OFFICE OF THE STATE CORONER

FINDINGS OF INQUEST

CITATION: **Inquest into the death of Hossam Mohamed ELSHAZLY**

TITLE OF COURT: Coroner's Court

JURISDICTION: Cairns

FILE NO(s): COR: 00000373095

DELIVERED ON: 29 June 2011

DELIVERED AT: Cairns

HEARING DATE(s): 11/08/2010; 16/11/2010; 01/12/2010; 29/06/2010

FINDINGS OF: Kevin Priestly, Northern Coroner

CATCHWORDS: CORONERS: Inquest – Collision - cyclist and truck at roundabout - design standard of roundabout at construction - current design standard - need for road authority to monitor risk and consider retrofitting roundabouts to current standard

REPRESENTATION:

Counsel Assisting:	Anthony Mirotsos
For Department of Transport and Main Roads	Crown Law Mr Ben McMillan instructed by Department of Transport and Main Roads

Mr Hossam Elshazly was 38 years of age and resided at 12 Savaii Close, Palm Cove, a suburb north of Cairns in an area known as Northern Beaches. He was employed at Cairns Base Hospital as a Renal Physician. Mr Elshazly was also an avid cyclist, regularly cycling from his home onto and along the Captain Cook Highway.

At about 7.15am on Saturday 17 January 2009 Mr Elshalzy was riding his Bontrager Trek bicycle in a southerly direction on the Captain Cook Highway, approaching the roundabout at the intersection with Trinity Beach Road. At the same time, Mr Glenn Wilkins was driving his loaded Nissan UD tip truck towing a trailer in a southerly direction in the left hand lane of the Captain Cook Highway, approaching the same roundabout.

On entry into the roundabout, Mr Elshazly and the truck came into contact. Mr Elshazly fell from his bicycle and wheels of the trailer passed over him. He suffered severe injuries and died at the scene.

Post Mortem Examination

On 19 January 2009 Dr Paull Botterill, Forensic Pathologist, conducted an autopsy, limited to external examination, concluding that death was consistent with multiple injuries due to motor vehicle – bicycle collision (rider).

Dr Botterill reported:

"In plain terms, limited post mortem examination showed deformity and x-ray changes consistent with broken skull, facial bones, multiple ribs, pelvis, both arms and the left forearm, with grazes over much of the front of the body, blood in the right side of the chest and possible bleeding within the bladder.

In my opinion, at the time of limited examination, the cause of death was probably multiple injuries but the possible contribution of alcohol &/or other drug toxicity was unable to excluded at that time, and the restricted extent of examination meant that otherwise unidentified natural pathology which may have contributed to the circumstances leading to the collision were impossible to exclude.

Further investigations were performed. Testing of fluids for drugs and poisons, including alcohol, was negative."

I have carefully reviewed the autopsy report and accept the findings and opinions of Dr Botterill.

Issues for Consideration

S.45 of the Coroners Act 2003 requires me to make findings at the conclusion of the investigation about the following matters:

(a) who the deceased person is;
(b) how the person died;
(c) when the person died;
(d) where the person died; and
(e) what caused the person to die.

While the evidence is sufficient to enable me to make findings about each of these matters, the element as to how Mr Elshazly died requires further consideration. To progress my findings about how he died, a better understanding of the location is required. I will then consider the findings of the Forensic Crash Unit's investigation.

The Location

The Captain Cook Highway is a major highway linking Cairns to the south of the scene with Mossman to the north. It also serves as the major link for commuter traffic from the Northern Beaches to and from Cairns. Captain Cook Highway comprises four marked traffic lanes, two in each direction separated by a grassed median strip. Trinity Beach Road runs off the roundabout in an easterly direction and comprises two marked traffic lanes providing access to the suburb of Trinity Beach. The roundabout is large with a gardened void in the middle.

There is a sealed shoulder on the eastern side of the southbound lanes of the highway marked with a single unbroken white line. There were no markings on the lane to suggest that it was a bicycle lane. It was 2.3 metres wide just to the north of the roundabout (21.2 metres from the point of contact) and narrowed considerably on the approach and entry to the roundabout. It measured .32 metre nearest the point of contact. On entry to the roundabout there was a concrete kerb on the eastern side of the southbound lanes. This kerb measured 12 cm in height. These aspects of the scene are clearly depicted in photograph 1 in the Appendix.

At hearing, Mr Ringer, Department of Main Roads Traffic Engineer gave evidence that there were 18,000 vehicle movements per day on this section of the Highway.

