TRANSPORT IN THE PUBLIC INTEREST
Submission on Victoria's Draft Infrastructure Strategy

Public Transport Users Association
October 2016

Introduction

The Public Transport Users Association (PTUA) advocates for a comprehensive, efficient, environmentally friendly and socially inclusive public transport network throughout Melbourne and Victoria. It is the peak advocacy body for current and aspiring users of all forms of public transport in Victoria.

This submission has been prepared for Infrastructure Victoria (IV) by the PTUA in response to IV's *Draft 30-Year Infrastructure Strategy* ('the Strategy') released in October 2016.

The PTUA welcomes the opportunity to comment on the proposals and methodology of the Strategy. It is hoped that our critical feedback will be used to strengthen the valuable work already done by IV,, to ensure the final strategy to appear at the end of 2016 is a fitting reflection of community desires and expert evidence. It will then deserve to stand as a long-term policy instrument where earlier attempts at long-term strategy have failed.

As befits comment by a transport advocacy organisation, the scope of our submission is limited to the transport policy elements of the Strategy.

The submission commences with summary responses to the three key questions posed by IV in its submission process. Subsequent sections provide supporting details of our response under various headings.

Summary Response to Key Questions

Will the recommendations in the draft 30-year infrastructure strategy help achieve the objectives and meet the needs?

IV has presented Victorians with an impressively long list of recommendations—even restricting specifically to transport initiatives—and there is a strong case that many will contribute to specific identified needs. Transport projects can specifically affect needs 1, 2, 4–6, 10–13, 16, 18 and 19, which are focussed around infrastructure demands and challenges, community amenity, improved access and efficiency of movement for people and freight, and environmental sustainability. When they make a positive contribution to meeting these needs, the recommended initiatives will help achieve the broader objectives defined by IV.

We submit however that a small number of initiatives—in particular the proposed expansion of urban motorways—are more likely to have the opposite effect In

short, they will make it more difficult to meet demand for movement of people and goods in 30 years' time and beyond; discourage physical activity; destroy urban amenity and accessibility; result in increased travel times for people and freight compared with alternative measures; degrade natural environments; fail to reduce carbon emissions; and further degrade the resilience of our cities and critical systems.

Accordingly, we strongly disagree with recommendations for the following initiatives on the basis that they will contribute negatively to IV's needs and objectives:
• Eastern Freeway–CityLink–Western Ring Road corridor preservation (EWW/EWE)
• North East Link (NEL)
• Outer Metropolitan Ring Road (OMR)

These conclusions follow from plain empirical study of the consequences of analogous projects in Melbourne and in other cities around the world, from which planners over the past four decades have gleaned the near-universal 'Law of Congestion': that additions to road capacity do not relieve congestion on parallel routes, and generally worsen congestion on other routes that feed them, meaning that any travel time savings are transitory and evaporate after a small number of years.

The Strategy itself claims to accept this well-documented principle, asserting for example that "Victoria can't build its way out of congestion", and yet it claims—even on the same page—that new motorway projects are strongly justified on the basis of travel time savings. The Victorian public, and planners working both within and outside IV, are owed a better account of this apparent contradiction. Based on a long history in Victoria of confident predictions of travel time savings and congestion relief from motorway construction that were never realised in practice, we submit that the discrepancy arises from on one hand a flawed technical methodology for modelling traffic effects, and on the other a tendency for modelling inputs to be formulated in an opaque process that can be influenced more by prior convictions of powerful 'insiders' than by transparent, publicly agreed assumptions.

The same methodological and process flaws that suggest benefits contradictory to experience for road construction also systematically underestimate the benefits of rail and other public transport network expansion. We submit that remedying these flaws would demonstrate that prematurely excluded rail initiatives, such as the proposed Doncaster and Rowville rail extensions, would better meet IV's defined needs than, for example, a North East Link tollway.

