VEHICLE DIMENSIONS AND MASS REVIEW

SUBMISSION

ROAD CONTROLLING AUTHORITIES FORUM (NEW ZEALAND) INCORPORATED

Special Interest Group on Low Volume Roads

We note that this submission may be requested under the Official Information Act 1982 and confirm that all of this submission may be released by the Ministry of Transport in that event.

The Road Controlling Authorities Forum (New Zealand) Incorporated (RCAF or RCA Forum) is a closed, non-political incorporated society of road asset managers and roading professionals from all territorial local authorities (except the Chatham Islands Council), the Department of Conservation and the New Zealand Transport Agency.

The RCA Forum was established on 15 October 1996 by Transit New Zealand and representatives from the territorial local authorities, the Department of Conservation, Land Transport New Zealand and Local Government New Zealand to address common issues.

The RCA Forum vision is to assist road-controlling authorities to make informed decisions. It supports sector working groups on common issues and meets to exchange information and provide updates on sector activities, proposed legislation, new standards and guidelines, highway and procurement strategies and other issues relevant to the other member organisations.

The member authorities of the RCA Forum support infrastructure-related initiatives that will increase productivity in New Zealand. Every authority is keen to support any initiative that boosts economic performance for its ratepayers and road users, as district and regional economies in particular remain built on export production of dairy, meat, logs and wool, and increasing tourism. To thrive, each of these industries requires an efficient transport network. However, one of the major drawbacks of transporting heavier loads on the road network is the potential for a substantial increase in pavement degradation, causing network sustainability issues for local authorities.

The RCA Forum member authorities recognise that the aim of the Review is to enable improved transport productivity through ensuring a better fit between vehicles and the roading network. The VDAM Rule must support competing elements of the national transport policy. It is expected to support economic growth, improve public road safety and achieve more efficient delivery of goods and services to the public.

The road freight industry is not the only, or even the principal, stakeholder in this discussion. Consideration needs to be given to the impact on local road networks and on competing modes, especially rail. The Discussion Document and associated cost-benefit analysis prepared by Castalia recognise these wider considerations exist, but it is apparent that insufficient data have been available to allow fully informed policy formulation. The analysis in the documents is incomplete.

1. AXLE MASS AND GROSS MASS

Our submission is that current axle mass and gross mass limits should be maintained.

The proposed revised Schedule 2 limits are not supported.

An increase in general access gross mass limits for eight axle vehicles from 44,000kg to 45,000kg is supported.

Removing the permitting requirement from the operation of 50Max vehicles is not supported.

Amending tyre size categories for axle mass is not supported.

Reducing the weighing tolerance is supported.

1. The Discussion Document reports that road transport operators, through their representative organisations (RTF, HHA and FOF) consider the present vehicle dimension and mass limits conservative in relation to current road and bridge capacities and concludes that, as a result, the existing network infrastructure may not be fully utilised under the existing limits. Therefore, an increase in limits would provide productivity benefits to industry, and community well-being benefits from fewer heavy vehicle trips reducing crash risks, congestion and vehicle emissions.

2. Maintaining current axle mass and gross mass limits, it is suggested in the Discussion Document, does not optimise productivity by matching the transport task to network capacity. The Discussion Document does recognise that the current limits are within the designed network infrastructure capacity. Furthermore, it notes the current limits are known and understood by operators and regulators, and allowance for heavier vehicles is available through HPMV.

3. The Discussion Document recognises the correlation between axle mass limits, productivity, and the impact on infrastructure. An increase in the axle mass limit would provide a related productivity gain from vehicles carrying heavier loads and making fewer trips to carry any specific freight task. However, heavier axle limits will result in increased costs of maintaining the roading network, as infrastructure deteriorates more quickly under heavier loads.

4. The consequences of such accelerated degradation, noted in the Discussion Document, include a cost from delays caused by increased road maintenance and additional pressure on detour routes that may not be designed to cope with heavy vehicles.

5. The Discussion Document notes that heavier axle mass limits would correlate with higher Road User Charge (RUC) rates, to reflect the increased impact on the roading network and suggests that, "ideally, the increased revenue from the higher RUC rates would match the increased costs of more regular maintenance of the roading network infrastructure."[1] Road controlling authorities are fully supportive of this ideal, but remain concerned that the proposals put before them contain no mechanism for putting it into effect.

Productivity Benefits and Effects on Traffic Volumes

6. The substantial economic benefits claimed for the proposal by the Discussion Document, based on the analysis done by Castalia, rely on the conclusion that the heavier trucks will result in reduced traffic, reduced fuel consumption, lower emissions and improved safety. Member authorities retain serious doubts over the underlying assumptions for this conclusion.

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[1] Discussion Document, Page 16

[2] Turner S, Roozenburg A, Francis T, *Predicting accident rates for cyclists and pedestrians*. Land Transport New Zealand

7. The analysis assumes that the additional infrastructure costs are paid for through the increase in road user charges. It does not take into account that, for local authority roads, more or less half of these costs can be paid by local authority ratepayers. This reduces the net benefit.

8. Castalia has also adduced a large safety benefit from fewer trucks on the road overall. It concluded that safety involves a quantity risk and quality risk; reduced numbers of heavy vehicles for same freight task reduces quantity risk, while heavier vehicles increases the quality risk. A relaxation of the VDAM rules leads to fewer trucks on the road network and newer, but heavier, trucks, which Castalia argue pose no increased safety risk compared to an older lighter truck.

9. Sufficient research on the relative change in risk from increased frequency of different modes has been done to suggest that great care should be taken in assuming a linear relationship between reduced truck numbers and reduced safety risk. Increasing the number of cyclists using a road, for example, has been shown to reduce the safety risk for each cyclist.[2] Less frequent encounters with heavy trucks on a road have the potential to increase the risk in every unexpected encounter with a larger and heavier vehicle, relative to a situation where more frequent encounters with heavy vehicles could be expected to produce greater caution in situations of greater potential hazard, such as corners, curves, bridge approaches and some tunnels.

10. Castalia also note correctly that increased mass requires a longer stopping distance and yields higher energy in a collision. The proposed changes to the VDAM rule would therefore appear to trade off the potential increases in safety that would naturally accrue from the introduction of improved safety technologies with the normal renewal of the existing heavy vehicle fleet over the coming decades. In the meantime, however, what has been observed by member authorities is that modern technological improvements in heavy vehicle design, such as stability control and ABS brakes, have allowed these vehicles to travel at higher speeds on all road surfaces. In considering the energy yield in a collision, therefore, the proposal increases both the speed and mass involved.

11. The analysis assumes that the improved productivity of individual heavy vehicles will lead to a proportional reduction in traffic volumes – to "fewer trucks on the road overall". This assumes that freight transport is a derived demand that is inelastic in response to changes in price, and also that the freight transport supply is inelastic. Freight modelling done in Australia found that freight transport demand is price elastic, however.[3] A change in road freight volume was found to correlate with a change in road freight price with a factor of -0.86. This means an increase of 10% in the price of road freight results in a reduction in road freight demand of 8.6%, while a reduction in price by 10% will result in an increase in road freight demand of 8.6%. Comparable modelling has not been undertaken in New Zealand, but there is no reason to believe that a similar relationship does not apply here.