The Forensic Crash Unit Investigation

Forensic Crash Unit Investigator Sgt Steve Webb conducted the scene investigation and reported as follows:

> "I observed scratch and gouge marks on the road surface. These were situated .8 of a metre from the kerb on the left southbound lane. These marks indicated to me the point where the bicycle went under the wheels of the dog trailer of Unit 1. They were left by parts of the bicycle such as the crankset and other heavy metal parts as it came into contact with the road whilst being crushed by the trailer.
>
> I observed the body of the deceased lying on his back on the roadway some 4.2 metres south from the point of impact. His head was facing in a south westerly direction and his feet were pointing toward the kerb. It was apparent to me that he had sustained massive injuries and had died instantly. I observed that he was wearing a bicycle suit and a helmet.
>
> I observed a bicycle lying on the roadway. This cycle was located 4.6 metres south of the point of impact and closer to the kerb than the body. The bicycle appeared to be of carbon fibre construction and I could see that it had sustained massive impact damage as a result of the collision and was destroyed. I could not make a comment as to what gear the cycle was in at the time of the collision due to the damage apart from the fact that the chain was situated on the 5th cog on the rear wheel.
>
> I could find no tyre marks on the road surface that may have been attributed to this incident."

Photographs were taken at the direction of Sgt Webb. A photograph from his report depicting the narrowing of the road shoulder on entry to the roundabout is shown in the Appendix.

There were no potholes or debris that might have contributed to the incident. Sgt. Webb noticed that the white fog line adjacent to entry to the roundabout was faded due to a large volume of traffic passing over it.

Sgt Webb also inspected the truck at the scene. He found no signs of markings or damage that might be attributed to contact between the bicycle and truck. The windscreen of the truck was clean and visibility from the cabin was good. All mirrors were present and serviceable. The truck was later subjected to a mechanical inspection and although a number of deficiencies were found, none of those directly contributed to the cause of the incident.

Sgt Webb saw that the bicycle sustained substantial crush damage.

While at the scene, Sgt Webb and Michael Ringer, Senior Traffic Engineer from the Department of Main Roads, watched traffic approaching and entering the roundabout, including heavy vehicles similar to that involved in this incident. Sgt Webb reports that the vast majority of these vehicles rear wheels or trailers crossed over the white fog line associated with the eastern side of the roundabout entrance.

Mr Wilkins, the truck driver, was interviewed at the scene. He reported departing Wangetti Beach about 6.50am headed to Woree, south of Cairns. He said he overtook the cyclist about 50m before the Trinity Beach roundabout and slowed. On entering the roundabout, he felt a jolt on his left side and looked into his side mirror. He saw a cyclist on the road and stopped. Others had already called an ambulance.

Following about 4-5 car lengths behind Mr Wilkins was Dr Kristin Sopa, a medical practitioner and regular cyclist in the area. She reported seeing the front of the truck pass the cyclist just prior to the cement kerbing near entry to the roundabout. She thought the cyclist appeared to be aware of the truck beside him as he had stopped pedalling. Ms Sopa said the truck and cyclist entered the roundabout entrance together. The front of the truck was past the cyclist at this time. Ms Sopa did not believe that the truck did anything dangerous, they were both too close. She saw the cyclist go down and the back of the trailer pass over him. Ms Sopa immediately stopped and went to the assistance of the cyclist. She found he was deceased and there was no hope of reviving him.

From a cyclist's perspective, Ms Sopa offered the opinion that there was 'no room' for a cyclist on the roundabout. The kerb is extremely tight. The gap between the kerb and white line would not fit a cyclist unlike the other roundabouts at Kewarra, Trinity Park and Campus Shopping Village.

No enforcement or criminal prosecution was commenced against Mr Wilkins. Sgt Webb concluded that the considerable narrowing of the shoulder at the entry to the roundabout greatly contributed to the cause of this incident. In Sgt Webb's opinion, if the shoulder had been maintained at the correct width throughout entry to the roundabout, this incident may not have occurred.

Conclusion

Ms Sopa was in the best position to see and appreciate the dynamics involved in the moments before and during contact between Mr Elshazly and the truck. While the front of the truck had passed Mr Elshazly some 50m before entry to the roundabout, he remained in close proximity and was aware of the presence of the truck. However, on approach to the roundabout, the shoulder narrowed considerably. Further, Mr Wilkins attention was likely focussed on traffic to his right, either through traffic continuing north on the Captain Cook Highway or traffic coming from the south and turning across his path into Trinity Beach Road. On entry to the roundabout, Mr Elshazly came into contact with the truck, lost his balance and fell to the road. The wheels of the trailer then passed over him.

There was no dangerous action on the part of either Mr Elshazly or Mr Wilkins. The contact between Mr Elshazly and the truck was due to the very confined space through which they each sought to travel. Mr Elshazly may not have appreciated that the truck was towing a trailer. This may have exacerbated the lack of space due to the tendency of a trailer to track inside the turning arc of the towing vehicle. Mr Wilkins may not have appreciated the proximity and location of Mr Elshazly during the manoeuvre.

Findings required by s.45.

In light of the above evidence, I make the following findings:

Identity of deceased: Hossam Mohamed Elshazly

Place of death: Roundabout at the intersection of the Captain Cook Highway and Trinity Beach Road, Trinity Beach near Cairns.

Date of death: 17 January 2009

Cause of death: Multiple injuries due to motor vehicle & bicycle collision (rider).