Our submission therefore recommends that:
• the Transport Modelling initiative (ABM) be greatly expanded in scope with a thorough review of methodology and surrounding process; and
• to guide the ongoing refinement of the Strategy, a more broad-ranging citizen jury process be implemented, with adequate time for deliberation, access to a broad range of expert opinion, and oversight by a stakeholder reference committee.

Is the timing of recommendations in the draft strategy appropriate?

As with our response to the 2012 Rail Network Development Plan by Public Transport Victoria, we submit that many more public transport initiatives will need to proceed in the short to medium term if Melbourne is to escape a future of debilitating car dependence and adverse effects from over-reliance on large freight trucks. Melbourne is set to add the population of Adelaide to its urban area before 2030 and only a first-rate public transport network combined with comprehensive support for walking and cycling will cater for this growth without adding to the pressures now generated by business-as-usual policy. Avoiding high car dependence and chronic congestion in urban growth areas also relies on high-quality public transport services being in place at the time residents first move in.

Initiatives requiring closer attention in the short term (5–10 years) include high-capacity signalling (RCF), Melbourne Airport rail (MAH) and the Clyde rail extension (CRE).

Overall, do the recommendations in the draft strategy work well together (for example, is the balance between new build and optimisation initiatives right)?

We agree in principle with an approach that seeks to maximise the utilisation of existing infrastructure ahead of new works, on the basis that rectifying wastage and inefficiency in existing systems can often achieve substantial benefits at lower cost than equivalent benefits from new construction. At the same time, the need for new infrastructure sometimes cannot be avoided where a strategic need exists and the expected benefit is substantially greater than either the cost of construction or the benefit achievable from incremental improvement to existing infrastructure.

When it comes to project selection, it is necessary to acknowledge the fundamental tension between expansion of road space for cars and trucks on the one hand, and expansion of public transport service and rail freight capacity on the other. Transport modes do not exist in isolation from one another: a trip made by public transport is a trip not made by car, and vice versa. The greatest benefit is obtained from public transport expansion where the temptation to expand road provision for private cars at the same time is resisted.

Project Evaluation: The Trouble With Models

In order to formulate recommendations from the available options, preliminary assessments were undertaken using as the primary tool the Victorian Integrated Transport Model (VITM). This was carried out for IV by consultants KPMG, Arup and Jacobs and described in their report, *Preliminary Demand Modelling and Economic Appraisal*, accompanying the Strategy.

Modelling of this sort is routinely undertaken in order to quantify the beneficial effects of changes to the transport network. In practice the largest of these beneficial effects revealed by the model and used to justify new infrastructure provision is aggregate travel time savings, as the increase in network capacity allows (allegedly) the same journeys to be made at higher speeds.

The VITM forms part of a large family of models with its origins in the analytical transportation study tools developed by Wilbur Smith and other transport consultants in the postwar era. The purpose of these transportation studies was to provide 'scientific' justification for the extensive road-building plans of postwar governments in North America and Australia. Even by the 1970s these tools and the plans they generated were subject to harsh criticism: geographer J.M. Thomson in his celebrated 1977 book *Great Cities and Their Traffic* referred to "the earlier American transportation study techniques, by now thoroughly discredited". Accordingly, much valuable work has gone into improving these tools in more recent decades, but fundamental methodological difficulties remain, well beyond those discussed in the KPMG/Arup/Jacobs report.

Sequential traffic assignment models have difficulty forecasting induced demand

The fundamental 'four step approach' of VITM is shared by other transport models in this family, and it is important that those evaluating the results of such models fully and completely comprehend the underlying logic. The steps in order are as follows:

1. *Trip generation*. This first step estimates for each land 'parcel' or 'zone' in the urban area the total number of trips made in each time period in a typical day, working from so-called *exogenous* factors such as zone population and employment rates.

2. *Trip distribution*. The generated trips are now allocated to destination zones, usually by a so-called 'gravity rule' that assumes an inverse-square or similar relationship between the distance of two zones and the propensity to make trips between them. After this step, the intensity of travel between each origin and destination zone is essentially known.

