

TRANSCRIPT

ROAD SAFETY COMMITTEE

Inquiry into serious injury

Vermont South — 23 July 2013

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Mr G. Waldron, managing director,

Dr C. Naude, senior economist,

Dr P. Cairney, principal behavioural scientist,

Mr C. Jurewicz, senior research engineer, road safety, and

Ms V. Hoang, supervisor, coders, Australian Road Research Board.

The CHAIR — On behalf of the Victorian Parliament's Road Safety Committee I would like to thank the members of ARRB for giving us a demonstration and presenting to us today. With parliamentary inquiries we have the benefit of parliamentary privilege. While the evidence is taken, it carries that benefit, but evidence or comments made outside the arena do not have that benefit. Hansard is recording proceedings today, and you will get a transcript in a couple of weeks. We will invite you to correct any typographical or factual errors in the transcript and return it to us. It is envisaged that the evidence you give today will be placed on the web. Should there be any confidential insights you would like to convey, we can go off record, in camera, and record material. On behalf of my colleagues, I thank you for your warm welcome inside and the opportunity to review the equipment that we have just seen on the vehicle outside. I encourage you to make a submission. Our colleague Mr Telmo Languiller is testing the roads on his way here at the moment. I anticipate that he will be here in about 22 minutes.

Mr WALDRON — Twenty-two? That is a very precise measure. We do some traffic engineering here, of course, and certainty of travel time is one of those things that is very topical at the moment.

Thank you very much for coming, and it is a real pleasure for us to be able to speak to you about this and to talk to you a bit about the submission that we have already put in. You have referred to us as ARRB, and we are very happy to be called ARRB, but we are actually the Australian Road Research Board. We are an august organisation that was started by the state road authorities in the 1950s, but the actual kick-off of ARRB was March 1960. They basically came together to share the benefit of a national research program rather than reinventing the wheel state by state. In the period between 1960 and 1980 they invested a fair bit of capital in setting up ARRB, and we had a very good working relationship. Earlier on, Murray, you asked me whether we were government funded, and in those days you would have said yes. It was really a coalition of the states that was funding us in those days.

The 1990s, of course, brought some economic rationalism, and research was not so valued. The national program of research was moved to Austroads and cut down to about a quarter of the size that it had been before that. So ARRB was basically asked to become a commercial organisation and stand on its own two feet. In 1990, 80 per cent of our work was on our national research program and 20 per cent was commercial work that we did to stay close to the operations of our members in some cases, and basically selling on some of the benefits of the research that we had done in commercial products such as the ones you have seen out there. If you had come here this time the year before last, we would have been 80-20 the other way — 80 per cent commercial and 20 per cent national research programs. Today that is about 30-70, and that is because Austroads has actually increased the size of the research program that we are conducting on its behalf. The other 70 per cent we earned the hard way in competitive tendering and those sorts of activities, sometimes for our member organisations and a fair bit for other organisations. We work for the mining industry, we do international work and we do a lot of other work to basically meet our overheads and keep the organisation rolling.

The ATO assesses us as a not-for-profit organisation, despite having such a high percentage of commercial work, because being a company limited by guarantee and with our purpose all of the profits from our commercial work get ploughed back into the national interest research, and so that gives ARRB a little bit of flexibility in good times to invest in some national interest research at the same time. Of course we do not always have that, and we have had a period just recently where the eastern seaboard road agencies were all doing a pretty major restructure, and with that there is a fair bit of uncertainty about who is who in the zoo. The amounts of their budgets have been cut and a whole lot of those sorts of things. So there has been a hiatus where they basically did not commission terribly much work from us last year, and of course our international work was suffering from a higher Aussie dollar. So even though we are the leaders in the field, that and the GFC between them meant that our export sales of equipment, for instance, were very flat.

As a commercial organisation we suffer all of the same sorts of vagaries of any other commercial organisation, and frankly sometimes you struggle. We are in reasonably good shape this year, but I do not think it is in the nation's best interest that we have such a dependence on our commercial work to subsidise the national research programs that we do. That is my political statement for the opening there.

I have only a couple more notes here, and then you should hear from the technical people as soon as possible, but ARRB's current strategic plan only has four things that we try to deliver on. The first one is sustainable expertise, and our member agencies in particular are all suffering from a loss of expertise, with the reductions in

staff and the reductions in investment in people. So to a fair extent ARRB is the custodian, if you like, of the residual of that expertise on a national basis. Not all of the experts have to work here. They can still be dotted out amongst the agencies, universities and various other places, but it is our job to try to pull the network together to ensure that Australia has the expertise that it needs.

We like to get involved in managing research investment, and so directing research funds and activity to areas of greatest benefit is again in the national interest, and for that reason we have a strong role in road safety, but we also work in asset management areas, in the material science areas and also in traffic engineering and the operational utilisation of the road infrastructure. We would have to characterise ourselves as being primarily focused on the infrastructure aspects of all of those discipline areas.

We have a very strong focus on knowledge transfer. We have a knowledge transfer group. We run in excess of 100 knowledge transfer sessions each year. Some of these are webinars and a lot of them are face-to-face small group training sessions. A large proportion of those are in road safety related areas, things like teaching people how to use the road safety tools et cetera that we have developed for the Austroads programs. And then finally our fourth strategic goal is to keep the boat afloat. It is basically to be commercially sustainable while we do all of those things. So it is a difficult balancing act, and you cannot sort of head off down any one of those paths without managing the balance between all of them.

I might leave my comments there. I am very pleased that you are hearing from some of our experts today. Chris Jurewicz will be talking to you to begin with, and then Cliff Naude, who is one of our economists, and then finally you will be hearing from Peter Cairney, and I know how much you want to hear from the psychologist.

We are a unique organisation in lots of ways in that we blend so many different disciplines into this activity, and I think we concluded some time ago that there was probably no strategically important road and transport-related question that could be handled or could be advised by a single discipline. Single-discipline projects are operational in their focus and not of very great strategic benefit in the long term. So we are really in the business of trying to do the biggest strategic types of things and then develop the guidelines, the standards and the expert systems that can help the practitioners deliver the benefit of that research in their daily operations. That is ARRB in a nutshell. I am happy to take any questions if you have any of me, but after that, obviously, I will hand over to the experts.

The CHAIR — Thank you. I will lead off with one quick question, and that is: what personnel, roughly, do you have based here, and do you have other staff deployed in other states?

Mr WALDRON — Yes. We are a national organisation and this is head office, so we have about 120 people here, but our total staff complement nationally is about 230. We have a rapidly growing office in Brisbane, an office in Sydney, a small office in Adelaide, quite a significant office in Western Australia and then we have sort of one-man representation in the Northern Territory, Canberra — or the ACT — and Tasmania.

Mr PERERA — You were talking about experts being in different spots. Who are they, and how do they fit into the picture?

Mr WALDRON — Do you mean geographically separated?

Mr PERERA — Yes. You said that experts can be anywhere — in the university — and that you make sure experts are there.

Mr WALDRON — It is a difficult trick, and it is something we are not yet as good at as we would like to be, but a large part of that is in bringing people together in things like the task forces that guide the Austroads programs of research. So you have the opportunity to bring people in from anywhere who have an interest in the area or something to offer. They then guide the management of the projects that we deliver, and so in lots of ways the major output they are looking for are the guides to best practice. The Austroads guides are fairly recently updated, and Australia has 96 guides to best practice covering everything from the material science to cycling, or something like that, on roads. So we do all of those areas. ARRB is not necessarily expert in all of them. In tunnels and things like that we are definitely not experts, but we are the authors of that guide, so we have been able to pull in even the international experts in those sorts of spaces to bring that together.