12. Castalia have assumed an increase in average cargo of 3 tonnes, representing a productivity gain of 15.38% per heavy vehicle moving from a maximum gross mass of 44 tonnes to a maximum gross mass of 50 tonnes. This added productivity would incur some added costs in fuel and road user charges, but a 15.38% improvement in productivity would be likely to produce a 10-12% reduction in freight rates. This in turn would be expected to produce a 8.6-10.3% increase in road freight demand, based on the Australian modelling. Thus the gain in productivity will produce a lesser reduction in heavy vehicle trip numbers than is predicted by assuming no effect on demand.

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[2] Turner S, Roozenburg A, Francis T,*Predicting accident rates for cyclists and pedestrians*. Land Transport New Zealand Research Report 289 (2006)

[3] BRTE, *Freight Measurement and Modelling in Australia*. Bureau of Transport and Regional Economics: 377 (2006)

13. This growth in road freight demand would not be solely the result of increased economic activity, but would include modal shifts of freight from rail and coastal shipping and increased centralisation of storage and supply, where companies use fewer larger distribution facilities that require more transport instead of more numerous local distribution facilities. Castalia has specifically not assessed the cost of a shift of cargo from rail (or coastal shipping) to road, but has noted that road has higher safety risks and higher emissions for the same freight task than rail. What is proposed, therefore, are changes that can be expected to result in a movement of freight both to a distribution pattern with higher safety risks and higher emissions and increasing use of a mode with higher safety risks and higher emissions.

14. Adopting these proposals will also require extensive new signage throughout the network, on almost every bridge, tunnel, overpass, corner or curve. Local parking, refueling and standing areas are likely to need upgrading, as is the geometry and width of a significant portion of the rural road network. These are costs that will need to be met partially or substantially by the ratepayers of those local authorities. Insufficient analysis of the overall effect of these additional costs on local communities appears to have been included in the assessment of benefits and costs of the proposals.

Damage to infrastructure

15. Heavy vehicles generate significant costs through their use of the road network and only pay for part of these through road user charges and fuel excise duty. Much of the cost is borne by the ratepayers of the local authorities whose roads they use. The proposed amendments will lead to increases in these costs with no provision in the proposal for local authorities to be reimbursed for these additional costs. The result is that the proposal effectively requires local authorities through their ratepayers to subsidise efficiency improvements in the transport industry.

16. Any increase in gross mass limits for heavy vehicles needs to be based upon a full economic analysis of the economic benefits from the proposed high productivity heavy vehicles and the cost of the extra damage to road pavements caused by the increased vehicle mass. Road controlling authorities retain concerns that the analysis to date has given insufficient consideration to the costs inherent in the proposed increases.

17. A small increase in axle load causes a proportionately much larger increase in road pavement wear. Increasing vehicle mass increases the forces acting on the pavement, including the sheer force at the pavement surface during braking, accelerating and turning. Increasing vehicle length increases the required radius of the turning arc for the vehicle, leading to damage to bridge approaches and safety rails, and to costly changes to road geometry in areas of steeper topography.

18. Careless or inexperienced drivers, operating larger, heavier and faster vehicles exacerbate the damage to pavements with visible degradation at braking, accelerating and gear-change points near intersections and on gradients.

19. The majority of road pavements in New Zealand are based on a flexible pavement structure comprising a thin chip seal or asphalt wearing course and granular pavement layers. The design of these pavements has been based on empirical and mechanistic design methods derived from international research, including full-scale tests using in-service roads and test roads. New Zealand road pavement design practice for state highways and local authority roads carrying high volumes of traffic is now based on the Austroads Design Guide. Prior to the introduction of Austroads design standard, the majority of local roads have been designed using empirical design methods based on earlier AASHO road tests in the USA and UK research, using design methods such as the CBR design methods specified in NZS 4404.

20. These types of pavement are vulnerable to pavement damage when increased axle loads are applied to them. Rapid failure of road pavements due to increased axle loading were observed in the Northland and Gisborne areas after increased axle loading of forestry trucks resulted in accelerated pavement damage and

additional funding was required to maintain these roads. Many authorities have experienced accelerated pavement damage on rural roads due to forestry and quarry trucks, which has resulted in a substantial increase in road maintenance costs on these roads without additional funding from the road user charges.

21. The AASHO road tests undertaken in 1959-61 established a fourth power relationship between pavement wear and axle loads that has been used as a basis for pavement design and asset management ever since. In New Zealand it has also been used as the basis for determining the pavement maintenance component of Road User Charges. The fourth power relationship is therefore the basis for pavement design, pavement management and Road User Changes in New Zealand, and is also used as the basis of current design practice specified in Austroads Guide to Structural Design of Road Pavements (Austroads 2004), the previous Transit NZ State Highway Pavement Design and Rehabilitation Manual (1989) and various design methods adopted by local authorities, such as NZS 4404.

22. Road pavements have been designed to carry the expected axle loading carried by the pavement over the design life, which is normally taken as 20 to 25 years. The life of a road pavement and the pavement damage caused by vehicle loads is proportional to the axle loading on the road pavement during the design life. The anticipated pavement damage caused by different axle configurations and axle weights has been determined in the design of New Zealand roads by converting the axle loading to an equivalent number of passes of the standard axle using the fourth power relationship. This measure is referred to as the number of Standard Axle Repetitions (SARs) in Austroads; it is also referred to as Equivalent Standard Axles (ESA) or Equivalent Design Axles (EDA) in other design standards, such as NZS 4404. The pavement damage caused by an axle passing over a pavement has been considered proportional to the fourth power of its weight.[4]

23. Recent research, however, has shown that, while the fourth power has been used for empirical pavement design, for fatigue cracking of chipseal on thin flexible pavements caused by heavier axle weights the fifth power is appropriate, and for rutting of chipseal on thin flexible pavements the seventh power is more appropriate.[5]

24. The Austroads Pavements Design Guide (2004) recognised these higher damage exponents:

> *The Damage Exponents 5 and 12 (for fatigue of asphalt and cemented material respectively) are derived from the fatigue relations for these materials … The Damage Exponent 7 (for rutting and loss of surface shape of bound pavements) is derived from the subgrade strain criterion … The Damage Exponent 4 (for overall damage to granular pavements with thin bituminous surfacing) is derived from field studies of pavement performance.*

25. The New Zealand Supplement to the Guide retains the exponent choice, as does the Austroads Guide to Pavement Design Part 2 (2012). Empirical design is considered valid for standard loadings, but HPMVs apply higher than standard axle loadings (i.e. outside the empirical design envelope of the pavement), which suggests that it is prudent to use higher damage exponents, particularly where the local roads suffer damage primarily from cracking and rutting.