3. *Mode choice*. The distributed trips are allocated between private car and public transport modes.

4. *Route assignment*. The specific route taken by each trip is plotted, on the assumption that all travellers work to minimise their individual 'generalised cost of travel' which is a function of travel time, fuel or fare costs, and specific cost penalties (such as for an inconvenient wait at a station with poor interchange facilities).

(It is acknowledged that this is a simplified picture of the actual model workings. In practice there is some interaction allowed between destination and mode choice, and between mode choice and route assignment, but this does not fundamentally change the order of steps above.)

A key feature of this methodology is that the overall intensity of travel is assumed to be a function only of those 'exogenous' factors external to the transport system. Thus, the number of people travelling between a given pair of suburbs is supposed to be determined by their populations, the distance between them, the presence of trip-attracting land uses and the overall level of employment or school attendance. Importantly, in the simplest analysis it is *no*t assumed to be affected by the quality, capacity or convenience of travel by the various available modes between those two

places.

For this reason, VITM and similar models have always had difficulty accounting for the empirically observed phenomenon of *induced demand*—where an improvement in the transport network between two points results in increased travel between those points, even when all other factors remain the same. The original Wilbur Smith models, and earlier versions of VITM, simply ignored this effect (the 'OTM' model also used by IV's consultants as a first approximation to VITM still does).

The VITM does account in a limited way for induced demand by supposing that a proportion of present-day demand is 'suppressed' and does not currently generate trips. However, this is not the same as reproducing the full real-world 'feedback' effect between perceived ease of travel by specific routes and modes and the generation of new trips. As a result, the methodology almost of necessity produces forecasts of induced demand that fall well short of those observed in practice, and described in research such as Duranton and Turner's influential 2009 study *The Fundamental Law of Road Congestion: Evidence from US cities*.

Unfortunately, the KPMG–Arup–Jacobs report provides little guidance on the treatment of induced demand in VITM, or whether VITM is able to retrospectively model induced demand actually observed in practice, such as following the opening of CityLink in 2000.

True origin-destination patterns cannot be deduced from traffic flows

A related problem is ensuring the validity of the *a priori* assumptions that the trip generation and distribution algorithms themselves state in mathematical form. Models like VITM are typically calibrated against observed traffic flows and public transport passenger volumes, whereby the parameters in the 'gravity rules' and other formulae in these algorithms are empirically adjusted to ensure a reasonably close match with observations. But to completely calibrate such a model requires empirical data *both* for traffic flows *and* for the underlying origin-destination patterns; unfortunately, the latter are seldom available at the level of detail and coverage required. ABS Census data provides comprehensive origin-destination data sets for journeys to work, but not for any other purpose; the periodic VISTA survey considers all journey types, but has only limited coverage of the population.

Some years ago, in 1998, the PTUA raised a similar methodological concern in its submission to the Environmental Effects Statement for the Scoresby Freeway (now Eastlink). Our submission at the time pointed out that the use of the 'gravity rule' for trip distribution failed to reproduce the strong radial travel bias evident both in Census journey-to-work data and in VATS (the predecessor to VISTA). Modelling for the Scoresby Freeway was therefore likely to be forecasting demand for 'orbital' travel far in excess of what would actually come about in the absence of the new road. Arguably the subsequent experience with lower-than-expected traffic volumes on EastLink has provided more evidence for this view.

The gravity rule has been employed as much or more for its intuitive appeal as for any empirical justification, yet there are alternative rules that are equally intuitive (if

more complex to apply) and may provide a better match to real-world data. One example is the geographers' 'mental map' model, whereby people seek out not the nearest suitable destination as measured by absolute distance or time, but instead the nearest destination in a familiar direction that correlates with other favoured destinations. People may be presumed to act this way in order to maximise opportunities to combine trip purposes, or for social interaction.