Perhaps I should just add that ARRB is very well internationally connected. The federal government nominated us in quite recent times to be a member of FEHRL, which is the Federation of European Highway Research Laboratories. In this organisation there are about 35 laboratory organisations like ARRB — with a similar history to ARRB, and with some of them longer living than us and many of them better funded than what we are. But you just need to understand that the Horizon 2020 program for the EU is in the order of €80 billion to be spent on research, basically to make the EU a nicer place — so better employment, better environment and all of those sorts of things. The amount to be spent in the research program for transport is reckoned to be about €7.2 billion. So not all of that will go into transport infrastructure. Some of that will go into car companies for green cars and various things like that. However, the FEHRL group will actually end up coordinating and managing the delivery of a very significant program, probably in the order of some billions of euro.

ARRB is almost unique in the world in that the FHWA in the USA, CSIR in South Africa and one other organisation are the only international members, and we were invited to be members because of our outputs and our commitment to the sorts of areas that were of interest to them. But it is a huge benefit to Australia for us to have the opportunity to participate in their programs and to basically be able to bring the learnings from such large programs to bear on the local community. So that is part of our role.

The CHAIR — Thank you very much for your time, and thank you for your welcome this morning.

Mr WALDRON — Thank you. I may sit in the back and listen to what the others have got to say.

Overheads shown.

Mr JUREWICZ — Van and I will do a joint presentation. I will talk a little bit up front about risk management in road safety. That will lead into some data collection and coding-related issues, which Van will talk about. I will come back again to talk about the strategic approach to road safety using risk management.

Before I kick off I just want to talk a little bit about the broader context. You deal with road safety; that is your committee. You have probably seen many different aspects of road safety in your time — from road user issues, things like licensing and recidivist driving, to legal issues and legislation and also issues to do with VicRoads, which are generally to do with infrastructure.

What we are doing is probably closer to the VicRoads area of interest, which is reflected in what sorts of roads we provide to the travelling community and how we work with all types of road users that are out there, not just drivers. It does not really deal all that much with licensing or punishing people or enforcement et cetera; it is about the roads.

We can talk about two major approaches to improving road safety. One is a reactive approach, which basically deals with what is broken. We have crashes and we go to fix it. We spend money to reduce those crashes — from 10 to 5; it is an improvement, there is a benefit, there is a value. It is a squeaky wheel. If it stands out on the map, we have to deal with it and fix it.

We also have a proactive approach, which has been emerging over the last 10 or 15 years, which does not necessarily focus on crashes but focuses on finding where potential crashes may occur in the future. That is predominantly driven by the road infrastructure itself, how it operates and who is using it.

I will talk a bit more about the types of road futures that we look at, how the traffic flow comes into it and, very importantly, how speed is related to safety. The proactive approach may or may not include crash history. That is optional because crash history is only one of the predictors of what is going to happen in the future. Just because something happened in the past does not mean it will happen again — but it is likely to.

The key approach again is to treat the highest risk locations first, so there is still prioritisation in the same way as you would have with the reactive or black spot approach, where you prioritise and try to spend your money wisely and fix the most outstanding locations first. Is that distinction reasonably clear?

The CHAIR — Yes.

Mr JUREWICZ — It is about prevention. I will give you a bit of context. Over the years we have found that black spots have been diminishing; around 40 years worth of black spot programs under different guises

have been very successful. We are actually finding that it is harder and harder to find good black spots — ‘good’ meaning good for engineers to treat or ones that have a lot of serious crashes.

The research we did a few years ago indicated that only one-third of all fatal crashes occurred in black spot sites; two-thirds of them happen where we are not looking at all. More than half of fatal crash locations are at places where no crash has been recorded as happening before.

The problem we are finding, particularly in rural areas and on local roads, urban or rural, is that particularly severe crashes are scattered almost semi-randomly. This map is reasonable at showing this. The red crosses on the map are fatal crashes. If you look at the vast network of roads shown in red, you can see that they do not happen everywhere; they are just scattered fairly randomly. This is a problem we found; it is very difficult under the black spot approach to address all of your road trauma. You would only be skimming over that one-third all the time.

In recognition of this comes the safe system vision. Have you heard about that paradigm? That is the underlying basis for the current road safety strategy in Victoria. The focus is on preventing fatal and serious injuries across the entire road network. Straightaway that implies that we should continue what we have been doing. But we need to do more. We will never actually stop deaths and serious injuries by treating high-crash locations. We need to look beyond traditional solutions; we need to be proactive. Like I said before, prevention is better than a cure.

All of this is happening in a very supportive national and Victorian strategy environment. It has taken some decades to get to this point, but the two most relevant road safety strategies are really supportive of getting out there, finding high risk and treating it.

A little bit of back history: the development of this proactive crash risk approach to road safety really started in the 1980s, but the first method, road safety audits, started to become quite common in the 1990s. Have you heard about road safety audits? This is an expert subjective way of finding out where the crash and injury risk lies and then providing some recommendations and hopefully treatment.

In order to strengthen that approach and make it less subjective and more methodical we have been working very hard for over 10 years researching ways of quantifying risk. I am a senior road safety auditor. Rather than me going out and saying, ‘I think this is dangerous; please fix it’, I say, ‘This is the evidence that you need to look at to fix it. This tells us that this is dangerous and should be fixed’. It is about quantifying it rather than there being a qualitative, opinion-based approach. Again, that makes it more applicable, more comparable and more accessible than road safety audits. I am not bagging road safety audits; they are still very useful and will continue to be useful at a project level — a detailed level.

We have had a shift to focus on fatal and serious injury from the general casualty kind of basis that has been the main staple of road safety practitioners. That has changed things; it meant that we needed to look again at our research. We are doing a lot of work at the moment in that area, but the results have been that we have a better understanding of severe crash risk. We have increasing familiarity with the proactive approach — with the risk approach — and that is resulting in a changing culture among engineers and managers. We have growing confidence in the application of different methods.

Just to give you some examples of risk-based approaches, the Safer Roads Infrastructure program guidelines have strong elements. I will call it a hybrid; it is both reactive and proactive. That has been very successful and in place for a number of years — nearly 10 years. Also the risk-assessment approach is used in other areas. For example, there is a risk-based approach to the way we set speed limits in Victoria. We look at the sorts of road features that would make it dangerous, and therefore the speeds need to be tapered to a safe level.

What are the things we actually look at? Here is a list of some — there are many more. Some of the key ones to note are the traffic flow — the amount of traffic that goes through a road every day. Speed is very important; the faster people travel, the harder they crash. It is kinetics; it is physics. Regarding the alignment of the road, both the road slope and horizontal alignment are very important factors. Particularly for rural roads, narrow pavements result in much higher risk of crashes. There are also things like clear zones — this is the offset to hazards. Other things, like guidance — the line marking and signs — are also quite important. Intersections — you probably know this from your prior work — are absolute nodes. Flows intersect, and they are hot spots for risk and also for crashes. Regarding pedestrians in urban areas, the presence of pedestrians is a high risk, but

there is also how we deal with pedestrians. What facilities are provided for them and how they are managed plays a large part in determining the level of risk.

Here are some relationships. I only have two of these; I will not bore you too much. This relates to curve sharpness, and on the horizontal axis you can see the curve radius — the smaller the radius, the sharper the curve. A 200-metre curve is something that would normally make you slow down quite a lot, and you can see that the relative risk of a casualty crash is exponentially — up to six times — higher than it is for a relatively straight road, which is on the right-hand side, with a 1400-metre radius. That is a very gentle bend — almost straight. We can straightaway use these relationships that come from research. This comes from the work we had done here several years ago that Blair led. We can use this in our risk-assessment methodologies.

Similarly, we have clear zones — a similar sort of relationship. A clear zone is the offset to the roadside hazards that you have — your trees or your potholes. If it is fairly small and under 1 metre, the risk is six times higher than it is when it is quite good — I would say about 13 metres. These are things we have quantified. It is not just us; there has been international work in the United States, the UK, Europe and other countries. We constantly check our results and research against international research.