26. Local research using accelerated testing has concluded that higher powers than those recognised in the Austroads Guide may apply for weak pavements (and lower powers for strong pavements).[6] While some

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[4] A standard axle has been defined as a twin-tyred single axle loaded to 80kN or approximately 8.2 tonnes.

[5] Laskewitz J, Hudson K, Wanty D, *The damaging effect of overweight vehicles on Southland roads*. (2014)

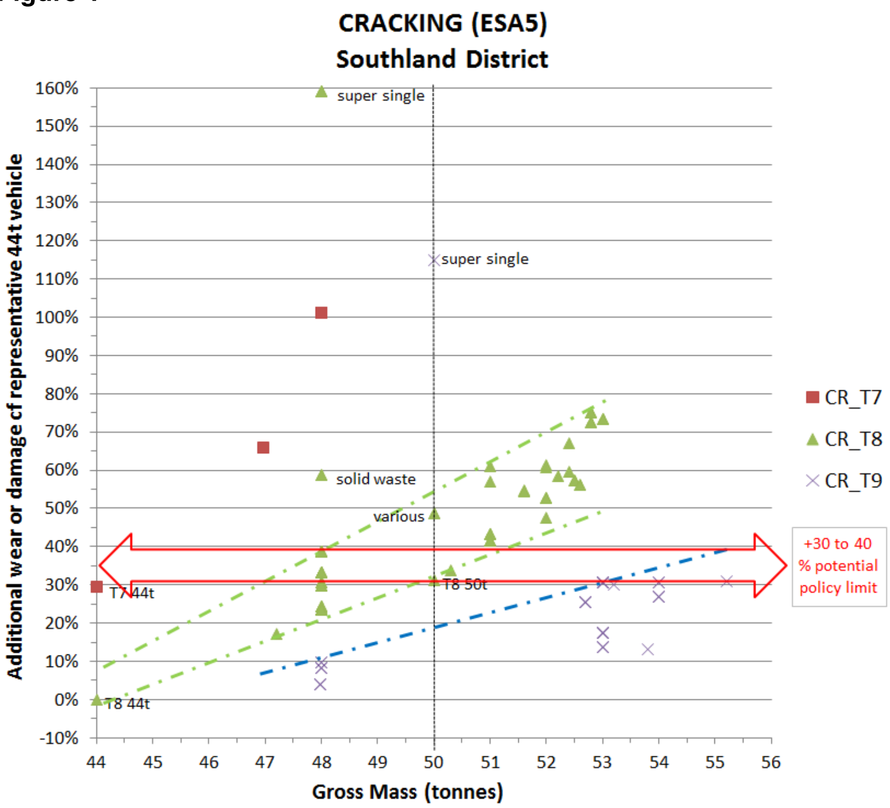
[6] Arnold G, Steven B, Alabaster D, and Fussell A, *Effect on pavement wear of Increasing Mass Limits for Heavy Vehicles*. Land Transport New Zealand Research Report 281. (2005)

geological regions of New Zealand are more likely to have weaker pavements than others, a national policy considering the maximum mass for general access to the network must be cognizant of the potential for greater than average pavement degradation in these regions.

27. Where the increase in pavement damage is greater than the increase in productivity there will be a net increase in pavement damage from these changes. While it has been argued that the trucks will pay for the increased pavement damage through road user charges, local authorities are not fully funded for pavement maintenance, and in fact the Road User Charges cost-allocation model incorporates the local authority expenditure and does not charge the road users tor this component, so that member authority ratepayers are subsidising the road transport industry.

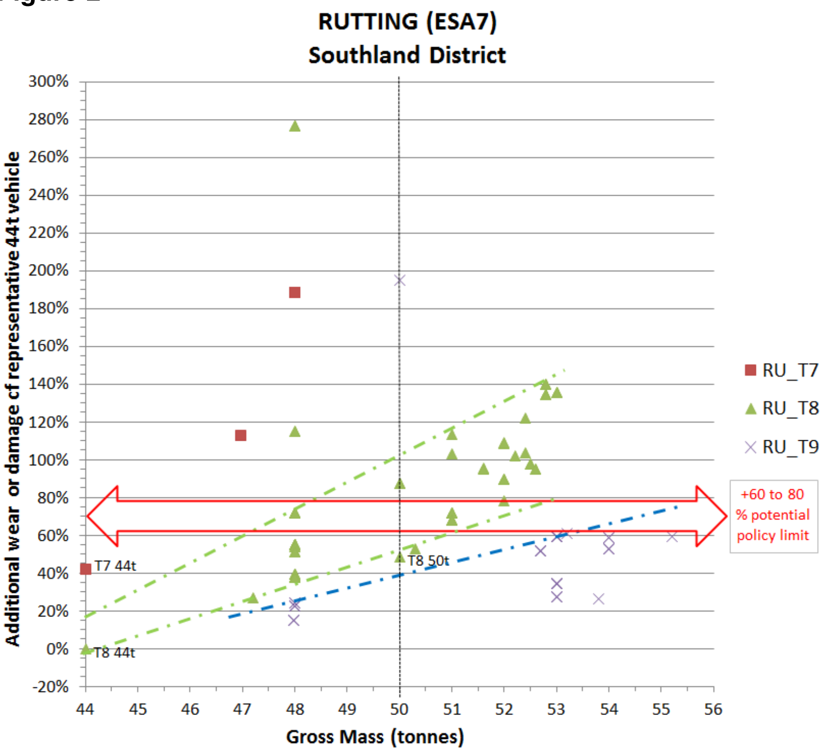
28. The additional pavement damage relative to a representative vehicle laden to the 44T limit was shown graphically by Laskewitz et al in the following two figures, which show significantly greater damage from fatigue cracking (CR) and rutting (RU) in each case from increasing the gross mass of seven axle (T7), eight axle (T8) and nine axle (T9) configurations.

Figure 1



29. It can readily be seen from the two graphs showing cracking and rutting damage to roads in Southland District that an increase in general access gross mass limits from 44T to 45T for seven axle combinations would cause substantially greater damage than would be caused by eight or nine axle combinations and for this reason the increase in general access gross mass limits can be supported only for eight or more axles.

Figure 2



30. There are also other infrastructure wear and damage concerns. A major issue is bridge damage. In the road user charges cost allocation model bridge maintenance costs are allocated in proportion to gross vehicle weight. Thus, increasing the weight of a 44T combination to 50T is a 14% gross vehicle weight increase, which would be expected to increase bridge maintenance costs funding by a proportionate increase in road user charges. This increase represents a 21% increase in pay-load and hence a theoretical 18% reduction in vehicle trip numbers for the same freight task. This suggests that there should be a small reduction in bridge wear.