How he died: Mr Elshazly and a heavy vehicle towing a trailer entered the Trinity Beach roundabout directly adjacent to each other, heading in the same direction. The narrow confines of the entry to the roundabout brought them to come into contact and resulted in Mr Elshazly falling from his bicycle. The wheels of the trailer passed over him causing his death.

Comments and Recommendations

An objective of the Coroners Act is to help prevent death from similar causes happening in the future by allowing coroners at inquests to comment on matters connected with death including matters related to public health and safety (see sections 3(d) and 46(1)).

The circumstances of the death of Mr Elshazly raise an issue of public health and safety, namely how the road authority monitors changes in design standards that impact on the safety of cyclists and decide when to retrofit existing infrastructure to comply with current standards.

To this end, I consider in detail the evolution of the design standards relevant to the interaction of cyclists and motorists on roundabouts and the approach that the Department of Main Roads took to the application of those standards to this roundabout.

Design and Construction History of the Roundabout

The Department of Main Roads (now Department of Transport and Main Roads but for convenience referred to as DMR) provided a number of reports about the history of the design and construction of this roundabout.

The roundabout is situated on a highway under the control of DMR and was designed in 1989 in accordance with the Principals of Intersection Design, as stipulated by Austroads in the Guide to Traffic Engineering Practice, Part 5 – Intersections at Grade, published in 1988; and Roundabouts – A Design Guide published in 1986 ('the 1986 standard').

Construction was completed in 1991. An asphalt overlay was completed at the roundabout in 2003. From construction until this incident in January 2009, there was no structural or design change to the roundabout, its entrances and exits.

At section 5.2, the 1986 standard addressed cyclist safety as a consideration in the design of roundabouts in the following terms:

> "In most circumstances, roundabouts provide satisfactorily for cyclists, although it has been found that multi-lane roundabouts are more stressful to cyclists than single-lane roundabouts owing to the greater chance of conflicts between vehicles and cyclists. Although little reported information is available on the safety of cyclists at roundabouts, the Victorian Country Roads Board study showed an overall reduction of 45 percent in the casualty accidents per year involving cyclists after roundabouts were installed. This is encouraging, although not statistically significant. It has been found that generally, cyclists use roundabouts in a similar way to motor vehicles. Special provisions for cyclists are not normally required."

Accordingly, in the design of this roundabout, no special provision was made for cyclists. Although this view was to dramatically change, there was a considerable passage of time before a serious rethink and action in the form of a new standard.

In 1999, and on publication of the second edition of the Austroads 'Guide to Traffic Engineering Practice – Part 14 Bicycles' (the 1999 standard), cyclists at roundabouts was considered a subject 'deserving of special consideration'[1]. This new standard commences its consideration of roundabouts with the following statement:

> "Roundabouts are a form of intersection treatment adopted extensively during the 1980's on both local and arterial roads due to the benefit of both a relatively low crash rate and of less severe crashes for motor vehicles than other types of intersections. They are an important device used by traffic engineers to physically control traffic behaviour and to combat road trauma and improve amenity in residential areas. However, various studies have indicated that roundabouts, particularly those which have more than one lane in the circulating roadway, are markedly less safe for cyclists than for other road users."

The new standard then refers to numerous studies identifying safety concerns for cyclists. Importantly, in the context of this fatality, the standard identifies seven broad groups of cyclists for which planners and engineers should cater. These are:

- Primary school children;
- Secondary school children;
- Recreational cyclists;
- Commuter cyclists;
- Utility cyclists;
- Touring cyclists; and
- Sports cyclist in training.

The publication notes that sporting cyclists travel long distances on arterial roads; their primary requirements are a smooth even surface and enough space to operate safely; and off-road paths are generally not suitable for this group to train on because of the high speeds and potential conflict with other path users.

The last design consideration seems applicable in this setting. There is a serious issue about the suitability of the shared cyclist/pedestrian path adjacent to the Captain Cook Highway at this roundabout for use of sporting cyclists.

The standard also notes the various treatment options to mitigate risk and then addresses what type of roundabouts require special consideration. These roundabouts include those where:

- The cumulative, approach traffic volume, exceeds 10,000 vehicles per day;
- Multi lane roundabouts occur, and certainly where vehicle speeds exceed 50kph through the roundabout; or
- The central roundabout island diameter exceeds 25m.

While satisfaction of only one criterion is sufficient, all three are satisfied in this instance. The standard provides for what is considered 'appropriate treatment' and details the provision of a path for cyclists that is separated from the highway.

The key development is separation of cyclists and motorists at roundabouts. The manner of separation depends on the nature and setting of the roundabout.

In 2004 the NSW Road Traffic Authority published the NSW Bicycle Guidelines to assist in the design and construction of bicycle transport facilities. It offers suggestions about treatment of roundabouts in different settings. Figure 7.9 from that publication is depicted in

[1] Section 5.5.2.1 at page 63

the appendix and shows the use of a wide bicycle shoulder lane, painted green, to separate cyclists from vehicular traffic. This form of treatment is suggested for a single lane roundabout to provide some physical separation of cyclists and motorists. The dimensions on figure 7.9 contemplate a cyclist's lane width on approach of 1.25m, during circulation of 1.25 -1.5 from the kerb, and on departing of 1.5m.