A related issue became apparent in modelling for the East West Link Comprehensive Impact Statement in 2013. Travel surveys routinely find that around half of all trips are within a local area (across at most two suburbs or so), yet the tendency of models to overestimate orbital travel relative to radial travel also leads them to overestimate the extent to which heavy flows on urban arterial roads are due to long-distance orbital travel, rather than the aggregate of many local journeys. Since strong *radial* flows to and from inner Melbourne produce a lot of widely-separated origin-destination pairs, the model builds in the assumption that a similar number of widely-separated pairs must be present in orbital directions as well—raising the likelihood that the model will overestimate long-distance orbital travel and consequently underestimate local travel. This helps explain why modelling for the East West Link appeared to contradict the empirical findings of the Northern Central City Corridor Study in 2003, that only about 16% of inbound Eastern Freeway traffic is destined for the Tullamarine Freeway or further west.

The following sections briefly outline the material consequences of these modelling issues for the evaluation of major road and rail projects in Melbourne.

Benefits Forecast for Road Projects May Not Exist

The North East Link originally appeared in postwar Melbourne road plans as the F18: a radial commuter road designed to carry car traffic into central Melbourne via the Eastern Freeway. It was shelved in the 1970s when it was realised that radial commuter freeways came at huge environmental and community cost and served only to undermine public transport's comparative advantage in connecting the suburbs to the city centre. But in recent decades it has been revived on the basis that it would carry orbital freight traffic between the Hume and Dandenong industry centres, and more recently, farm produce from Gippsland to the relocated Melbourne Markets in Epping.

It is not clear that the Strategy has adequately considered the effect of the North East Link's most probable routing on the Warringal Parklands and the regionally signficant Bolin Bolin Billabong wetlands—a large part of the reason the F18 was originally shelved. But what has likely not been considered is the way the road would almost certainly revert to its original function as a radial commuter road, inducing additional private car travel between the north-eastern suburbs and the job-rich inner city, including by diversion from existing public transport services. It is likely that additional freight traffic would be diverted from the CityLink–Monash Freeway corridor through the north-east of Melbourne, with adverse effects on suburban communities. And as in practice EastLink has failed to materially reduce congestion on parallel roads like Stud Road or Springvale Road, nor can it be expected that a North East Link would provide any material relief for Rosanna Road,

the main popular justification for considering new road infrastructure in this region.

Yet the Strategy has noted the North East Link as one of the proposed projects showing highest benefit in its indicative evaluation. We submit this is actually due to critical errors in modelling, primarily (a) the failure to adequately account for induced traffic, (b) the misattribution of short-distance local trips as long-distance orbital travel, and (c) the overestimation of future orbital traffic flows in the absence of a new road.

Similar observations apply to the argument for the Outer Metropolitan Ring Road, and also to the Strategy's implicit acceptance of an 'inevitability' argument for the East West Link, despite having no evidence of substantial benefit from the latter. At a time when cities around the world are dismantling inner-city motorways rather than building more, the people of Melbourne should not be encumbered with easements for urban roads that are likely to be more destructive than beneficial and to perpetuate congestion problems.

Rail Project Evaluation is Structured to Miss Actual Benefits

The PTUA disagrees with the exclusion from the Strategy of major suburban rail extensions to Doncaster and Rowville. These specific projects have been proposed for many decades to address gaps in the provision of high-speed, high-volume 'backbone' services as part of a comprehensive Melbourne-wide transport network.

The rail projects were excluded after initial modelling found them unlikely to have substantial benefits. Specifically it is claimed that:
• the rail projects would not generate any substantial mode shift from car travel;
• consequently, the rail projects would draw their actual patronage primarily from existing public transport services; and
• there is little potential for benefits to be derived from new populations of public transport passengers in these established suburbs.

We submit that this is in fact an instance of the classical fallacy of begging the question, somewhat disguised by expressing it in mathematical language. In other words, the findings are not so much deductions from the modelling process as a restatement of the assumptions encoded mathematically in the model itself.