All this knowledge has to be put to good use, and we have been working over a number of years very iteratively and practically to develop methodologies to help us apply this knowledge to practical situations. Some of these methodologies have been very specific — for example, on pedestrians. We are currently working with VicRoads on a very small project, helping them to make decisions on whether to extend school zones to areas that are not close to the school. They are using one of our risk-assessment models for that. Others are universal; they can be applied anywhere on the network. I think these are far more interesting and more applicable to large road agencies. Here are some examples.

I probably mentioned AusRAP. This is part of the iRAP family Gerard mentioned earlier that is used in over 70 countries around the world. You have USRAP, ChinaRAP, KiwiRAP — that is the New Zealand one. We have AusRAP here — one of the earlier ones. Again Australia has led this field, and RACV is the local state custodian of that. The overall custodian is AAA, and it is quite a mature system to codify and rate roads according to risk. They use the star rating system. I am sure if you went to the RACV website or just typed ‘AusRAP’ into Google, you will see the past work that has been done.

Personally I think far more exciting is the Australian National Risk Assessment Program — ANRAM — which our team has developed. This actually has the same basis as AusRAP and iRAP, but this has been tailored for road agencies — for the VicRoads of the world — across all of Australia; again, same basis, different outputs. AusRAP is of interest to people who lobby and people who deal with the public. ANRAM is of great interest to people who put together road safety programs and infrastructure programs — same basis, different outputs. ANRAM is of great help to VicRoads, and we are currently talking with them about implementation and ways we can get it in. Also local government this is often forgotten. When we deal with state road agencies they look after state roads, but this is a tool for local governments to engage and seek funding, particularly in rural areas, for their local roads.

That is just showing the general structure. I am basically talking about ANRAM, but a lot of this applies to AusRAP; I do not want to differentiate between the two. Basically we use the traffic flow — annual average daily traffic — and a lot of the risk factors. Some of them I showed you before. We look at different types of crashes. There are computational things occurring in there. We put the codified data in. We use the relationships to provide risk scores for crash types, and then we translate this to a predicted number of severe crashes. This is actually a predictive tool. It deals with the same currency that road authorities use.

I think I will skip through some of these more technical things here. This is just a graph that shows how the computations are done. I think the important thing to remember is that it works on different crash types. If you want to have a program that targets run-off-road crash risk, you can actually use this to do that. If you want to target head-on crashes, then you can do that. If you want to target pedestrian crashes, you can use this system.

The outputs from the system basically show the breakdown of your risk. This is a little bit fine, but you can basically see on the bar chart where the majority of your risk for that location here on the photo comes from. The big green blob in the middle is the intersection. You can see that this is an approach to an intersection. For

that section of road the majority of severe crash risk comes from the presence of the intersection, so if someone were to focus energy and funds to that area, they would be looking at how to improve that intersection.

Like I said, the ANRAM is a predictive tool; it can tell you not how many crashes you are going to have in the next five years but on average how many you would expect for a location with these features and this traffic flow and speed. It is an indicator, but it uses the FSI — fatal and serious injury crashes — as currency. We have tested this, and it correlates pretty well to the real-world performance of roads. Again, in here you have an indication that the majority of your fatal and serious injury crashes would come from the intersection interaction. The grey area there — the ‘other’ — includes the rear-enders. It is pretty much what you would expect at the intersection, the cross-traffic type of crashes, turning crashes and rear-enders.

ANRAM also provides a whole bunch of other analytical outputs. I am not going to bore you with that, but again the whole idea is to home in on the features that are likely to cause future crashes and deal with them. The outputs are the risk scores predicted, fatal and serious industry crashes per five years per road section and information on specific, treatable crash risk factors. I will talk about this a bit later, but there are also road safety program development tools inside the program. This is to make it easier for decision-makers at VicRoads and other jurisdictions to actually put together proposals — for example, to TAC or any other funding body.

The inputs are the road type; state, which is very easy, being Victoria; the observed severe crashes per section — we actually want the historical data as part of the computational mix — and also the coded road feature data and traffic flow. That last item is actually quite a big task and a big part of what Ms Hoang is going to talk about. I will leave it to her, and I will come back briefly later and tell you about the strategic aspects of using this.

The CHAIR — Thank you very much, Chris.

Overheads shown.

Ms HOANG — I am Van Hoang. I am a coder supervisor. I have been working with ARRB for about 10 years. I used to be a coder as well, but as the years have gone by I have progressed in my role, and now I am a supervisor for ARRB coders and a supervisor for the Indian coders as well. We have a partnership with the India office, so I am supervising them for coding as well. For the coding in ARRB I actually have around four to eight coders. It could get up to 10 coders; it really depends on how busy we are.

I am not going to go over this again; Richard talked about this when we were outside. Basically our vehicles can capture the entire road. The vehicle can do horizontal alignments, vertical alignments, superelevation, road conditions and all sorts of different things, such as doing the road assessment.

Here is my office. Some of the people are still my coders, but some of them have left because they had school. To do coding the raters need to be very patient; they need to be very concentrated on the task. It seems to be easy, but it is not easy. Those are our workstations.

This is an image I took from one of the software programs we use for coding. The vehicle outside is using this software, so when the vehicles record the images we load them up using software is called Hawkeye. We view all of these. We can actually view the entire road. We look for delineation, signage, barriers — whatever you can see on the road, we can code it and its condition as well. We can also do georeferencing of roadside objects.

Most of the time what we are doing in the office is pavement conditions, but you all know that I am also training for iRAP, which is what Chris was talking about. We are looking for a lot of different criteria. We are looking for speed limits. The coder has to record what the speed limit of that road is. The coder also needs to record whether the road is divided. We observe motorcycles, pedestrians, roadside objects and also the intersections.

This is the rating form we use. The coder loads it up in the software and codes it. We have the drop-down box I am showing you. In that drop-down box we have a variety of selections — for example, speed, which could be 40, less than 40, 60, 80, 100. This is what the coder uses. When they select one of the codings, it will record it in Hawkeye. Our software is records whatever you select. When they finish coding one section, when they export it, it will record everything when they select it.

Mr PERERA — What is the information you get? Is it pictures?

Ms HOANG — I will show you what the coding reports look like. The road that we are doing currently doing is Princes Highway west. This one we use for AusRAP at the moment. We are coding the safety of this road. We can do the georeferencing. For example, the sign on the left — if we click onto that sign at the bottom, we can get the georeferencing for that sign. Then with the measurement of the lane width we can draw from one spot to another and get the measurement of that lane width. There are all sorts of different things we can do. Once the vehicle collects the data and brings it back to the office we do the coding, and then we send it off to the processor generate the coding results.

This is what it looks like in the reports. It is actually in a text form. It has the road name from the start chainage to the end chainage, and it also has a long — in the rest of the other columns are where the writers report. For example, if it has been recorded as 80 kilometres per hour, then you can see — sorry, it is a bit small, I know — somewhere in this column here it will tell you that that chainage to that chainage is actually 80 kilometres per hour or 100 kilometres per hour. That is how the rest of the rating results look.

This is where we finish coding and we pass it on to the processing teams to generate the data. Are there any questions? I will just go through a very short checklist of how we did the coding. But when we do the actual coding it is really hard, because it needs a lot of concentration on what you are doing. If you click the wrong box in the drop-down box, it could turn the road into a different — rating seems to be easy, but it is tough.

Mr ELSBURY — I am just wondering what the distance is between assessment points done by your coders? Is it 10 metres, 20 metres, 100 metres?

Ms HOANG — The vehicles go and collect the data. For example, Princes Highway is 100 kilometres long, and the vehicle collects data on 100 kilometres of that section and then brings it back to the office. We put it into this software. We can load this with the whole section, which is 100 kilometres long, but for each frame we go — —

Mr ELSBURY — Each frame?

Ms HOANG — We have three cameras in front of the car we have out there. Each camera captures a 10-metre interval, but we could actually code a 100-metre interval. There is a short-cut key where we can jump to 100 metres. We can see as far as 100 metres ahead. Each image is collected at 10 metres or 20 metres; it really depends on different requirements of the clients. We scroll through these images by 10-metre intervals, and we assess those 10-metre sections.