On 24 September 2007, the Acting Executive Director (Planning, Design and Operations), DMR issued a memorandum to all District Directors providing guidance on design criteria relevant to cyclists and intersections. It states that the Road Planning and Design Manual is the primary technical reference, to be supplemented by the following (in order of priority):

- Austroads Guide to Traffic Engineering Practice Part 14: Bicycles;
- Qld Transport Cycle Notes; and
- NSW Bicycle Guidelines.

The memo had a number of attachments. Attachment 3 is headed 'Intersection Treatments for Cycling', and reads:

> "District Business Units associated with planning, development control, operations, construction and maintenance are asked to ensure the measures in Table 1 are applied as part of all new roads and major upgrades. For existing roads, the table is proposed as a reference and where ever practical, the approaches should be applied to the greatest extent possible."

This reference contemplates application of the guideline in the event of a major upgrade. No attempt is made to address and suggest a method of assessing the relative safety risk between the as constructed state of a road and the current standard. Nor is any attempt made to set out criteria by which any assessed safety risk might be used as a basis for deciding to retrofit to a current standard outside of a 'major upgrade'.

Attachment 3 then tabulates the preferred treatments, including for roundabouts with greater then 3000 vehicle movements per day and a speed limit of greater then 50kph by stating:

> "Single and dual lane roundabouts can be marked with bike lanes around the circulating lane, but take measures to slow entering traffic. Splitter islands or similar dividers between the bike and other traffic lanes on the entries will assist, as will proper deflection."

Reference is then made to the NSW Bicycle Guidelines, stating:

> ".. this bike lane marking approach can be used on single and dual lane roundabouts but it is not suitable for very large diameter, high speed roundabouts."

In 2009, Austroads published the Guide to Road Design Part 4B: Roundabouts. In the introduction at section 5.1 it notes:

> "A number of studies have shown that roundabouts increase the risk of crashes for cyclists and this fact needs to be taken into account when considering the adoption of a roundabout treatment at an intersection. Cyclists are involved as circulating vehicles in a high percentage of entering/ circulating vehicle crashes and this is likely to relate to entry speeds and motor vehicle drivers scanning behaviour on the approaches."

It acknowledges that studies indicate a separated cycle path, located outside the circulating carriageway, is the safest design when there are high vehicle flows[2]. It also acknowledges the need to cater for different types of cyclists at roundabouts, referring to earlier published standards.

[2] p.50

The publication notes[3]:

> "At small single-lane roundabouts on local streets where the geometry encourages very low approach speeds (e.g. 20 km/h) cyclists should be able to safely share the road with general traffic.
>
> At larger single-lane or multi-lane roundabouts where speeds are higher, consideration should be given to treatments that assist young or inexperienced cyclists as well as commuter cyclists, namely:
>
> - an off-road bicycle path around the roundabout with uncontrolled cyclist/pedestrian movement across each approach leg – there is some evidence to suggest that this is the safest design, at least where traffic flows are high
> - an on-road bicycle lane to improve drivers' awareness of the possible presence of cyclists and to provide some separation for cyclists from motor vehicles within the roundabout."

Under the heading '5.3.3 Bicycle Lanes at Single Lane Roundabouts' and subheading '*Collector road or arterial road with physical separation of bicycle lanes*', the publication advises:

> "Where bicycle routes pass through single-lane roundabouts that have relatively high traffic volumes and moderate speeds, a marked bicycle lane may be provided within the roundabout as shown in Figure 5.3. The circulating bicycle lane should have a contrasting surface that provides cyclists with separate space and comfort but no special priority. However, advance warning signs, a contrasting surface and bicycle pavement logos should be provided to ensure that the facility is highly visible and warns motorists of the likely presence of cyclists. Cyclists passing straight through the roundabout or turning left will remain in the bicycle lane. Cyclists may turn right with general traffic or undertake a hook turn from the left side of the exit. As the islands separating cyclists from motor vehicles are narrow in this treatment it is most important that they are provided with a high standard of delineation (e.g. narrow retro-reflective signs on all noses facing traffic approaching the roundabout and departing from the roundabout)."

Under the subheading *'Collector road or arterial road with no physical separation of bicycle lanes'*, the publications states:

> "The treatment shown in Figure 5.4 has been adopted and implemented by some road authorities. It provides a bicycle lane on the roundabout approaches and departures without any physical separation. It is known that many motorists will cut across the bicycle lane on the entry and exit curves when no cyclists are present. For this reason, the maximum entry path radius criteria in Section 4.5.5 should be applied by assuming drivers will cut across the bicycle lane (i.e. Step 3 in Figure 4.6 will involve drawing a line 1.5 m from the kerbed left edge of the bicycle lane).
>
> There is some concern that this treatment may lead to conflict between heavy vehicles and bicycles where the route carries a relatively high volume of both freight vehicles and cyclists. It is therefore suggested that the entries of these treatments should be designed so that the swept paths of entering design vehicles do not have to encroach into the bicycle lane. However, where a site has low volumes of both trucks and bicycles, encroachment may be allowed if necessary to achieve the maximum entry radius criteria in Section 4.5.5."