The primary issue is once again the sequential trip assignment process, which provides for only limited feedbacks from public transport level-of-service to mode choice, and from mode choice to trip generation and distribution. In the case of the Doncaster proposal, it also reflects the poor choice of routing we have noted in prior submissions to the 2011 Doncaster Rail Study, which has the route bypass the region's major activity centre and terminate instead at a car park remote from any activity centre, contrary to all prior notions of the route the line would take.

Fundamentally, the conclusions of the modelling for Doncaster and Rowville rail follow from the implicit assumptions that population and employment in these regions are essentially static, and that public transport mode share cannot be materially influenced by service quality. And yet 2011 Census data shows that the City of

Manningham's public transport mode share for journeys to work of 12% is not only well short of the Melbourne average of 18%, but also well short of the 21% mode share in the adjacent CIty of Whitehorse, which is demographically similar to Manningham yet benefits from a frequent rail service.

Data from other Australian cities also confirms the ability of major improvements in public transport quality to attract substantial patronage. Prior to the construction of the Mandurah line in Perth's southern suburbs, the regional population was provided with express bus services carrying an average 16,000 passengers per weekday. This was forecast to increase to 25,000 passengers per day on the new rail service. Yet by its second year of operation the train line was carrying double this figure, and it currently carries around 75,000 passengers per day.

The potential for major rail extensions in Melbourne's suburbs to drive substantial mode shift to public transport must not be dismissed on the basis of inadequate modelling.

Driverless Vehicles and the Space Problem

The Strategy makes much of the potential of driverless vehicles to 'disrupt' existing transport systems. Autonomous technology shows promise when applied to all modes of motorised travel, whether trains, buses, trucks, taxis or private cars. Yet the context in which the Strategy discusses autonomous vehicles is limited almost exclusively to consideration of driverless cars and trucks.

Urban transport planners who have considered the consequences of driverless or 'robot' cars, such as US consultant Jarrett Walker (who has blogged extensively on the subject at humantransit.org) have made the following observations that should temper any discussion of the potential for robot cars to radically refashion urban transport systems:

1. Autonomous vehicle technology will almost certainly become viable in public transport contexts well before it does so for general private vehicle travel. This is because public transport runs on predictable fixed routes with well-defined characteristics. Autonomous trains have already run in London and Vancouver for many decades. Any argument for robot cars displacing public transport use can equally be made for autonomous buses to displace non-autonomous buses providing essentially the same service.

2. The technical benefit of robot cars and trucks in 'platooning' in motorway conditions applies principally to rural and intercity contexts where large numbers of vehicles are making similar long-distance journeys. It is less likely to be applicable to urban contexts, even to motorways, where substantial numbers of short trips are made and many vehicles are entering and exiting.

3. Motorised travel is primarily a space problem. A road (motorway or arterial) jammed with stop-start traffic is unlikely to become free-flowing purely as a result of removing the drivers and handing over to machine control.

Improving Decision Making in the Public Interest

Our recommendations for improving the Strategy centre on the adequacy of modelling, and on the involvement of the public in formulating strategies and decisions that affect them.

We have argued above that transport models must be reconceived as interacting systems where all four elements of trip making (generation, distribution, mode choice and routing) have simultaneous feedbacks with the other elements. Accordingly we believe the transport modelling initiative (ABM) needs to be radically enlarged in scope to better reflect actual travel behaviour and the complex feedbacks that occur in real life.

We have commended IV for its use of citizen juries in the Strategy process, but believe this needs to be extended to ensure community views are properly represented and the advice of a broad range of subject matter experts is made available to support decisions. Properly constituted citizen jury processes take many months to carry through, and are also assisted by reference committees that can advise on suitable expert witnesses globally.

The use of citizen juries in such an extended process will greatly assist in refining the Strategy toward and beyond its final form as Victoria's transport needs evolve.