BUS SAFETY INVESTIGATION REPORT

SCHOOL CHILD PEDESTRIAN FATALITY
COOLAGOLITE, NSW

8 AUGUST 2016
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GLOSSARY

<table>
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<th>Term</th>
<th>Definition</th>
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<td>Bus stop</td>
<td>A location that incorporates signage, and possibly a shelter, and meets the prescribed standards.</td>
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<tr>
<td>Non-designated bus pick-up or drop-off location</td>
<td>A location where a bus passenger requests to be picked up or set down and other than a bus stop. The location is not constructed to recognised standards.</td>
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<tr>
<td>Accident</td>
<td>An unwanted outcome, which includes a collision or crash.</td>
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<tr>
<td>Human factors</td>
<td>The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.</td>
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<tr>
<td>Child, children</td>
<td>4 to 16 years of age.</td>
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EXECUTIVE SUMMARY

At approximately 1630 on Monday 8 August 2016, a school bus stopped for two school children to alight from the vehicle on the northern side of the Cobargo-Bermagui Road at Coolagolite NSW. The section of road is gazetted as a 100 km/h speed zone.

The children, a girl aged 13 years old and a boy aged 10 years old, were siblings. The children began to cross the road once the bus had departed. While the children were crossing the road at a point adjacent to a crest, a westbound vehicle struck and fatally injured the younger child.

OTSI’s investigation determined that the crossing location did not provide sufficient sighting distance or time for the pedestrians or the driver of the vehicle to avoid the accident. Additionally, OTSI determined that generally children do not necessarily have the perceptual and cognitive capabilities, and the motor skills, to avoid or respond effectively to this type of situation.

OTSI has made a number of recommendations to Transport for NSW (TfNSW), TfNSW’s Centre for Road and Maritime Safety, Roads and Maritime Services, Local Government Councils, the bus industry, and bus operators with their community.

Full details of the Findings and Recommendations of this bus safety investigation are contained in Parts 3 and 4 respectively.
PART 1 FACTUAL INFORMATION

Introduction

1.1 This accident occurred shortly after two children disembarked from a school bus on the Cobargo-Bermagui Road, Coolagolite NSW. The bus drop-off location was not a designated bus stop.

Location

1.2 The accident occurred at the locality of Coolagolite, approximately three kilometres southeast from the township of Cobargo on the NSW south coast and approximately 400 kilometres south of Sydney.

1.3 The accident occurred on a gazetted 100 km/h section of road.

Environmental information

1.4 The weather was clear at the accident location on the afternoon of 8 August 2016. The sealed road was contaminated with dirt and residue from the cattle crossing adjacent to the accident site. The road surface was dry.
The accident

1.5 At approximately 1630 on Monday 8 August 2016, a school bus operated by Bega Valley Coaches carrying 18 school children turned off the Princes Highway at the township of Cobargo and made its way in an easterly direction on the Cobargo-Bermagui Road towards Bermagui.

1.6 At approximately 1630 at the locality of Coolagolite, the bus stopped in a lay-by for two school children to disembark the vehicle. The children, a girl aged 13 years and a boy aged 10 years, were siblings. The bus operator said the children disembarked the bus and stood stationary adjacent to the bus' front door. The children began to cross the road once the bus had departed. While the children were crossing the road adjacent to a crest, a westbound vehicle (a tray-back utility) struck and fatally injured the younger child. It was unclear as to the actual location of the school bus at the time of the accident. The driver of the bus was unaware of the accident until the return loop journey.

1.7 Police and the NSW Ambulance Service were called and attended the site.

Photograph 1: Looking east towards the accident site.

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1 Lay-by is a roadside area specifically prepared to allow a bus to pull off clear of the roadway.
Photograph 2: 150 metres from the accident site. Looking west towards the accident site from the vehicle’s approach view.
PART 2  ANALYSIS

Introduction

2.1 Rarely does only one factor lead to an accident. Usually numerous factors combine to create the situation for an accident to occur.

2.2 OTSI’s investigation principally focussed on the factors that contributed to this accident for the purposes of improving the safety of school children in rural and regional areas.

2.3 OTSI’s investigation objective is to identify systemic improvements to reduce the risks for school children crossing a road from one safe place to another safe place, and their safe passage beyond the road environment.

2.4 For the purposes of this report, OTSI has defined a “bus stop” as a location that incorporates signage, and possibly a shelter, and meets the prescribed standards. The report also refers to a “non-designated bus pick-up and drop-off” point as a rural location where a bus may pick-up or set down passengers, and the location may not meet the standards for a bus stop.

2.5 Rural and regional areas are heavily reliant on bus transport to convey children to and from school. Every day in NSW, tens of thousands of children utilise this relatively safe mode of transport although it is not without its risks.