I pause to make a few observations. The publication acknowledges the absence of physical barriers separating motorists and cyclists introduces an element of risk from motorists cutting across the bicycle lane. It also acknowledges the risk of conflict with heavy vehicles and treatment options for addressing this prospect. The emphasis is on separation of cyclists and motorists aided by clear delineation and designation of bicycle paths.

[3] p.50

At 5.3.4 Multi-lane Roundabout on Arterial Roads:

> "Multi-lane roundabouts usually carry high traffic volumes and have higher entry speeds than local street roundabouts and therefore create safety problems for cyclists. It is anticipated that only experienced cyclists will use this type of roundabout and whilst they may feel reasonably comfortable in selecting a gap and turning left and travelling straight through a multi-lane roundabout in the bicycle lane, they will generally find the right-turning manoeuvre challenging. Some cyclists will therefore bypass the right turn by using local streets, shared paths at the roundabout (where provided) or by undertaking a hook turn at the exit.
>
> There is currently no treatment that would assist cyclists to turn right safely through a multi-lane roundabout. However, the provision of bicycle lanes within multi-lane arterial road roundabouts is considered to offer some advantages to cyclists in that these lanes:
> - heighten the awareness of motorists approaching the roundabout that cyclists may be present
> - provide designated space on the circulating carriageway and thereby assist experienced cyclists to negotiate the through movement
> - assist cyclists to undertake a hook turn (right turn) as described in the Australian Road Rules (NTC 2008).
>
> Some jurisdictions may prefer not to provide the islands between the bicycle lane and the adjacent traffic lanes at multi-lane roundabouts. Under this arrangement, the criteria given in Section 5.3.3 for single-lane roundabouts with no physical separation between cyclists and motorists also apply
> .
> Where a multi-lane roundabout carries high volumes of both heavy vehicles and bicycles it is recommended that the bicycle lane should be physically separated from the general traffic lanes on the approaches as illustrated in Figure 5.5. Designers should design the island in accordance with the normal design principles for traffic islands (Section 10, Guide to Road Design – Part 4: Intersections and Crossings – General (Austroads 2009b)). Figure 5.6 shows suggested details of the separation island which is similar in principle to a pedestrian and cyclist refuge island."

I observe this publication continues the theme of physical separation of cyclists and motorists, particularly where there is a high use of heavy vehicles, and if that is not possible, a wide and clearly delineated cyclist's path is to be provided.

Clearly, none of these features existed at the time of this fatality.

DMR Response to this Fatality

Mr Elshazly died on 17 January 2009. Later that month DMR commissioned Black & More, Engineers to review the safety of the roundabouts on the Captain Cook Highway at the Northern Beaches. Site visits were conducted and a draft report on initial investigations was submitted to DMR on 5 February 2009.

In the Black and More publication, the Executive Summary reported:

> "These preliminary findings and recommendations indicated:
> - None of the nine roundabouts complied with DMR's list of ultimate requirements for signage, line marking and off-road cycle path accessibility;
> - All but one of the nine roundabouts did not contain adequate sign age and/or pavement markings warning motorists of the presence of cyclists on the road;
> - None of the nine roundabouts contained access to or from off-road cycle paths provided;
> - All of the roundabouts would benefit from the installation of advance warning signs, audible line marking and green pavement marking delineation cycle lanes in the first instance, with pavement widening to compliment these changes in the long term."

In effect, as at January 2009, the roundabouts did not comply with the then applicable design standards in significant areas relevant to the safety of cyclists. The specifics are listed in detail in the report. It is important to acknowledge the report authors reviewed the roundabouts against the current standard as opposed to the standard used in the design and construction. It is also important to recall that since construction, the roundabout at Trinity Beach has not undergone a major upgrade that would have triggered a design review since publication of the 1999 standard.

Black & More continued its investigations addressing the scope and cost of upgrades in the course of finalising its report. A copy of its report was tendered into evidence. DMR sought and obtained Black Spot funding from the Commonwealth government. A works program was initiated to implement the recommended upgrades to the roundabouts. The work was undertaken in two stages:

- Stage 1
    - Reduce the speed limit to 60kph through the approach to the roundabout
    - Install 'Watch for Cyclists' warning signs in advance of the roundabout and at the holding line on each of the three roundabout legs
    - This work was completed in May 2009
- Stage 2
    - Remove the concrete kerbs at the roundabout
    - Widen the pavement at the roundabout to improve the shoulder width to at least I.5 metres for cyclists
    - Replace some existing signs with frangible 'forgiving' posts and sign faces that are less of a hazard to motorcyclists.
    - This work was completed prior to this hearing.