The CHAIR — What is the method of validation of the work you have done? Is it validated in any way?

Ms HOANG — My role is supervisor for coding. Once we get the coding results, we have another team which compiles all the information that we have and generates it into the very short coding numbers. They produce — for example, there are 100-metre sections of road. At the start of the coding we do a test, and I train the raters how to do the coding and what it is. As you can see, the coding looks really long. It has more than 40 attributes. We use one road to test among each other to see if all the coders have the same ideas and understanding of what they are doing. Then we plot it up and see if they have the same chain. For example, some coder might say, 'That road is 80 kilometres an hour'. Sometimes you do not really see the speed limits at the right point where you code it, and they might assume. But they need to go forward or backwards in the images to be able to view what are the roads.

Mr PERERA — How do you code something like skid resistance? Is it from the information and pictures you have from the car, the pictures?

Ms HOANG — In here we use the images to record if there is any skid resistance.

Mr PERERA — So from the image how do you make an assessment; by having a look at it?

Ms HOANG — Yes. We also have roughness and rutting that can be produced from the vehicle when we collect the data. The vehicle does record that as well, yes. For example, we can use the car to test that the vertical or horizontal alignment as well.

The CHAIR — And once you have a very large, catalogued photo library of a road, how is it then drawn back? From your rating systems, does it trigger certain reviews if there is a dangerous element on the road or a piece of roadside furniture that needs to be removed or repaired? How is that adjusted or put on a program of works to be addressed?

Ms HOANG — For the roadside objects, this one is called rating form. When we make up this rating form we have to think about how many measures it was from the road to that object. How wide is the tree branch? How big is that tree branch? And then we are coding at that spot — we are recording for that spot — by using the drop-down box, and then in the end when the rating reports it will show you where it is.

The CHAIR — Yes, and are the roads regularly reviewed and re-rated.

Ms HOANG — Yes. In the past we had a lot of jobs that had been repeated again and again, so they can test that. Last year there were a lot of hazards on the roadsides, and then we reported it to them and said, ‘Okay, there are a lot of hazards at that point’. Now this year we collect the data again, and they might have changed something already, such as putting a barrier before that spot so that when the car crashes it will not go straight into the trees or something like that. So there are some changes every year. They want to know if each year the road has been bad or better.

The CHAIR — Do you identify potholes?

Ms HOANG — Yes. We do all sorts. Sorry, I do not have the images of my other rating forms, but we do potholes and cracking as well, so that is why it is not only the roadside severities; we also do pavement conditions. Pavement conditions mean also considering potholes, cracking, gravelling and stripping, and we also do the surface type as well. So we do all sorts of things. When you have the image, you can actually do a lot of things with that.

The CHAIR — Once you have identified something that needs to be done, do you then send it over to VicRoads to be repaired?

Ms HOANG — Yes. We actually do a summary report from one spot to another spot where there were a lot of defects. Then they look at that and say, ‘Okay, they are very severe defects. We need to fix that’.

The CHAIR — Thank you.

Mr ELSBURY — I am just wondering about the coding that occurs for barriers on the side of the road. I can see here on the left-hand side we have W barrier; on the other side we have wire rope. How would they be coded? Would wire rope barrier be coded as being a different type of barrier?

Ms HOANG — Yes.

Mr ELSBURY — And would it be rated as higher or lower than the value of a ‘W barrier’?

Ms HOANG — For the coding, for example, you can see that I have the coding on the left, and that is the roadside severity which is on the left, and we also observe on the right-hand side as well. So in the drop-down box there is a selection you can select. If it is wire rope, you can select it, and on the left-hand side is W beam, and you can actually select that as well.

Mr ELSBURY — So I am thundering along a road with a W barrier and then suddenly it turns to wire rope; does the rating go up or down depending on the barrier?

Ms HOANG — With that, I actually have to pass on to Chris for the answer to that. Maybe he could talk a little about that later on.

Mr ELSBURY — Okay, not a problem.

The CHAIR — Thank you very much, Ms Hoang.

Ms HOANG — If you have more questions, at the end of the day you can come and visit my office and you will see.

Mr ELSBURY — Don't tempt us!

The CHAIR — Just one final question: do you have any favourite roads?

Ms HOANG — We do a lot of roads for Victoria, and all the roads are different.

Mr LANGUILLER — Which is the one that keeps you most busy? Is there one?

Ms HOANG — I am sure there are a lot of them. I remember when I did the project in Brimbank, some of the streets were really in bad condition and it took a lot of time.

Mr LANGUILLER — That is my area.

Ms HOANG — We had to take a lot of time to do the assessment on those roads because there were a lot of different defects they were looking for, and when I was first employed I was struggling doing the coding for it.

Mr LANGUILLER — I might take up the offer and come to your office.

Mr PERERA — Are there any codings for police cameras?

Ms HOANG — We did a lot of things. I cannot remember it right now, but there were a lot of roads that we did.

Mr PERERA — Basically you have an idea where police cameras would be.

The CHAIR — Thank you very much for your presentation.

Mr JUREWICZ — I would be happy to answer some of your detailed questions about the risk rating and what makes a difference in the risk rating of the road. That is probably the area we do more work in. It happens after advanced data is processed in the risk tool. So if you have some of these questions, please fire away.

Mr ELSBURY — As I mentioned earlier on, when you come across a section of road that is protected by W beam verses wire rope, how does the rating change? Does it go up when you go into the wire rope area, or does it go down as you reach the wire rope?

Mr JUREWICZ — The wire rope is phenomenally less dangerous than a guard rail or concrete barrier, so the risk rating of the road would go down. This is based, for example, on freeways where we have a lot of wire rope barrier. And the sections with wire rope barrier rate much better than the ones with guard rail, for example. So yes, that is the simple answer.

Mr PERERA — Can you clarify overall how you code? Do you look at the picture or automatically for descent? When you code, for example, road resistance or wire rope or whatever, you have a particular code, do you not?

Mr JUREWICZ — Code? Yes.

Mr PERERA — So how do you look at the picture? Just from the picture?

Mr JUREWICZ — That form that Van showed in here is a standard form they use, with the drop-down menus as she described. These are then turned into a numeric code. So for each one of these road features you have a selection of a number of categories, and each category has a code — 1, 2, 3, 4, 5, 6, 7. This is a set of nice outputs.

Mr PERERA — But how did you come to that correct code?

Mr JUREWICZ — It is automated. They will select a word in here — for example, at the very top you have 'object distance — code 1: 0 to less than 1 metre'. They will pick that verbally on the drop-down menu; what the system records is 1. If they pick something else it will be 2, 3, 4. That code is then fed into the risk engine, if you like, the risk computations. I could show you. I do not have it here, but there is a very complex structure to the risk model. It then calculates a score, and the score is then used to calculate a predicted number of fatal or serious injury crashes.

Mr PERERA — So there is no manual information, like quality of curve?

Mr JUREWICZ — That is manual. There is a coding manual that sits behind this. It is a book about this thick, and all the coders have to learn it by heart. They have it sitting by when they code, and it gives definitions. The quality of the curve I personally think is one of the more complex ones because it relates to delineation, so your signage, your line marking and your edge lines. A number of factors are brought together into I think three categories — poor, average and good — and that is the choice that you have.

Mr PERERA — So you look at the picture and identify the attributes, and then you pick up the code?

Mr JUREWICZ — Yes, exactly; we have to learn how to tell those things apart. I think someone raised skid resistance. This is done visually again, based on things like pavement flushing and pavement quality. There are more sophisticated ways of doing that, of course, with screen testing. That is what VicRoads does. That is not necessarily used here, but if that is picked up through a vehicle — and there are those systems that look at roughness or texture — then it can be automated, but most of the time it is done visually. So subjectivity is a problem here, which is then countered by some of the systems that Van talked about, between different raters, seeing who has a problem in being objective, and then fixing that. There is also a quality assessment process, where a sample of all coded information is checked very thoroughly to make sure that it is correct. So there are layers and procedures to make sure that we get a good result in the end. Any more questions about rating, coding?