2.6 A great deal of work has been done with respect to school bus visibility and on-board bus safety. However, in many cases, school children must rely on their own abilities to travel to and away from a bus stop or to safely cross a road. The risk increases when children are required to cross roads outside designated school zones\(^2\), especially on high speed roads.

Designated bus stops and non-designated bus pick-up and drop-off points

2.7 Designated bus stops are provided within urban and some rural areas to provide a safe place for commuters to embark, disembark and to wait for a

\(^2\) School zones are areas adjacent to schools with designated 40 km/h speeds zones, specific signage and crossing structures.
passenger bus. Parameters such as road speed, local topography, road curvature, clear sighting distances, traffic density, adjacent land uses and local traffic conditions are considerations when designing and allocating the position of a designated bus stop. Bus stops are designed and constructed in accordance with recognised standards.

2.8 In rural areas, it is common for children to embark, disembark and wait for a bus at a ‘non-designated bus pick-up and drop-off point’. Many of these locations are typically selected for their convenience rather than their safety attributes. These locations are not sign-posted and may not have a purpose-built bus lay-by area.

2.9 In many cases, school children will either start their day, or complete their return journey at the end of the day by crossing a road to their place of residence. There were circumstances where children had remained on a bus during a loop route to provide the child a greater level of safety by embarking or disembarking the bus on the same side of the road as their residence.

2.10 The location and the design of a designated bus stop was the responsibility of the relevant road authority. Non-designated pick-up and drop-off locations do not require the road authority’s approval, and typically, the selection of the location was influenced by bus users.

Rural bus operations

2.11 Bus operators on rural school bus routes encounter designated bus stops and rural non-designated bus pick-up and drop-off locations. A bus company will regularly operate over rural highways, regional and local council roads, and over a variety of road surface types. Additionally, the bus service may share the roadway with a range of traffic densities and may include other heavy vehicles.

2.12 It is not uncommon for non-designated bus pick-up and drop-off points to make up approximately 75% of the total locations serviced by a rural school bus operator, as was the case with Bega Valley Coaches.

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3 A non-designated pick-up and drop-off point is a location where a passenger requests to be picked up or set down, and the location is not constructed to recognised fixed bus stop standards.
2.13 In rural areas, bus companies are typically privately owned businesses and are contracted by Transport for NSW (TfNSW) to provide local school bus passenger services.

2.14 To be eligible for a school bus contract a bus operator must hold a current Roads and Maritime Services’ (RMS) ‘operator of public passenger bus services’ accreditation in accordance with the *Passenger Transport Act 1990*, and additionally, have met the requirements of the RMS Bus and Coach Operator Accreditation Scheme (BOAS). School bus operators are accredited as a ‘regular passenger service’ operator.

2.15 Rural bus operators engage with the relevant road authority for the placement of designated bus stops, however, the bus company will negotiate with the community to establish a non-designated bus pick-up and drop-off point.

2.16 In this case, the location where the bus stopped for the children was selected by the parents and the bus company.

**The School Bus Safety Community Advisory Committee**

2.17 The School Bus Safety Community Advisory Committee (SBSCAC) was established on 29 April 2011 by the New South Wales Minister for Transport and the Minister for Roads and Ports to examine school bus safety in rural and regional NSW. The Committee comprised representatives from:

- parent organisations across the Government;
- Catholic and independent school sectors;
- the Belt Up for Safety Action Group;
- an emergency department doctor;
- BusNSW;
- the Country Mayors Association;
- the National Roads and Motorists’ Association (NRMA);
- TfNSW, and
- RMS.

2.18 The Committee was chaired by an independent expert in transport safety and regulation. The purpose of the Committee was to inquire into, and report on issues relating to the safe transportation of children in rural and regional NSW.
2.19 In October 2012, the SBSCAC handed down 35 recommendations in its report with the aim to identify opportunities for improvement in school bus safety.

2.20 In particular, recommendation 18 requested “that TfNSW and RMS develop a standard Methodology for fixed Rural Bus Stop Locations/Design, with reference to existing ‘best practice’ examples, for use by Local Councils.

The model should address factors including:

- speed zones;
- acceleration/deceleration lengths;
- vehicle and pedestrian visibility;
- ability of the bus to draw fully off the road;
- provision for parents to turn vehicles around, and park off-road, when dropping off/picking up children;
- condition of road surface – for example, unsealed road shoulder or loose gravel that may impact on traction;
- provision of safe zones protected by crash barriers;
- distance to intersections/junctions;
- suitability of road crossing points; and
- provision of footpaths leading to bus stops; maintenance of bus stops, etc.