The remaining roundabouts at the Northern Beaches were similarly upgraded with minor variations depending on the physical characteristics of each roundabout.

DMR Management of Safety Risk to Cyclists at Roundabouts in the Northern Beaches

The risk of conflict and collision between cyclists and motorists clearly existed since the creation of roundabouts. What was not recognised was the magnitude of the risk. The introductory remarks to the various standards demonstrate a growing recognition of the magnitude of the risk. How did DMR respond to this growing awareness?

During the course of the coronial investigation, DMR partly responded to this issue in the form of a report from Mr Tony Walz in which it reported:

> "Design standards are subject to periodic amendments and are published through Austroads Guide to Traffic Engineer Practice Series. The Department of Transport and Main Roads ensures that at the time of construction relevant standards in design and construction are followed. They do not automatically retro fit each publicised amendment to state controlled roads at the time of publication amendments (such as those made in 1999) as to do so across all roads and for all standards would be cost prohibitive. Any change to design is subject to funding, resource availability and results of road audits."

Clearly, it would not be efficacious to automatically retrofit all roads so as to comply with every change to design standards. There must be a balance between need (including a component involving assessment of safety risk) and available funding. To this end, auditing tools play a vital role in the decision making process.

Mr Walz explains that the Department evaluates risk to cyclists on the road network in two ways. The first, described as a reactive audit process is identified and described as follows:

> "The department carries out regular (six monthly) analysis of the road network with respect to reported bicycle crashes. Specifically they run road crash reports to determine

> where cycle crashes have occurred and what has contributed to these crashes. The department then prioritise expenditure toward projects to construct cycle infrastructure such as green paint cycle lanes and wider road shoulders at these location to improve safety for cyclists. An example of this is the Targeted Road Safety Initiative Report which identifies, by ranking, the sites in this region, and others, where bicycle crashes have occurred on state controlled roads. We use this report to identify specific cycle infrastructure project for funding under the Safer Roads Sooner program."

Mr Walz gives as an example of this process in action, referring to the remedial work undertaken to the roundabouts on the Captain Cook Highway following this death.

The second, a proactive audit process is identified and described by Mr Walz as follows:

> "The department audits roads using a prioritisation tool called Netrisk. This audit software, developed by the Australian Road Research Board (ARRB), uses specific road characteristic such as geometry and roadside hazards to rank road section in terms of exposure to crashes, and allows the prioritisation of road safety audits. The department applies other criteria such as traffic volume to further rank road sections for auditing purposes. This auditing process considers all road users and is not specific to cyclists. To enhance the department's proactive auditing process, Far North region has engaged ARRB to provide a road safety audit program based on the results of the Netrisk report and regional inputs such as crash rates (reactive element) and Annual Average Daily Traffic information. The audits carried out on roads will report on deficiencies and safety issues for all types of road users, including cyclists. Audit recommendations are then prioritised and added to the relevant works program as funding becomes available."

This sounds a perfectly logical and sophisticated approach to the identification and prioritisation of hazards on the road network including those that impact on cyclist's safety such as infrastructure at roundabouts. Unfortunately, Netrisk does not assist in providing information to assist in managing cyclist safety in the manner contemplated by Mr Walz.

Mr Ringer, a Traffic Engineer, DMR, was asked about the use of Netrisk. Specifically, he was asked whether Netrisk data was of any assistance to the assessment of risk to cyclists. His response was "No"[4]. He later elaborated, stating that Netrisk could not be used to understand cyclist's safety issues on our roads. Netrisk did not differentiate motorists and cyclists when considering road user types.

Therefore, in terms of identifying risk to cyclists on the road network, in particular, at roundabouts; DMR is entirely reliant on incident reporting systems. In other words, bicycle crash statistics. This is a better characterised as a reactive process.

Mr Ringer explained the model used for the allocation of funding to cyclists safety between locations within this region was reliant on various forms of incident reporting, predominantly using data from sources like emergency services. Mr Ringer reported that the data showed no incident involving cyclists at the Northern Beaches roundabouts prior to this death. The effectiveness and validity of these modes of data gathering was not canvassed in this hearing.

Opportunities for Improvement

It is important to acknowledge that the adequacy and allocation of funding for cyclist safety within a region is a matter entirely for DMR and it would not be appropriate for me to comment on that subject. However, it is appropriate for me to consider and comment on the efficacy of the decision making processes and the tools and sources of information used to guide the making of such decisions.

[4] p.23/ l.48

The present approach, as best that can be discerned from the department's publications, is to consider retrofitting to the current standard when major upgrades are planned. The only opportunity for earlier intervention is when crash statistics at an unspecified level suggests that immediate action is necessary. In the context of a motorist and cyclist, a recorded statistic usually means serious injury or death with emergency service involvement. This approach is unsatisfactory as it's vague and reactive.