31. This is unlikely to be the case, however. Any improved efficiency of the road freight industry will reduce freight rates, which will in turn generate additional traffic (not all of it newer heavy vehicles with extra axles) that will offset the reduction in bridge wear. Also, bridge wear is a fatigue damage process better described by a power relationship similar to the fourth power relationship used for pavements. Appendix A of the bridge evaluation component of the heavy vehicle limits project presents a formula for calculating the residual life of bridges subject to increases in load.[7] This formula shows a fifth power relationship between bridge damage and load. Using the fifth power damage exponent means that any increase in axle combination loads will have a significant effect on bridge wear.

32. This increase is both far greater than any possible productivity gains for road transport and far more than what would be funded by the increase in road user charges. Furthermore the majority of bridges on local authority roads are more than 40 years old and have not been designed for the current HN-HO loading specified in the Transit NZ Bridge Manual. A specific structural assessment of all bridges will be required to ensure that the bridges can safely carry the additional heavy vehicle loads. The cost of this assessment will need to be recovered from the heavy freight industry under any user-pays model.

33. A similar situation arises in relation to culverts. For pipes and utility services under road pavements, these facilities are generally within 1 metre of the road surface and have been designed to carry the

[7] Roberts W and Heywood R, Transit New Zealand Heavy Vehicle Limits Project. Report 1, Bridge Evaluation (2001)

surcharge load from a 8200 Kg axle load. With an increase in the axle loading on HPMV vehicles, the structural strength of these facilities will need to be assessed.

34. A further aspect of infrastructure wear to be considered is geometric effect. Many local authority roads, particularly those built before the introduction of recent subdivision design standards such as NZ4404 in 1982, have not been designed to accommodate the space requirements of large combination vehicles. A typical intersection on a local authority road is based on road widths of 10 m to 12 m with corner radii of 9 m to 13.5 m. Large vehicles such as semi-trailer vehicles currently have difficulty negotiating the corners of these roads and remaining on their side of the road. This creates a significant safety risk on roads where local topography obscures the view of what might be approaching at a corner. At intersections and entrances heavy vehicles cause damage to kerbs and channeling, because they are unable to negotiate the turns, and they present a safety risk to other vehicles in opposing traffic lanes, or parked nearby. Large vehicles also have difficulty negotiating roundabouts and right-turn bays at intersections and often drive over and damage medians and traffic islands. Many rural local authorities have already incurred significant expense in repairs to safety rails on narrower bridges, because the longer vehicles cannot negotiate the approaches.

35. Repairs to these items are only partly funded from the National Land Transport Fund and the shortfall is paid by local authority ratepayers. Allowing heavier trucks with these dimensions will cause greater damage, because of the higher weights. In theory, there should be fewer trucks and so fewer instances of damage, but the reduction in trucks numbers is not likely to be as great as predicted and overall it is expected that geometric damage on roads will increase due to the heavier axle loadings. Again, the additional repair costs will be substantially met by ratepayers and the cost benefit analysis has not adequately addressed this.

Fuel Consumption and Emissions

36. At highway speeds on flat ground approximately 40% of heavy vehicle fuel consumption is proportional to the vehicle's mass while 60% is independent of mass. In stop-start conditions or in hilly environments, a much larger proportion of fuel consumption is mass dependent. Overall about 50% of fuel consumption is mass dependent. For a vehicle combination loaded to a 50T maximum compared with the same vehicle laden to a 44T maximum there is a 14% increase in weight and a 7% increase in fuel consumption.

37. Castalia has calculated an average increase in cargo of 3 tonnes to an average gross mass for 50T maximum heavy vehicles of 41.2T.[8] Based on this average gross mass, Castalia has calculated the increase in fuel consumption at about 6.5%, increasing from 31L/100km to 33L/100km.[9]

38. Emissions fall into two categories: greenhouse gas emissions that contribute to climate change and regulated emissions that affect air quality and have human health impacts. Greenhouse gas emissions from transport consist primarily of carbon dioxide. The amount of carbon dioxide emitted is directly proportional to fuel consumption and is calculated by Castalia as 2.7kg of carbon dioxide equivalent emissions per litre of diesel consumed.

39. Based on the figures used by Castalia, a heavy vehicle with a capacity for a gross mass of 50T and laden to an average gross mass of 41.2T would generate 89.1 tonnes of carbon dioxide over 100,000 km, while the equivalent figure for the average gross mass of a heavy vehicle within the current limit of 44T is 83.7 tonnes of carbon dioxide over 100,000 km.

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[8] Table 2.2

[9] Table 2.5

40. Castalia argues that, despite this average 5.4T/100,000 km increase in carbon dioxide emissions per vehicle, reduced truck movements are assumed to lead to reduced emissions. Castalia has also, however, made the assumption that newer, heavier, trucks will be used more than those being replaced, so it is far from certain that the proposal will deliver reduced vehicle emissions benefits from this analysis.

41. Regulated emissions, particularly particulate matter from diesel engines, are implicated in about 500 additional deaths per annum in New Zealand.[10] Air quality is a major concern in urban areas. While the Discussion Document states that heavy vehicles emit 21.5% of national carbon dioxide emissions, the ARC Auckland Air Emissions Inventory 2004, found that heavy vehicles made up 7.3 % of the vehicle kilometres on Auckland roads, but generated 43% of the PM10 vehicle emissions.[11] PM10 is considered a surrogate for health impacts from all air pollutants.

42. The significance of this potentially higher impact on urban air quality has been noted by Castalia, who have commented that at lower speeds higher-mass vehicles have higher emissions, but it is not clear that it has been appropriately factored into the analysis of costs and benefits.

43. Apart from airborne emissions, heavy vehicles have a number of other adverse environmental impacts on local authority roads that currently result in costs to ratepayers. These include heavy metal and hydrocarbon contaminants from tyres, brakes and fuel contaminating storm water and berms. When accumulated over time the quantities of contaminant on roads carrying high volumes of heavy vehicles are substantial. With increased axle loadings and longer decks the road surface wear will be greater due to increased traction and braking forces on the road pavement and increased scuffing on corners. As a result there will be increased road surface detritus build-up on roads. The typical heavy vehicle tyre loses 7.5kg of weight in its life, which is typically around 100,000 km. An eight-axle combination typically has 28 tyres and typically travels about 100,000 km per annum and thus would leave 210kg of tyre detritus on the network annually.

44. Heavier vehicles wear out tyres and brakes faster. If the heavier vehicles resulted in a proportionate reduction in traffic the volume of contaminants would not change. If the improved productivity of heavier vehicles leads to the reduction in road freight costs and an increase in road freight demand, however, the volume of contaminants will increase. For member authorities the fundamental issue is that these costs are generated by road users, but the majority of the road cleaning costs are paid for by the ratepayer.

Safety

45. Heavy vehicles are over-represented in the fatal and serious injury crash statistics. The Discussion Document notes that heavy vehicles make up about 7% of vehicle journeys, but contribute 18% of fatal crashes. This disproportionate involvement in serious crashes is a result of the weight difference between heavy vehicles and the other vehicles leading to more serious crash outcomes. The truck driver is at fault in only about 35% of crashes involving trucks and other vehicles. However, trucks are also involved in a significant number of single vehicle crashes and in almost all of these, driver error is a contributory factor. The proposal will result in heavier trucks. The reduction in total truck trips is likely to be much less than expected and the safely gains from any reduction in truck trips are likely to be less than assumed.