Mr ELSBURY — Yes. Can you use this system in an area where there are large amounts of roadwork going on, like when the Western Ring Road project was going ahead, so that you can provide a risk assessment about what the works are actually doing to the road at that given time?

Mr JUREWICZ — It could be. Technically, yes, it does. We find roadworks in here, but that is mainly for exclusion in any long-term planning. However, if you wanted to use that, I do not see a problem with why you could not, because you would still pick up all the temporary things and code them and rate them. It has not been done.

Mr ELSBURY — When we are talking about the ring road we are talking about four years of roadworks that were going on and whether or not the barriers were appropriate and whether or not signage is appropriate and line markings were clear — that sort of thing.

Mr JUREWICZ — It will not go to that level of detail. Maybe one day, when it is all fully automated and we have computers rating and coding everything every 10 metres and sign recognition. All these things will come eventually. At this time the categories of information are fairly rough.

Mr LANGUILLER — Just quickly, do you mind going back to the photos, please? I want to ask you about them. Your submission indicates that you are able to pick up fractures or potential damage to the roads; is that correct?

Mr JUREWICZ — Yes. This is an ability that we have. We do not normally do this with the risk data. The bulk of our data at ARRB is to do with pavement management. The vehicle at the front had the lasers — the big white thing at the front are the lasers — pointing at the pavement and codifying all that information, by cracks, ruts and stripping. It is all to do with pavements and not directly related to safety. We have that ability to collect data. We do it for VicRoads, I understand, every couple of years.

Mr LANGUILLER — And how far outside the road do you do that?

Mr JUREWICZ — Richard mentioned a 160-degree angle, so about this far with three cameras. It is pretty good. This system, this Hawkeye system, allows these things to be fairly well lined up. The cameras are calibrated against each other, so the measurements can be done seamlessly across the whole field.

The CHAIR — Chris, how is the data validated?

Mr JUREWICZ — Validated? Can you explain what you mean by ‘validation’? What specifically? In terms of what? Going out on site? I have already talked about the code as being compared, crosschecked against each other.

The CHAIR — The crosschecking between what has been done by way of the site and just making sure that the rating is correct?

Mr JUREWICZ — Van already explained that there is a process — correct me if I am wrong — that means that different coders may have subjectivity issues. It is a human thing; they are crosschecked against each other and their coding of the same piece of road is compared. You can easily see who is deviating from what should be, and then those people can be corrected, it can be explained and their training is brought up to this standard. I was involved in one of these exercises three years ago with untrained people, and it was quite interesting. Van was leading that. There were people from RACV and all different auto clubs and from VicRoads who were coding. It was really interesting. We finally got everybody to do things more or less the same. Then on top of that a percentage of the whole road sample is audited by Van or another senior person who has got a trained keen eye to make sure things are not done incorrectly. Sometimes they are done incorrectly, and then the whole lot — that particular thing — needs to be redone, and it is rekeyed.

The CHAIR — Thank you.

Mr JUREWICZ — That is all I can say.

The CHAIR — Thank you for that answer.

Mr JUREWICZ — Okay. If there are no further questions on the coding, I just wanted to say literally a few words about how the risk assessment of roads can be used in a strategic sense in managing safety across the road network. So far we have talked about the model and we have talked about coding. What do we do with all this information? How do we apply it to make our road network safer? These sorts of risk models — ANRAM particularly — all the risk models produce risk scores of some sort. ANRAM also produces fatal and serious injury crashes for each road section.

This map here shows different colour coding based on the risk scores. You can see: if there are really good roads here, they will be green. This area had no good roads. The yellow is the best; red follows that, and that is for higher risk roads; and the black ones are the worst. This very clearly shows the road authority the key areas to focus on, very quickly. You can see that there is a bit in the middle that is black, there are some coastal roads over there that are black and so on. These should start triggering bells for where to investigate further.

Also, this information can be used directly in preparing works programs. I already mentioned that ANRAM can be used to identify and compare crash risk across the whole road network and target priority areas. It can also look at particular crash types, especially things like pedestrians and motorcyclists. There are certain features that it can fish out of the information, out of the risk coding information, that are relevant to particular road user groups — the heavy vehicles, pedestrians — and we could even extend this, I suppose, to things that all the drivers have issues with. The scope for taking information out is almost limitless. It is what you want to know about road infrastructure.

The key thing is about prioritising improvements — so, strategic alignment of the dollars that are available with where the risk is. ANRAM helps people to do that. There is a toolbox in there that allows users to create potential road programs and evaluate them and get NPVs and BCRs. It is a creative, iterative tool you can optimise until you run out of energy. The idea is to basically create a program that delivers good value.

The assessment of the network should be repeated every few years. This is still a fairly young process; it is going through its first pilot at the moment. iRAP, which has been at it for quite some time, has had a lot of success, particularly in other countries and in Queensland, in creating works programs of this nature. We can also use the risk model to measure progress towards safe system infrastructure. We can look at key performance indicators. For example, what percentage of the network has wire rope barriers in the median? What percentage of the network has roundabouts instead of at grade right-angle intersections? There are certain solutions which are considered safe systems; they are much better for safety than others. This can help you measure how we are getting there, how we are getting closer and closer to the vision.

This is an example from New Zealand. It is being talked about quite a bit. They have adopted this in their strategic approach. On the vertical axis is the risk score, and on the horizontal axis at the top is the actual crash performance. It assigns different approaches, different types of programs, to roads which fall into different areas of this graph. In the top right corner you have roads which have a very high risk score — that have a very high

individual risk for an individual driver of a serious crash occurring but that also have a lot of crashes. These are roads that probably have a lot of traffic on them and are dangerous. These roads are being prioritised for safe system transformation works, for really major types of things. It may be, for example, grade separation or putting in a pedestrian overpass; it may be about diverting the road away from commercial areas and doing some sort of bypass.

Then you have the safer corridors, the orange area. This is where you are getting into the middle ground but are still at the higher end. You can see the line; that represents the urban undivided and divided roads. That is where you have quite a lot of risk but not so many crashes. So there are some structural things about these roads that need to be improved. They could be the subject of a longer term program or more reactive types of projects or mass projects being done. Safety management is more about kind of being smart about how you manage safety, just doing little things.

As the risk decreases, in the lower left corner, where there are roads which have pretty good features and not a lot of crashes, you are moving to safety maintenance. That is where asset management comes in and technological improvement. So you get your safety benefit not necessarily by taking big action but by doing things smarter. At those two lower tiers there is where I think a lot of the rural road safety happens. Because we do not necessarily have huge numbers of crashes on those individual sections it is hard to justify expensive black spot projects, but that is where you can realise systemic improvements — things like adjusting speed limits, doing line marking, doing signage, rumble strips — all these sorts of low-cost things that can be rolled out on an entire route or entire system.

This is more about implementation of a system; I will not bore you with that. It is mostly a flow chart for a road authority to follow in terms of generating the data, processing it, doing the analysis and the feed-back iteratively and then, when they are happy with the proposal, seeking funding from the funding bodies.

Some of the examples of users of these risk models are policy-makers, funders — that is, Treasury or TAC in Victoria — and large road project planners. We are talking to someone at the moment about using ANRAM to develop plans and assess them. It has been done before. Again, *ARRB has been in this space for some time in Bangladesh and other places actually doing assessment of plans before they build. Also, with the regional local governments we are still trying to figure out how to make it accessible for them, but it would be a huge area if there were funding available for local governments to use risk assessment, because they have traditionally missed out on black spot funding, not so much in Victoria, as we have been more proactive, but in other states they get zilch — zero. If there were a funding mechanism for rural communities to start treating the roads using risk assessment, that would make a dint in the road trauma. Of course auto clubs are already using AusRAP, the local version of iRAP — so, the same sort of coding and same sort of risk assessment.