DMR needs to develop a truly proactive program for assessing the difference in risk of harm to cyclists between the 'as constructed' state of infrastructure and the most recently published standards. Only by considering and measuring risk can managers consider the cost effectiveness (degree of risk reduction) of work required to bring the infrastructure into compliance with the current standard.

I suspect that in many instances, changes to standards addressing cycling infrastructure might only have incremental impacts on risk reduction and would not justify retrofitting in the absence of a major upgrade to the road for other reasons. However, like in this instance, when there is a tectonic shift in the approach to managing cyclists safety at roundabouts (a requirement for separation of cyclists from motorists), the safety implications should be fully explored and assessed. Policy guidelines should be developed with more explicit guidance as to the circumstances in which retrofitting is required. However, such a program does not address the relative and competing needs for risk reduction measures as between motorists and cyclists. Clearly, Netrisk performs the admirable function of enabling managers to prioritise works for motorists generally but not as between the distinct and separate (sometimes competing) safety interests of cyclists and motorists.

Based on the level of risk to cyclists and the cost of works to bring the infrastructure to a compliant condition, managers and traffic engineers can make better, cost/risk informed decisions.

Recommendations

Based on my comments, I recommend:

1. DMR establish a program to review the current design standards relevant to cyclist safety and to develop guidelines to assist traffic engineers and managers in assessing the need for and <u>when</u> to retrofit treatment options (risk mitigation measures) to existing infrastructure. The review should be conducted by a traffic engineer or analyst. The safety implications of changes to standards should be risk assessed and the treatment options costed.
2. The guidelines so developed be disseminated to the regions to assist traffic engineers in assessing and prioritising locations on their road network for cost/risk effective retrofitting to current standards. Regional traffic engineers and managers can then allocate available funding to the highest priorities as well as apply for further funding if the level of risk supports that application.
3. Further, DMR explore whether there exists an opportunity to incorporate into Netrisk a module that would allow its key functionality to apply to state of infrastructure with safety implications for cyclists and to prioritise the need for retrofitting as between particular locations.

I close the inquest.

Kevin Priestly
Northern Coroner
29 June 2011

Appendix

Photograph of the scene at the northern approach looking south.

The narrowing of the shoulder is depicted in the foreground. The post-impact position of the

bicycle in depicted to the left of the red cones.