46. A further complication arises when considering rollover stability. Most large heavy vehicles in New Zealand are required to achieve a minimum level of rollover stability. This is quantified using a measure known as static rollover threshold or SRT and vehicles must achieve a minimum level of 0.35g. The SRT of a vehicle depends on the height of its centre of gravity, the tyre track width and the roll stiffness of the

[10] Fisher G, Kjellstrom T, et al., *Health and Air Pollution in New Zealand.* Health Research Council of New Zealand, Ministry for the Environment and Ministry of Transport: 166 (2007)
[11] ARC TP 292

suspension and tyres. Increasing the cargo mass on a vehicle without increasing its length will normally result in a higher centre of gravity and lower rollover stability. Studies of heavy vehicle crash rates have shown that the risk of a rollover crash increases dramatically as the SRT reduces below 0.4g.[12] For lower SRT values this increase in rollover risk is substantially greater than the increase in productivity. It is reasonable to conclude that an outcome of increasing the mass able to be carried and the centre of gravity is an increase in heavy vehicle rollovers.

47. Road safety is also likely to be adversely affected by heavier vehicles through the increase of the range in agility of the vehicles that use the same road. If all vehicles have the same agility, less overtaking will be required, which is a prime factor in most serious road crashes. Heavy vehicles do not have the same agility as lighter vehicles and are more affected by steep gradients. Longer vehicles are relatively harder for smaller vehicles to overtake. An increase in the range in agility would produce a deterioration in road safety.

48. In wet conditions the extra axle and tyres generate increased spray that significantly obscures visibility for smaller vehicles following or passing. There is also a substantial vortex effect with larger vehicles that can be a significant risk for cyclists and small vehicles. These effects need to be included in the assessment of the costs and benefits.

Detour routes

49. Emergency detour routes have been established based upon the weight, configuration and dimensions of the existing heavy vehicle fleet. The existing emergency detour routes may not be suitable for the proposed higher axle and gross masses. It would be inadvisable for the Police to have the authority to divert heavy vehicles onto unauthorised non-designated detours as they may have no knowledge of the nature of the detour roads. It would also be unreasonable to expect a truck driver to have any knowledge of possible bridge limits and restrictive road geometry on a detour route. These situations would create problems on roads where there is no turn-around availability for the vehicles. The detour issue also raises the question of liability, in the event of an over-weight truck using a substandard road, for structural assessment as well as possible remedial work. It also raises the issue of how the road controlling authority would become aware of such an incident unless an obvious problem occurs. The detour issue also raises the question of funding to bring proposed designated detour routes up to an appropriate standard, both structurally and geometrically. This cost has not been included in the economic analysis.

Reducing tolerance to 500kg

50. The Discussion Document suggests that increasing the general access gross mass limit to 45T should be considered in conjunction with reducing tolerance from 1,500kg to 500kg. Maximum weighing tolerances are provided for in the Land Transport (Offences and Penalties) Regulations 1999, with current tolerances scaled from:

- 500kg - weights up to 11,000kg
- 1,000kg - weights from 11,000kg to 33,000kg, and
- 1,500kg - weights heavier than 33,000kg.

51. That is to say that the greatest tolerance is accorded to the offence causing the greatest damage. The Discussion Document notes that it has become widespread practice for operators to load up to the current tolerance levels, above the legal limits, so that where the prescribed maximum vehicle mass is 44,000kg,

[12] Mueller T, de Pont J, et al., *Heavy vehicle stability versus crash rates.* Land Transport Safety Authority (1999)

the 'tolerated' mass of 45,500kg is often adopted as the acceptable limit. The Discussion Document recognizes that operators are paying road user charges only on 44,000kg, and therefore not paying for the impact the additional 1,500kg is having on the road network. This creates a strong economic incentive to overload.

52. The Discussion Document refers specifically to operators of seven-axle combinations who currently load above the legal limit, to the tolerated 45,500kg, without obtaining a permit and without purchasing a road user charge licence appropriate to the additional weight. These operators will need to reduce their load by 1,000kg to avoid being liable for overloading penalties. A 7-axle vehicle combination loaded to 45,500kg is estimated to cause, on average, 50 percent more pavement damage than an 8-axle combination at the same weight. Road user charges for 7-axle combinations do not reflect the damage caused when running at more than 44,000kg.

53. The proposal reduces the tolerance to 500kg for most legal maximum weights, with the exception being the 300kg tolerance on front-steering axles, which will be retained. The proposal is described as better reflecting the level of accuracy of modern weighing techniques. The rationale for setting a limit and immediately setting a higher limit below which no action will be taken appears dubious. Modern load cells claim significantly greater accuracy than 500kg and most operators are able to load very accurately to 45,500kg at the moment, as the Discussion Document notes.

54. It is worth noting that all road vehicles used for transporting forestry harvest on British forest and public roads must have access to a weighing device which, from the point of loading *within the forest*, shows the gross vehicle weight or load weight. The device may be on the vehicle, or on the machine loading the vehicle. The operator must be able to produce a document recording this information. Operators will provide this record on reasonable request to the Landowner, VOSA, Police, Department for Transport, Health and Safety Executive or mill personnel.

55. Responsibility is very clearly placed on the vehicle operator by UK Timber Transport Forum Code of Practice for Road Haulage of Round Timber, which states unequivocally:

> *Overloaded vehicles can impact on road safety and can cause road damage. All parties responsible within the supply chain have a duty to monitor compliance with Gross Vehicle Weights: Overloading is illegal.*

56. Retaining any officially specified tolerance for overloading will continue to create an economic incentive to pay for a lesser load and to overload vehicles to that tolerance to maximise the return on the journey. Removing the tolerance completely places the onus on the operators to exercise due care and diligence in loading and creates a strong incentive for all operators to comply with the limits.

57. The Discussion Document refers to 18% non-compliance by truck and trailer combinations, although the 2014 WIM data shows 21.2% of such combinations by number and 29.7% by gross mass were overweight. This indicates very strongly that the current approach is not curbing misuse of the network.

Super-single tyres

58. The Rule currently provides for two tyre sizes, and sets mass limits in relation to these. The Discussion Document refers to stakeholder consultation that has led to proposals that the Rule could reflect a greater variety of tyre sizes. In particular, it is suggested that wider 'mega' ('super single') tyres have the benefit of distributing mass over a larger footprint, therefore reducing pavement impact and wear. This claim is not supported by research undertaken in New Zealand.[13]

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[13] Laskewitz J, Hudson K, Wanty D, *The damaging effect of overweight vehicles on Southland roads.* (2014)

59. Allowing units with super single tyres on the drive or trailer axles is a very poor option for pavement sustainability as the increase in pavement damage can exceed 300%. This can be seen in the figures below comparing pavement damage taken from Laskewitz et al. The extreme right-hand bar shows the relative pavement damage caused by a 50Max vehicle fitted with wide super single tyres (375 mm to 450 mm wide). Under current regulations tyres can be classed as wide singles if they are as little as 330 mm wide, which cause even more pavement wear than the tyres allowed for in the graphs.