That is more what we are doing. We are doing trials at the moment. We are in the process of engaging with VicRoads to do a trial here. Other states are already doing little things and bigger things. What else? That is pretty much it. I have told you a little bit about the strategic approach to it, and I am happy to receive questions on it. It is, in my view, of interest to the government — the big picture. Fire away.

The CHAIR — Thank you, Chris and colleagues. I might just lead off with one question. The work is predictive of matters to be addressed; has it been retrofitted and applied to where accidents have historically occurred to see whether there is a correlation between predictive road features that might be regarded as unsafe and where accidents have actually occurred, or is it just a random consideration and, while there is good science applied to trying to be predictive, the accidents have been occurring at unpredictable locations?

Mr JUREWICZ — I think I can best answer that by talking about the evaluation of black spot programs, because that would apply. The evaluation of black spot programs has looked exactly at features that have been installed — retrofitted, if you like — and then looked at what happened after. So it is before and after evaluation. Then we learn about the safety value of these features. The crash reduction factors, for example, are derived that way.

We have not really had enough time for these sorts of things to be applied on a mass scale in Australia. In Queensland that has had a longer run, and Peter is involved in a project with the Queensland government — just starting it up — on ways of evaluating it and picking the right methodology. We can estimate what the crash reduction factors will be from that. Clearly that is based on the science.

Mr ELSBURY — Earlier on in the presentations we heard about high pedestrian traffic areas that are taken into account, but a lot of your assessment language seems to be focused on drivers and vehicles. Do vulnerable road users get factored into many of your studies or into some of the work that you advise VicRoads with?

Mr JUREWICZ — Yes; well pointed out. I think the tradition is that of focusing on the drivers. This is a problem in road transport in general and probably has been reflected in my language a bit. The shift has occurred; we are doing research on vulnerable road users in particular. It has been a focus in the last, say, four to five years. Again, Dr Peter Cairney has done a lot of work on motorcyclists and some of the high-risk motorcycle routes and treatments. These risk models have the pedestrian component in them. At that point, when we were developing this, we did not follow through with motorcyclists, for example, because what we found was that the risk factors for motorcyclists are very similar to those of vehicles. We had to squeeze a certain scope into the development project, and a specific model for motorcyclists was deferred to a later time. It is the same with the cyclists: cyclists have very particular needs, and the model for them is different. They already exist; they are just not in ANRAM. Cyclists have different models. Motorcyclists have almost the same as a vehicle, and pedestrians, again, are very different, and their risk factors are included in ANRAM.

The CHAIR — Thank you, Chris.

Mr JUREWICZ — Pleasure.

Overheads shown.

Dr NAUDE — Good morning, ladies and gentlemen. My presentation will focus on the inquiry's term of reference (a), which is 'determine the appropriate methodology to identify the cost of a serious injury to the Victorian community and economy'. Much of the presentation will focus on the willingness-to-pay methods, and I will give you an update as far as some recent work we have undertaken in this area goes. Hopefully that will serve as input to your deliberations. I will first discuss some methods of cost estimation in this area and then focus on current practice in Australia, some current estimates that are available and scoping of a national willingness-to-pay study for Australia, which is the aim and objective of a lot of the more recent work we have undertaken for Austroads. I will then just briefly look at some interim values that are under consideration and methodologies towards that and then finally some conclusions, which might help you as well.

In terms of the methods available — you might be aware of some of the methods through the submissions that have been presented so far to the inquiry — they have essentially moved from human capital and what may be termed 'hybrid human capital' and 'modified human capital' in Australia through to the willingness-to-pay methods, which encompass revealed preference and stated preference. More recently there has been an emergence of another approach, called the 'life satisfaction' approach, which is more prevalent in the UK and quite unique to that area so far.

In terms of the human capital approach, as you would probably be aware, it focuses on the loss of output to households and the workplace due to death and injury and more latterly has included human cost — in other words, attempting to account for pain and suffering of victims of crashes and so on. In terms of willingness to pay, that focuses on the respondent's willingness to pay to reduce the risk of death or injury, in broad terms. As far as revealed preference is concerned, that is based on the inferred willingness to pay based on actual data of purchases that are in related markets, which can be called 'hedonic pricing' and is more prevalent in the United States and to some extent in countries like Sweden, as you will pick up from the rest of my presentation.

In terms of proxies, in this area you would be looking more at the safety attributes of cars and selecting that as a proxy for the value attached to safety and reducing the risk that victims would have. In terms of the stated preference approach, this is usually aimed more at a survey of respondents to determine their willingness to pay — or in some cases it can be a willingness to accept, as in the case of New Zealand. Then, of course, you are liable to get some differences in values, depending upon which approach you use.

In terms of the stated preference approaches, they have moved from essentially a lot of contingent valuation studies over time to more recently choice modelling or choice experiments that have been applied. That was largely the focus of our work and our report, which has been identified for you.

In terms of contingent valuation, it is more aimed at the willingness to pay, or at least attempting to ask respondents what value they attach to a level of risk reduction, whereas the choice modelling or choice

experiment approach is aimed more at providing them with multiple sets of gains, if you like, or choices. They can determine their preferences through either the variations in value of risk reduction — in other words, their willingness to pay for avoiding a fatal accident or a serious injury accident — versus what they would be prepared to forgo in terms of savings or losses in travel time; what they are essentially willing to give up in savings of travel time and vehicle operating costs to increase their safety. I will come back to that if we need to.

Current practice in Australia is described in detail in various Austroads reports which I have identified at the end of the presentation and also in the VicRoads submission. I have endeavoured to not repeat some of the work that was already contained in the VicRoads submission, which drew to some extent on the work that we had undertaken in the willingness-to-pay area.

In terms of Australian practice, it has moved from a human capital approach, which has been compiled by the Bureau of Infrastructure, Transport and Regional Economics based on the loss of output to households and the workplace due to death and injury, to a modified human capital approach in 2006, which introduced a pain and suffering component and also dealt with additional costs of crashes — for example, emergency services and clean-up costs. Those are additional or identified items that are outside, for example, willingness to pay.

In terms of the willingness-to-pay approach, the most comprehensive study that has been undertaken in Australia has been that of the New South Wales RTA, as it was then, in 2007, which focused on a stated preference approach, attempting to set a value of risk reduction via a choice experiment.

Then finally, of course, there has been some updating by Austroads, which is done more or less biannually and has focused on updating values using the human capital approach values, as have been published by BITRE, and then more recently the New South Wales RTA willingness-to-pay values as well.

This is just a bit of additional detail from the New South Wales RTA study, because it might help with the choice experiment aspect. For example, when they did their study on car users, respondents were provided with 10 games, or situations if you like, of choice between two hypothetical alternative routes, so route A and route B, which differed in characteristics — in other words, traffic conditions, speed, travel time, the number of lanes and then the risk of fatality and injury.

By so doing, you are looking at what people are willing to trade off in terms of benefits from reduced risk of fatality and injury and what they are prepared to accept in terms of delayed speed or travel time and additional vehicle operating cost. By doing those games a number of times you are able to not only increase the number of your observations but also get an idea of people's preferences, and you can attempt to put a value on it that way.

Likewise, a study was also done on pedestrians choosing between two routes differing in terms of the number of lanes which people would have to cross, speed limits, the crossing type, walking time and housing or rent increases to cover road safety improvements — and then, of course, the number of fatalities and injuries, which is your key dependent variable. In those cases, the sample sought was around 200. That is going to be an interesting aspect as well, once you get into a larger study. In this case just over 200 interviews were conducted, mostly in Sydney and of course so-called non-urban in Bathurst. As we have discovered with interviews generally — and that is pretty much the norm of what we have seen as well in various studies — they took between 15 minutes and 45 minutes, depending on the amount of preparation involved and of course the level of detail of the questionnaire.

