees is available to heavy vehicles (other than Type 1 & Type 2 trucks) that are kept in Outer Areas outer area means— (a) the whole of Kangaroo Island; or (ab) the area of the District Council of Coober Pedy; or (ac) the area of the District Council of Roxby Downs; or (b) all other parts of the State that are not within a municipality, a district council area or Iron Knob.	40%
WA	Interchangeable trailers - A rebate is granted for goods carrying semi trailers where the number trailers exceeds the number of prime movers registered in an operators name.	75%
	Trailers used outside the Southwest Land Division	50%
	A 50% concession may be granted to a vehicle which is used during the currency of the licence SOLELY for the carriage of stock.	50%
Tas	Interchangeable trailers - A rebate is granted for goods carrying semi trailers where the number trailers exceeds the number of prime movers registered in an operators name. An interchangeable trailer cannot travel any more than 20,000 kilometres in a 12 month period.	40%
	Three axle buses - a rebate is offered to three axle buses exceeding 12 tonne GVM that travel no more than 60,000 kilometres in a 12 month period. The rebate means that these buses pay the same charge as a 2 axle bus that exceeds 12 tonne.	60%
	Trailers with a GVM greater than 4.5 tonnes but no greater than 9.0 tonnes - These trailers pay a flat rate charge. Presently \$154.00 instead of the per axle charge	Minimum of 57%
ACT	None	

Jurisdiction	Concession type	General rate of concession
VIC and NT	Information requested but not provided	