Figure 3

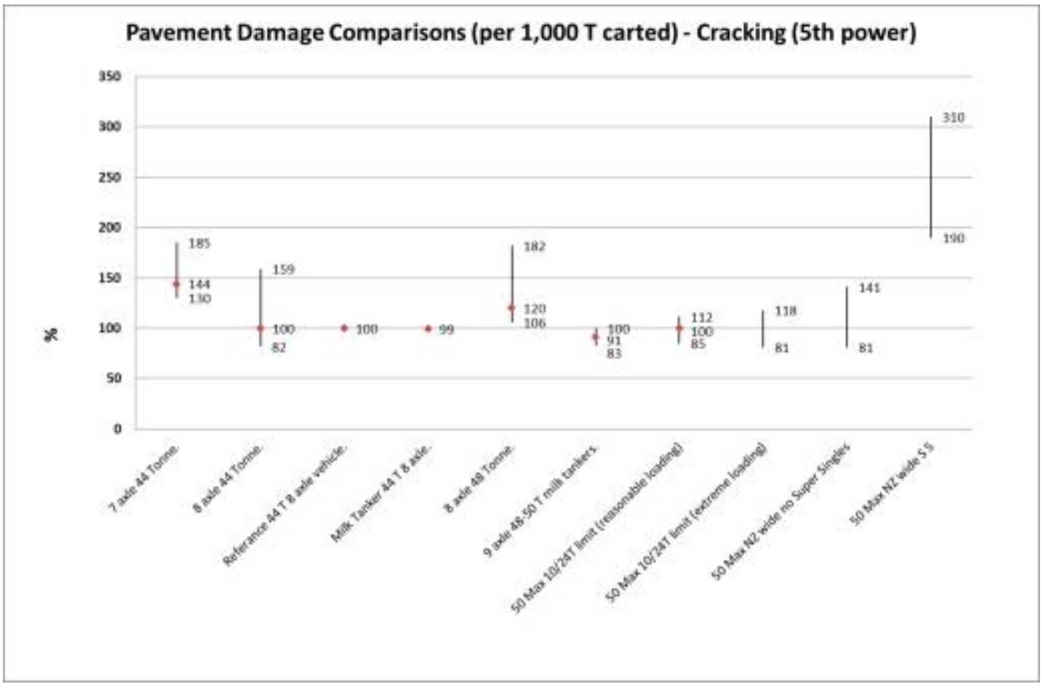
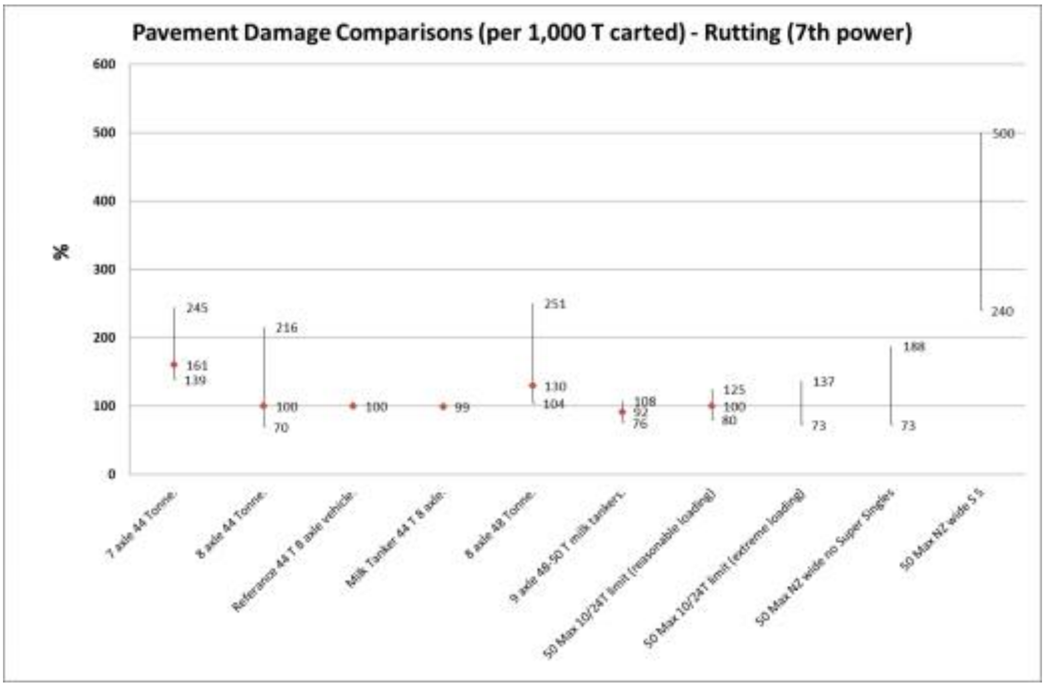


Figure 4



60. Current allowances are already more generous than comparable Australian standards. The Discussion Document notes that the New Zealand limit of 7,200kg for tyres of 355mm to 374mm width is 1,200kg heavier than the Australian equivalent. For trucks with super single tyres, the road user charge should reflect the significant increase in pavement damage that they cause, but these units should also not be candidates for HPMV's or 50MAX.

Road User Charges regime

61. Research undertaken in New Zealand over the past decade and already cited has shown how significantly pavement consumption varies with different load configurations for the same overall load. Currently, the Road User Charges (RUC) regime does not reflect these differences, so there is no economic incentive for operators to seek to load heavy vehicles to minimize pavement damage.

62. There is no difference in RUC for any public road that a transport operator chooses to use. This means that operators choose routes solely on what is best for them, rather than what may be best for sustaining an optimal transport network. An example is the use of shortcuts on local roads that may have been designed for only 10% of the ESAs that the alternative state highway was designed for. While the state highway may cost twice as much per kilometre to rehabilitate compared to the local road, it can carry ten times as many ESA before needing rehabilitation, which means the long-term cost to the local authority is five times greater when the transport operator takes the local road shortcut. The local authority ratepayers must meet a significant percentage of that cost.

63. Planning needs to begin on full user pays for the roading network, with RUC reflecting the actual pavement consumption for a particular loading configuration on particular roads. This could be achieved with the upgrade of currently available in-truck load-cell technology and GPS location with electronic RUC charging, a pavement damage comparison tool and GIS for route option planning.

64. By adopting this type of system, it would take RUC from being an "average of an average" to providing strong incentives to employ more sustainable configurations on the most cost-effective road for the particular freight task. It would also mean that the operators gaining the benefits of higher loadings would also pay for any additional costs imposed on the roading network in obtaining those greater benefits.