Again I want to stress that I have not gone through a rigorous international comparison, although that is in a lot of the previous Austroads work, and I will refer you to that. I also note again that the VicRoads submission had some of that, drawn from the Austroads work. What I have done here is just summarise the key studies that came to light in our most recent work. There you can see the human capital approach generates substantially lower cost per fatality, measured in June 2010 Australian dollars. Then there is of course the cost per serious injury. You also have the two willingness-to-pay results from the New South Wales RTA studies, for urban and rural. You can see there that the cost per fatality is notably higher, but then of course your cost per serious injury is not as high. That could, of course, be depending on how that value is elicited through the willingness-to-pay interviews.

In terms of willingness to pay, the other example that we have also considered is that of New Zealand. I have selected just one set of results, and again it is in Australian dollars. It is just over \$3 million for a fatality and then \$500 000 for serious injury. Finally, one of the other examples that we looked at was that of Singapore, and

I will talk to that in a minute. Again there is a fairly low level of cost per fatality but a cost per serious injury of A\$200 000, converted.

I just want to focus on the work that we have undertaken most recently and which we referred to in our submission. That was essentially a scoping study for a national willingness-to-pay project for Australia. The objective was very much aimed at a national study for Austroads and then to give them the additional information that they would need to be able to commission a national willingness-to-pay study for Australia. In other words, it was not to be prescriptive in any way but to simply give them the information that they would require and what they could expect from potential consultants and researchers that they might commission to do this work for them and then also to give them additional information in terms of not only the technical side of what is involved but also how much these sorts of studies actually cost and what length of time they take to enable them — in other words, to eventually issue a request for proposals.

The basis of the study also came from a national road safety strategy recommendation for action. That was to:

Develop a nationally agreed approach to applying the willingness-to-pay methodology to value safety.

So it was not necessarily looking at determining which of these approaches is the best but simply what is to be expected in the application of the willingness-to-pay methodology.

The project team was drawn mainly from ARRB, and the Austroads project manager was Dr Mark Harvey of BITRE. The key components of the study were a review of local and international case studies, interviews with identified experts, scoping the actual scoping component to enable them to issue the request for proposals, and then finally some interim values and guidance on that.

In terms of the review of local and international experience, there were about half a dozen case studies. The most prominent in terms of the willingness to pay and one of the most recent for the Australian condition was that of the New South Wales RTA study, which was between 2006 and 2009 and followed a stated preference or stated choice experiment. That looked at a value of risk reduction focusing on a willingness to pay to reduce the risk of death and injury. A key component of that and the subject of our discussions with some of the researchers involved was the choice experiment with the interview survey. That turns out to be an important component of any work that would be commissioned by Austroads eventually.

Likewise the New Zealand studies, of which there were two — one in 1991 and the other in 1996 — used a willingness-to-pay plus a willingness-to-accept approach. That was linked to the household travel survey, which enabled them to identify a sample for further additional and very detailed questioning in their interview survey. The study in Norway, which may be the most recent, is also a quite interesting case in terms of it being internet based. One of the lessons learnt from that particular experience was that it had to be repeated, and that provided some indication to us of just how important it is to get the questionnaire right and of how important it is to have the interviews undertaken by experienced researchers and of some of the potential pitfalls of an internet-based questionnaire.

The approach in Sweden was revealed preference, where the key component was the proxy that I referred to earlier, and the study was of vehicle safety attributes using a lot of vehicle registration data and vehicle sales data to determine people's preferences for safer vehicles, in other words, depending upon the costs involved and also the operating and other costs that would be involved in selection of those vehicles.

The UK has undertaken a number of studies on the value of preventing a road fatality. Since 1987 they have been focused generally on a stated preference approach using contingent valuation questions for valuing non-fatal injuries and then comparing those with the risk of death in terms of stated preference approach overall. In 1991 the study was extended to the value of the prevention of injury. Since then they have debated a number of times whether they would want to undertake a full-blown willingness-to-pay study. To date the consensus for the moment seems to be to simply update the values that they have currently in terms of the CPI and so on rather than undertake a full-blown study again until they have sorted out the issues around the methodology.

That goes back to the point that I raised earlier on the life satisfaction approach, which draws heavily on the household satisfaction survey in the UK. It is a key differential between countries like the UK, which has a substantial amount of data on satisfaction and people's value of life and wanting to get a different perspective

rather on how they view quality of life versus the level of data and the type of data that is available to countries outside the UK. It is of course a limit on the application of that particular approach outside the UK.

Finally the Singapore case study, which was essentially stated preference, involved a choice experiment and contingent valuation components which were compared. The interviews we undertook were aimed not only at getting behind the published material or published papers to find out how those studies were undertaken and what they involved in terms of budgets, how the interviews were undertaken, what some of the lessons learnt were, but also at getting input from the researchers involved and guidance as to what they envisage would be the key issues for a national willingness-to-pay study, if it was applied to Australia.

In terms of the Australian experience, we interviewed professors David Hensher and John Rose at the ITLS at the University of Sydney, who were the two key technical experts involved in the New South Wales RTA study; Vartgues Markarian, who is part of PricewaterhouseCoopers and was the project manager for that particular study; Frank Perry, who is now Transport for NSW, formerly with the RTA, who was the project manager from the RTA side from whom we got very good input on the practicalities involved in managing a project of this kind; and then professors Jordan Louviere and Joffre Swait at the Centre for the Study of Choice, CenSoC, at the University of Technology in Sydney, who are discrete choice modelling experts. We also interviewed Tim Risbey at BITRE to understand some of the issues behind crash data consistency, and that is important when you start looking at the definition of serious injury crashes and what constitutes a serious injury — in other words, length of hospitalisation, disability and the like — and the need to work towards consistency in that area across jurisdictions.

The New Zealand experience was drawn from Dr Jagadish Guria, formerly of LTSA, who was involved in both the New Zealand studies and is now an independent consultant.

I am just going to go very broadly over the scoping of the national willingness-to-pay study for Australia. We came to the view that, given developments in this area, the task force would probably expect, when they are looking for approaches coming from prospective researchers and so on, a stated preference-type study or proposal with a heavy choice experiment component. Given developments in this area, we advised them that that was what they could expect. Obviously once proposals are eventually generated, that might differ to some extent, but that was the key recommendation there. We also pointed to the need for a detailed experiment design and just how much work is involved in the survey and interview component, which, in our view and in the views of the experts, was critical in one of the key areas in terms of how the experiment is designed and how the survey and interview questionnaires are compiled and how the survey and interview teams would undertake the surveys — in other words, market research-type organisations and the value that they provide and the need for an experienced level of expertise there.

In terms of the cost, in 2012 dollars it was around \$1 million over all the components at that stage. In terms of the time frame, we estimated, given previous experience in this area, three to four years, and that goes from issuing a request for proposals through to obtaining proposals, adjudicating them, selecting consultants, going through an experiment design, a pilot study, the actual survey interviews, generating a set of results and reports and then pushing those reports around not only one government department but probably several to obtain their input. One prime example would be that of Treasury and the need to get their buy-in to those values, which was a key issue with the New South Wales RTA study.

We also identified the range of expertise that would be required, which would include not only the technical researchers — in other words, economists, econometricians, statisticians, if you like. It would also include the people who would undertake the survey — in other words, market research-type organisations, a project manager overall. And then there is the importance of a project manager from the client's side who would have to manage this quite extensive team of experts.

Finally, we also identified the need for a peer review, and that could be drawn internationally. What we did in our scoping study was, in an appendix, actually identify experts and possible contacts for the group across all those sorts of areas.

The other issue, of course, is that once those values are generated — at great expense and over a great length of time — they will generally have a life estimated at between 8 and 10 years before the exercise would have to be repeated completely. It could be updated from time to time in the interim. Of course funding availability is a key

issue, and all we have done is present the scoping study and what one might expect to the task force that has been managing this. Of course funding availability then becomes the key thing to kicking it off. In terms of the interim values, we put forward two options: either a very short-term option where those values are updated by the CPI, or they are indexed by per capita GDP and adjusted by income elasticity, much along the lines of the ATC national guidelines and recommendations, and that would be the way they would be updated periodically across the 10 years in between the major studies.