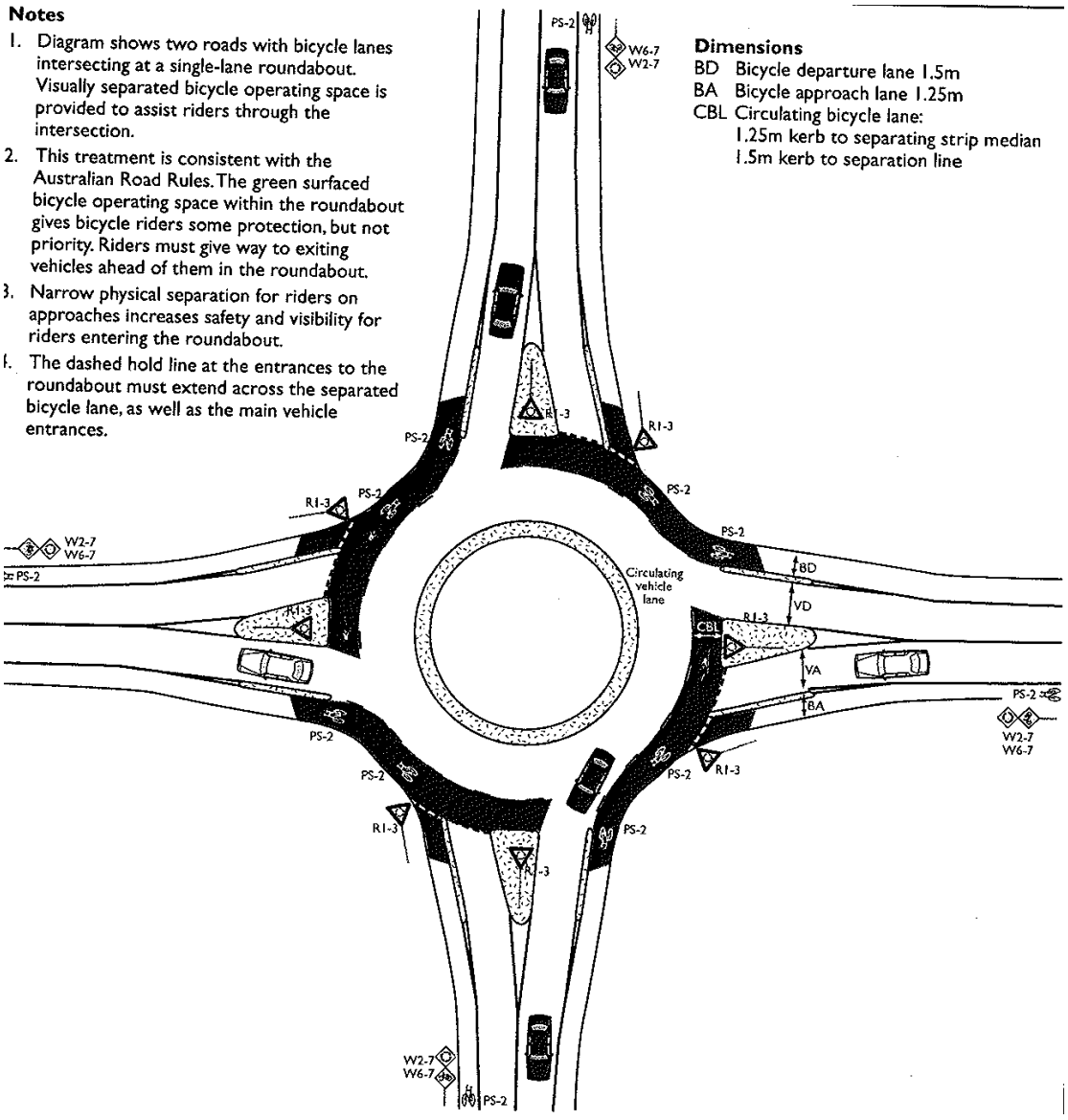

Figure 7.9 from NSW Bicycle Guidelines

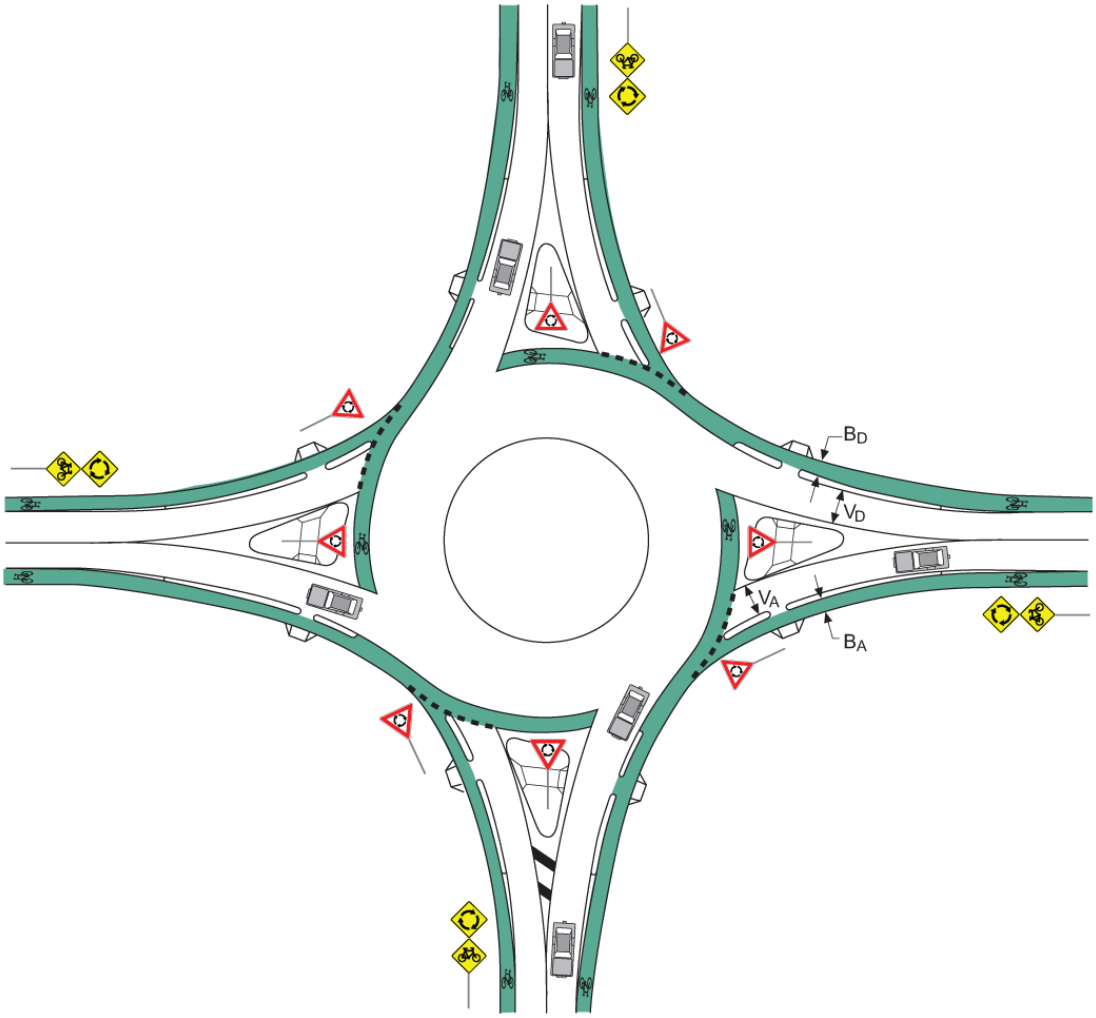

Figure 5.3 from Austroads 2009 Guide to Road Design Part 4B: Roundabouts