65. Such a system would also allow a fairer distribution of the RUC income to the roads where the pavement consumption is occurring. The current system does not do this, as it does not account well for the high cost per heavy vehicle using a low volume, low to moderate strength network. This is a particular problem on local authority roading networks where ratepayers rather than the road users are required to fund approximately 50% of the costs.

66. It should be possible to achieve significant cost savings across New Zealand's roading network by creating strong economic incentives to reduce the average damage caused by each unit.

Barriers to enforcement

67. There is a lack of clarity on the road as to which vehicles are operating under which part of the legislation. At the moment all HPMV vehicles must display the H plate. The meaning of the H plate is not defined or differentiated, so any observer is unable to know whether the H plate is indicating that a vehicle is over length or over weight or both, or 50Max or just someone with an H plate.

68. This situation creates a barrier to effective enforcement.

2. WIDTH

Our submission is that the general maximum width of 2.50m for vehicles with enclosed loads should be retained.

1. The Rule currently prescribes a general maximum width of 2.50m for all vehicles and their loads (some vehicles carrying particular types of loads; hay bales, wool bales and concrete pipes, are allowed a width of 2.70m). There is a list of exceptions that allow a vehicle's width to extend beyond 2.50m. These include load-securing devices, such as ropes, lashings, straps, chains, and j-hook assemblies, which can extend an additional 25mm from either side of the vehicle. Currently many vehicles in the fleet operate with an effective permitted width of 2.55m resulting in two sets of standards depending on whether a vehicle carries a fully enclosed load (2.50m maximum width) or an 'open' load requiring securing devices, such as logs (2.55m).

2. The Discussion document proposes a preferred option that allows vehicles to fully use the air space above the currently allowable 2.55m road width foot-print (when securing devices are taken into account). This option encourages increased productivity for vehicles with enclosed loads that have no need for external securing devices. Productivity gains are estimated to be approximately $93m NPV over thirty years. The proposal would give more flexibility on what units can be imported rather than especially made in New Zealand.

3. The Discussion Document states that increasing the maximum width to 2.55m is expected to result in a maintenance of, or improvement in, current road safety levels and community well-being through fewer heavy vehicle trips. The proposal standardises total width between enclosed and open loads, and makes this available for all vehicle types on all parts of the roading network.

4. The proposal to alter the maximum legal width to 2.55m for solid sided units to match the width of open loads does not appear to give sufficient consideration to the difference between ropes, lashings, straps, chains, and j-hook assemblies on a generally narrower load and a wider unit solid for its full length from corner to corner. Wider solid units will potentially increase existing problems with lane widths on many local authority roads, especially in circumstance where two full width vehicles meet each other. On urban local roads greater separation between the traffic lane and cycle lanes or parking is likely to be required by this proposal.

5. Apart from the obvious safety issues associated with this, it will increase pavement degradation through heavy vehicles travelling closer to the edge of the seal as they pass. On many lower volume sealed roads the sealed pavement is less than 6m across and truck (and especially trailer) tyres ride the edge of the seal. This causes edge break. Wider heavy vehicles can only exacerbate this problem, which has obvious maintenance cost implications for local authorities and significant safety implications for all road users forced to travel nearer or over the centreline.

6. Damage to the approaches and safety rails of bridges with curved approaches is already a significant cost for member authorities. Wider, as well as longer, heavy vehicles will only increase the incidence, severity and cost of this problem.

3. HEIGHT

Our submission is that an increase of the general access height limit to 4.275m, inclusive of load restraining devices is supported.

1. The current Rule creates different height standards between fully enclosed vehicles and vehicles with external load restraints. Fully enclosed vehicles do not require the use of load restraining devices and the body of the vehicle can only go up to 4.25m. On the other hand, vehicles with external load restraints are able to go to a total height of 4.275m.

2. The Discussion Document explains that transport industry has expressed concerns that the current general access height limit is not adapting to changes in the vehicle fleet. For example, Euro 5 vehicles are fitted with extra environmental technology, which is attached to the chassis of the vehicle. This raises the body of the vehicle and results in a loss of load capacity. Increasing the general access height limit for all vehicles could result in an improvement in volume capacity.

3. Another example cited is livestock vehicles, which currently require an over-height exemption in order to install add-ons that improve occupational safety and health (OSH) outcomes and animal welfare. Livestock vehicles are currently exempted and operate at a height of up to 4.3m already, however, so the potential benefit for livestock vehicles is not immediately clear.

4. An increase in the height limit would increase the risk of overhead strikes. The Discussion Document notes that KiwiRail has reported between 15-30 rail overbridge hits by heavy vehicles each year at the current height limit. Strikes on rail bridges pose a significant safety risk to both rail passengers and operators. Furthermore, they cause disruption to both road and rail services, and can be costly to remedy.

5. The Discussion Document notes, but does not list, five structures on the state highway network that have been identified as susceptible to an increase in the maximum allowable height for general access. It notes that data on the exact number of tunnels, bridges and underpasses on the local road network that would be susceptible to an increase in vehicles' maximum allowable height is not currently available.

6. An increase in the general access height limit to 4.275m for all vehicles, irrespective of the use of external load constraints, could provide productivity benefits to operators of fully enclosed vehicles (e.g. safety add-ons for livestock vehicles) without increased risk of overhead strikes as no change is being made to the current height limit. It does not provide any additional benefits to vehicles with external load restraints.

7. Increasing the general access height to 4.3m has the potential to significantly increase the risk of overhead strikes on tunnels, bridges and overpasses. It would substantially reduce the available margin for reseals under overhead structures.

8. Where the clearance under these structures has been achieved by creating a slight dip in the road beneath them, the combination of both taller and longer vehicles would significantly increase the risk of overhead strikes or vehicles becoming stuck under these structures.

4. CAR TRANSPORTER GROSS MASS

Our submission is that an increase in the gross combination mass limit for pro-forma car transporters to 38,000kg is supported.

1. The VDAM rule classifies car transporters as simple trailer combinations. Under the VDAM rule, simple trailer combinations are prescribed a gross combination mass limit of 36,000kg. An increase in the mass limit would compensate for increases in the length, and therefore the chassis weight of pro-forma car transporter designs. It would enable operators of these vehicles to maintain the same level of payload as for previous vehicles (nine cars). Enabling the pro-forma designs to maintain the same level of payload as standard designs would update the VDAM rule to reflect changes in the vehicle fleet.

PERMITTING

5. DIVISIBLE LOADS

Allowing road controlling authorities to grant permits for overweight divisible loads for non-HPMVs could enable greater productivity for some vehicles and is supported. Guidance on consistent conditions and best practice should be developed and promulgated to support this.

6. INDIVISIBLE LOADS

Giving formal status to the following 10 loads as indivisible loads is supported: transformer oil, building removals, platform trailers, construction equipment, load dividers, ballast, towing of disabled vehicles, fire fighting vehicles carrying water, slurry sealing and towing of trailers.

