

# Victorian trials

## Phase One – findings and recommendations



*Transurban's trial of partially automated vehicles, the kinds already on our roads today, set out to understand the infrastructure changes that we may need to make now, and over the next few years.*

Phase One recorded more than 6,500 observations from 12 vehicles driving on the Monash, CityLink and Tullamarine motorways.

The trial delivered a mixed set of findings, in some cases these findings led to clear recommendations, however others are inconclusive and require further investigation.

Some of the findings and recommendations related to motorways in general. Others are toll-road focused or specific to individual motorways.

Key findings across lines, exit ramps, speed signs, motorway art, and other objects and vehicles on the road which informed a number of recommendations are listed over the page.

### Key stats



4 trials



4,900 kms travelled



22 days over 4 months



6 vehicle manufacturers



46 trial sessions



12 vehicles tested



118+ hours on the road



6,500 observations

Phase One: Findings and recommendations

	Finding	Recommendation
Lines: the clearer, the better	<b>Yellow lines visible during roadworks</b> <ul style="list-style-type: none"> <li>Yellow lines were reasonably well read</li> <li>Line contrast had a greater effect than colour, for example a solid white line among yellow lines disrupted lane keeping</li> </ul>	<ul style="list-style-type: none"> <li>Where yellow lines are used, block out 'competing' lines, especially at transitions</li> <li>Avoid leaving strongly contrasting white lines alongside yellow lines during roadworks</li> <li>Revisit guidelines for line markings in roadworks, to provide clarity for contractors</li> </ul>
	<b>Changes in line marking under toll points</b> <ul style="list-style-type: none"> <li>Gaps in line marking under toll points disengaged lane keeping</li> </ul>	<ul style="list-style-type: none"> <li>Paint lines beneath toll points</li> </ul>
	<b>Other changes in line markings</b> <ul style="list-style-type: none"> <li>Changes in line markings (solid-dotted, expansion joints, dual lines, gap due to lane add) sometimes disengaged lane keeping</li> </ul>	<ul style="list-style-type: none"> <li>Evaluate impact of painting line markings over objects including expansion joints and drains</li> <li>Investigate options for line marking treatments where lines change (solid to dashed) or disappear (lane added)</li> </ul>
Pay attention next exit	<b>Line markings on exit ramps</b> <ul style="list-style-type: none"> <li>Vehicles favour solid lines, and would sometimes follow a solid line up an exit ramp, rather than continuing along main motorway</li> </ul>	<ul style="list-style-type: none"> <li>Revisit standards/guidelines for line markings at exit ramps. Consider step-out treatments if suitable</li> <li>Where available, suggest drivers choose middle lane(s) when using lane keeping technology, if their vehicle is susceptible to these issues</li> </ul>
	<b>Stopped vehicles</b> <ul style="list-style-type: none"> <li>Sometimes vehicles did not detect vehicles stopped at the end of a ramp and did not slow down. This observation was not unique to exit ramps, but more frequent with particular ramp alignments</li> </ul>	<ul style="list-style-type: none"> <li>Advise drivers of the technology's limitations through industry-wide awareness campaigns</li> <li>Explore further with vehicle manufacturers and raise with the Australasian New Car Assessment Program (ANCAP)</li> <li>Consider adding warning signs further up ramp (for example, to advise vehicles to 'prepare to stop')</li> <li>Explore longer-term options to alert vehicles on selected ramps and on other locations where queues may build up out of sight, through available connected vehicle communications</li> <li>Await high-precision maps, so vehicles can better recognise ramps</li> </ul>
Looking for a sign	<b>Electronic signs</b> <ul style="list-style-type: none"> <li>Electronic speed signs were more challenging for some vehicles</li> <li>Signs on tunnel walls were rarely read correctly</li> <li>Flashing signs were read correctly and more reliably than constantly illuminating signs</li> <li>Some specific sign types, locations and positions were more challenging to read than others</li> </ul>	<ul style="list-style-type: none"> <li>Share data with vehicle manufacturers to refine Traffic Sign Recognition algorithms</li> <li>Use different signs and change their position in future tunnels</li> <li>Review sign height and positioning at problem locations, and design of new road furniture</li> <li>Review and update electronic sign standards, if deemed necessary</li> </ul>
	<b>Static signs</b> <ul style="list-style-type: none"> <li>Static signs were read well, but sometimes vehicles read static ramp signs while travelling on main motorway</li> </ul>	<ul style="list-style-type: none"> <li>Investigate options to ensure signs remain visible on ramp but less visible from main motorway</li> </ul>
Urban design vs vehicle science	<b>Sound Tube</b> <ul style="list-style-type: none"> <li>The CityLink Sound Tube art installation disrupted autonomous driving mode and disengaged lane keeping technology</li> <li>Inside the Sound Tube some vehicles did not detect the correct speed limit, reading 80 km/h as 110 km/h or derestricted. The same vehicles read signs correctly before and after the tube</li> <li>In one instance, a "ghost" vehicle was detected where there was no lane</li> </ul>	<ul style="list-style-type: none"> <li>Highlight to vehicle manufacturers and map providers to help identify cause</li> <li>Once causes are understood, factor findings into future urban design wherever possible</li> </ul>
Blinkered vision: CAVs can't see everything	<b>Other vehicles on the road</b> <ul style="list-style-type: none"> <li>Vehicles travelling to the side of trial vehicles (for example, merging from entry ramps) may not be detected. Trial vehicles did not create gaps to allow merging vehicles into traffic</li> </ul>	<ul style="list-style-type: none"> <li>Explore further with vehicle manufacturers</li> <li>Where available, suggest drivers choose middle lane(s) when using automated driving features, if their vehicle is susceptible to these issues</li> </ul>
	<b>Other objects on the road</b> <ul style="list-style-type: none"> <li>Objects on roads may not be detected by CAV vehicles, including debris, stopped vehicles, people getting out of their vehicle (such as during an incident or breakdown), and roadworks equipment including traffic cones, plastic bollards, temporary and portable signs, and truck-mounted attenuators</li> </ul>	<ul style="list-style-type: none"> <li>Educate drivers about the limitations of driver-assistance features to ensure they do not overestimate the capabilities of their vehicle</li> </ul>