Finally, we also drew attention to the importance of crash risk and exposure data, trying to ensure the consistency of definitions and recording of crash data across jurisdictions. That is also why we have spoken to Tim Risbey at BITRE, who is busy with some work in this area. We can come back to that if you want to; I am just going to go through the conclusions now.

In terms of the conclusions, broadly, as I have mentioned, it would be based on — and the task force concerned could expect this — the stated preference technique being the prominent one in the absence of sufficient data for the revealed preference approach. This is also based on recent developments in this area which indicate that this is the direction things would probably take; however, cost and complexity of the survey interviews and complexity of the entire management and what is involved in a willingness-to-pay study, as well as the time involved, would be major considerations. Of course there is a need to estimate values for fatalities and injuries across modes — so, in other words, these exercises would be aimed at, and the national willingness-to-pay study would be aimed at, getting values for fatalities as well as serious injuries, slight injuries and so on. It is across the spectrum rather than one particular injury classification or crash severity, if you like.

A key aspect we also identified from the case studies was comparing different methods. Obviously, when you go back to the willingness-to-pay results coming from the RTA study, you have a very high value of statistical life there. One possible way of dealing with that and being sure and having confidence in those numbers is that one could commission or at least obtain research using a number of methods — so, in other words, a contingent evaluation versus a choice experiment, as in the case of Singapore. We would also say that the national willingness-to-pay study is the way forward, and because that sample would be drawn from all the major centres across the country, that would be the objective. There would be that much more confidence in the numbers eventually generated.

Of course any willingness-to-pay study would generate a set of values for fatalities and injuries. Then, of course, you would have to estimate additional cost in the form of emergency services separately, and that was a key component we identified as well. In the interim we have identified the interim values and methodologies — or the options for those. Those are relatively straightforward and are done whenever the Austroads updating of unit values occurs — every two years, anyway.

Finally, in terms of the numbers, we also have to recognise and trade off, I guess, the implications for economic evaluation — in other words, at great cost and great time, you would have to invest in getting the set of values for fatalities, injuries and the like. However, at the same time, when you are looking at your cost-benefit analysis, the crash costs are not necessarily the major cost. Of course, in terms of the overall magnitude, you also have to acknowledge that you are left with substantial costs from your savings in travel time and your savings in vehicle operating costs and the like being quite a major component, particularly the value of savings in travel time. That needs to be put in perspective as well.

Finally, those are the key references I would identify for you. I think they were also identified in the VicRoads submission and in our report, which is the Austroads 2013 study you see there. Thank you.

The CHAIR — Thanks very much, Dr Naude. We have a couple of questions. Firstly, would it be possible to have access to those reports?

Dr NAUDE — The three I have identified?

The CHAIR — Yes.

Dr NAUDE — Yes. I think they are published Austroads reports. The status of our one — it has gone through the national office, I think, so it should be available. I will just have to check on that one. The other two are certainly available or published.

The CHAIR — Thank you very much.

Mr LANGUILLER — If I might just quickly take you back, you talked about the life satisfaction approach in the UK. I do apologise; I missed your explanation on that bit. If you could just — —

Dr NAUDE — It was not a major part of our work at all, given our focus on the willingness-to-pay approach that was in our terms of reference. I have just mentioned it there as an additional approach, and that is a unique and relatively new issue that has confronted the UK, largely because they have a lot of data on their household satisfaction survey, and that might give them possibly another direction as a relatively new area which could be explored in the future. It did not feature in our particular scoping study because we were directed to the willingness-to-pay approach, and at that stage we were also looking at what was published and fully available and what the trend was, if you like, in developments in this area. We have identified a number of references in our approach where this approach is discussed by other authors, so there is that possibility as well.

Mr LANGUILLER — Further, it has been noted both in submissions and in published research that while the willingness-to-pay approach is the most appropriate costing model conceptually, there are a number of methodological issues that need to be overcome before it should be adopted. Associated issues include the significant cost involved in the undertaking of a willingness-to-pay survey, the time taken to complete a study and issues associated with the ability of survey participants to assess risk. What are your views on the methodological issues associated with the willingness-to-pay model, and do you believe they can or have been overcome?

Dr NAUDE — I think that is not from our submission. Is that one of the submissions that was made? Okay. From the discussions we have undertaken with experts in this area, as well as some of the work we have covered in the literature and so on, yes, there are certain key areas, and one of those is the need to have a very carefully designed choice experiment. That seems to be the most important thing when you are looking at the methodology of the willingness-to-pay approach. Another aspect which was also identified by one of the experts was preparation of the interview subjects — in other words, the respondents — and guiding them, possibly even through videos, for them to be able to understand what is involved in a fatal accident and what ‘serious injury’ actually means so they get a good understanding of what people are going to be confronted with in the questionnaire.

That is also in terms of the values they are going to be able to put on it, just how realistic those values actually are. I would say from a methodological point of view that probably the key component is the design of the experiment and the sorts of questions and the preparation involved in the interview surveys. That will subsequently take quite a lot of time. We identified it as at least a quarter of an hour through to 45 minutes per interview. So if you are doing a couple of thousand of them — and for a national willingness-to-pay study it becomes quite a time-consuming process, not a very quick exercise at all, especially if you want to get a representative sample drawn across a number of Australian cities and non-urban areas, not necessarily rural but towns — you would also have to consider that.

We have identified the importance of the pilot study. In other words, in several of the studies — the New South Wales RTA, for example, also had a pilot study. That seems to be a key thing, not only to test the questionnaire and the approach but also to test the logistics as well as the approach behind the survey so that you are actually able to, I suppose, identify any problems that you might have with your interview team. That goes back to what I have talked about, the need for an experienced set of market research-type people who are experienced in this sort of area. Again, that would be quite a key component of reducing any problems that you might face with the methodology in terms of the understanding of the questions and the application of the questionnaire. That is what I would say would be the key challenge. It is not insurmountable, but again it depends on your appetite in terms of the time and cost involved.

Mr ELSBURY — The committee understands that some willingness-to-pay values are comprised of both direct costs of crashes, such as for treatment and property damage, and values stated by survey participants relating to their relative risk of injury or death. Do you think that willingness-to-pay values should exclude the direct cost of crashes?

Dr NAUDE — By ‘direct costs of crashes’ you mean the additional costs?

Mr ELSBURY — The treatment costs and for the property damage, those sorts of things.

Dr NAUDE — Those would be separate components, and I believe that when we did our work we identified that need — in other words, to separate out those sorts of costs and determine them separately, because they are quite problematic. There, again, it comes back to the interviews. How you are going to address those sorts of things in the interview question becomes quite an important task then. The need to prepare respondents and so on would therefore be quite important. You see, if you are going to incorporate it, what we have suggested is that those sorts of issues be separated and determined outside the willingness to pay, if at all possible.

Mr PERERA — As part of the national project, is it intended that a WTP value will be determined for both serious injury and fatality or only for fatality? If the latter, how is it proposed that a value for serious injuries will be estimated? Will the value for serious injury be based on a fraction of the cost of a fatality?

Dr NAUDE — I think that draws on the New Zealand methodology as well, but what we have suggested in our scoping is that the values are compiled for statistical life, serious injury et cetera — in other words, across the spectrum, if possible, because when you are commissioning a study of this magnitude you would want to get as much out of it as possible. That would also determine how you address those sorts of issues in the questionnaire. There again the distinction becomes important, and people should understand — or the respondents need to understand — the difference between fatality and serious injury and exactly what is involved with a serious injury. That goes back to this whole issue of data consistency and how those crashes are classified across jurisdictions and understood. That goes back to issues of whether serious injury involves disability, for example, the length of hospitalisation involved and the need for consistency across those definitions as well. To answer your question, we recommend the study that actually goes across injury types and fatality.

The CHAIR — Dr Naude, thank you very much for your time and detailed submission. We appreciate it.

Witnesses withdrew.