1. Inclusion of ancillary components of indivisible loads with an indivisible load for the purpose of carriage needs to be approached with care, not so much in terms of practical application, but in terms of legal definition. If it is ancillary and able to be carried separately, it is by definition not indivisible.

7. CRANE BOOM SECTIONS

Providing exceptions for crane boom sections up to 3.1m in width and 4.5m in height is not supported.

1. It is proposed that crane booms that can be disassembled be allowed to be carried to the equivalent dimensions of a Category 1 overdimension vehicle (maximum width of 3.1m) and to a maximum height of 4.5m. The reasons are increased vehicle productivity and potential safety benefits gained by reducing the number of vehicle trips needed to move cranes.

2. Increased use of non-general access dimensions on the road is likely to have a potentially higher crash risk than any potential mitigation from having fewer vehicle movements at general access widths and heights.

9. MANAGEMENT OF OVERDIMENSION LOADS

The following proposals are supported:

- Proposal 1: Clarify in Rule the responsibilities of 'operator' for overweight and overdimension permits.
- Proposal 2: Flags should no longer be permitted to signal the edge of overwidth loads (but still be required to mark the end of long loads).
- Proposal 3: All tractors between 2.5m and 3.1m wide should be required to use a warning light or hazard panels signifying width.
- Proposal 4: Pilots should be able to use sound warnings to warn oncoming vehicles of an approaching overdimension load (where no restrictions on vehicle sounds are in place).
- Proposal 5: Pilots should be required to be positioned on the road in line with the outer extremity of an overwidth load (where it is safe and practical).

11. Other comments

1. The member authorities note two paragraphs in particular from a Cabinet Paper from the Minister of Transport in July 2013:

> *A key principle of the pay-as-you-go system for land transport funding is that road users must make a sufficient contribution toward the costs of operating and developing the network. Therefore, a steady series of regular increases to petrol excise duty, and equivalent increases to road user charges, is recommended so that the NZ Transport Agency is in a position to manage short term expenditure pressures, and to place the National Land Transport Fund into a sustainable position for the future (ie ensuring there is sufficient revenue through pay-as-you-go to meet likely expenditure demands).*
>
> *New Zealand's historic investment in land transport infrastructure has enabled a level of personal road travel among the highest in the world. However, during the 1980s and 1990s, the level of investment in the transport network was significantly lower than in previous decades, while traffic levels continued to grow at unprecedented rates. This has resulted in an infrastructure deficit that we are currently addressing. GPS 2012 outlined the government's priorities for the safe and efficient movement of goods and people, including increased investment in land transport targeted at State highways, the Roads of National Significance, safety, and public transport.*

2. An increase in the cost associated with the maintenance of the local road transport network for heavier vehicle use will as a consequence need alignment with local authority Asset Management Plans and Long Term Plans and consideration of the source of funding for this work.

3. While additional Road User Charges will be generated by the changes proposed, there is no mechanism available to allocate these additional funds to local authorities to cover accelerated damage to local roads caused by the vehicles for which the RUC was paid. If these RUC fund transfers do not include the local share of the necessary maintenance and improvement costs, these would be an unexpected charge on local authority ratepayers.

4. The member authorities retain concerns that the review of the rules governing the principal causes of road maintenance and improvement expenditure by local authorities and the review of the Funding Assistance Rates framework were not better coordinated to ensure that any transfer of funding burden onto ratepayers was avoided.

5. The redistribution of funding assistance applied to local roads across territorial authorities from the latter review, combined with no provisions for inflation and lower level of service expectations expressed in the One Network Road Classification (ONRC) system, transfers the additional burden on to property rates (or other sources of local revenue) to ensure that additional revenue forecast in the NLTF resulting from the increased fuel excise duty (indexed to CPI) is reserved for State highways, the Roads of National Significance, Auckland and Canterbury.

6. This does not support the Government's business strategy or growth agenda, which rely heavily on the continued export of primary industry products from rural, and predominantly lower socio-economic, areas of New Zealand. Primary industries and rural communities suffer a proportionately greater impact from reduced funding for local roads. Therefore, any increase in damage to local road infrastructure should be balanced by NLTF revenue increases applied to local road maintenance and renewal activities.

7. Member authorities remain of the view that optimal land transport outcomes cannot be achieved by transferring the burden from the NLTF to property rates for primary producing communities that contribute significantly to the business growth agenda of New Zealand.

8. Similarly to concerns about the disconnect between reviews of the Rule and the FAR, member authorities regret the lack of any direction within the Discussion Document towards a stronger regulatory response to the current safety standards of the heavy vehicle fleet.

9. Actions could be taken in parallel with the current review to achieve improvements in heavy vehicle safety at an early date. These would also lead to a more rapid modernisation of the fleet, with higher gains in efficiency and productivity available at an earlier date.

10. The Discussion Document refers to the 2014 Monash University report *Benefits of Crash Avoidance Technologies in the Heavy Vehicle Fleet,* which concluded that fitting Autonomous Emergency Braking Systems to all heavy vehicles would have the greatest effect on fatal heavy vehicle crashes. Significant reductions were shown for other safety-related systems that could be implemented now by the freight industry.

11. Fitting under-run protection systems on trucks, as recommended by the Cycling Safety Panel's 2014 report, could and should be required as a matter of urgency. Such systems are mandatory in most OECD countries and could assist to reduce cyclist and pedestrian fatalities from heavy vehicles.

12. Consideration should also be given to early introduction of a safety levy when vehicle ownership is changed, or as part of vehicle licensing, to be used to create an economic incentive to scrap older vehicles, as proposed in the Safer Journeys Action Plan 2013-2015 under the heading 'Actions- Accelerate the exit of unsafe vehicles'.

13. The member authorities believe the road transport industry must take responsibility by equipping their fleets with GPS and other modern technology to provide them with oversight of their operations. This equipment exists now and can be retrofitted. There should be a requirement placed on the industry to update the fleet accordingly and for the information collected to be available to Police and road controlling authorities.

14. Even when such information is available, however, enforcement is inhibited by the available regulatory provisions. Police cannot issue infringement notices under 16A of the Land Transport Act 1998. Every breach of a restriction must be taken to court, which is time consuming and expensive. The provisions in the Local Government Act for heavy vehicle restrictions allow Police to issue infringement notices for a breach of a bylaw, but the infringement fee is limited and would need to be significantly increased to be an effective deterrent to non-compliance. There is a separate need, therefore, for section 16A of the Land Transport Act 1998 to be amended to allow the Police the power to issue infringements for a breach.

APPENDIX

Road controlling authority members of the Special Interest Group on Low Volume Roads

Far North District Council

Kaipara District Council

Whangarei District Council

Auckland Transport

Waikato District Council

Whakatane District council

Ruapehu District Council

South Taranaki District Council

Whanganui District Council

Wairoa District Council

Marlborough Roads

Tasman District Council

Waitaki District Council

Dunedin City Council

Southland District Council

New Zealand Transport Agency