Reference to other models in NSW and other states may also provide guidance, such as the Riverina Eastern Regional Organisation of Councils’ Guidelines for Rural School Bus Routes and Bus Stops (REROC, 2004); and Queensland’s Guide for the Road Safety Management of School Bus Routes and Bus Stops (QTMR, 2002). RMS has also provided principles for the design of safe vehicle stopping areas, including bus stopping areas in rural locations. (RTA, 1999).” (SBSCAC 2012)

Transport for NSW and bus contracts

2.21 TfNSW is responsible for providing school bus services across NSW. TfNSW funds and engages contract school bus services through numerous Rural & Regional Bus Service Contracts. The contract is primarily a commercial document and relies on the RMS bus accreditation to attest that the bus operator has implemented the required safety management system.

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2.22 The contract referred to bus stops in Schedule 1 item 5; however, this section did not include or clarify non-designated bus pick-up and drop-off locations. The contract did not define roles or responsibilities for approving non-designated bus pick-up and drop-off locations.

2.23 In 2015, the TfNSW published their “School Bus Safety Guidelines – for contract holders of Transport for NSW rural and regional bus services”. The guideline was in response to the School Bus Safety Community Advisory Committee (SBSCAC) recommendations 8, 11, 12, 14, 21, 22, 28. Although this guidance did not specifically state a response to recommendation 18, Section 6 - student safety around the bus did cover general urban bus safety, however, it did not include specific detail for non-designated bus pick-up and drop-off points and crossing rural roads.

2.24 The guidance further outlined responsibilities for school bus safety issues and identified the responsible agencies.

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**Figure 2:** Relationship diagram of identities involved in rural road safety and school bus safety.
Roads and Maritime Services

2.25 RMS is a NSW Government statutory agency reporting to the NSW Minister for Roads, Maritime and Freight. As the NSW road regulator, RMS is the designated ‘road authority’ for classified state roads, and additionally, provides regulatory and administrative services for NSW maritime activities.

2.26 Local Government Councils are the road authority for regional and local roads. Local Councils are required to be party to the relevant Local Traffic Committee (LTC) and, as required, the RMS Regional Traffic Committee (RTC).

2.27 RMS set policy and provide regulatory oversight of the NSW road environment through accreditation, audit, inspection and enforcement.

RMS bus and coach operator accreditation scheme (BOAS)

2.28 As the road regulator, RMS has mandated that all operators of ‘public passenger bus services’ be accredited in accordance with the Passenger Transport Act 1990, meet the requirements of the RMS BOAS, and that their bus drivers hold a TfNSW bus driver endorsement on their motor vehicle driver’s licence.

2.29 The purpose of the BOAS accreditation system is to assess whether a person is of suitable character and fitness, and has the competency to operate public passenger transport services. The accredited operator was bound to comply with the prescribe Acts, Regulations and standards imposed by RMS. These standards, among other things, aimed to raise the awareness of bus operators in the area of safety.

2.30 The BOAS required a bus operator to complete an online course that included topics such as the accreditation process, management information systems, vehicle maintenance management systems and safety management systems.

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5 Classified roads as defined by the Roads Act 1993.
Once the bus operator had completed the course, they were then required to pass a computer based examination\(^6\) to obtain their BOAS certification.

2.31 RMS requires the bus operator to undergo an initial and triennial independent audit\(^7\) of the BOAS requirements. The RMS may conduct additional audits as required. The operator is also required to conduct an annual self-assessment of the BOAS requirements and submit an annual self-assessment report (ASAR) to RMS. The ASAR Part D(c)ii, safety management, did not require the bus operator to demonstrate they had periodically reviewed their risk register.

2.32 The *RMS Safety Management System (SMS) Handbook, a Guide for Bus and Coach Operators*\(^8\), introduced a risk-based approach to assessing the safety of a bus operation and outlined the use of a company safety risk register. The guidance provided a sample risk register and risk evaluation matrix, however, the list of common bus industry hazards was not comprehensive and did not include the risk of strike by motor vehicle, or hazards associated with pedestrians in the vicinity of a bus.

2.33 For further help on managing bus hazards, the RMS handbook referred to a Bus and Coach Association of NSW video entitled “*managing hazards in the NSW bus and coach industry*”, however, this video was orientated to WH&S\(^9\) issues within a bus company and did not offer guidance to hazard identification of pedestrians in the vicinity of a bus.

### Bega Valley Coaches

2.34 Bega Valley Coaches operate bus services in the Bega district. Bega Valley Coaches held a TfNSW rural & regional bus service contract, had met the BOAS requirements, and was accredited by RMS as a public passenger bus service provider in accordance with the *Passenger Transport Act 1990*.

\(^6\) The BOAS examination is conducted through the Institute of Transport and Logistics Studies, Business School, the University of Sydney.

\(^7\) The independent audit is conducted by an RMS authorised independent auditor.


\(^9\) WH&S – work, health and safety.
Regional Local Government Councils

2.35 Regional local government councils are the road authority for regional and local roads other than RMS classified state roads. The local council is responsible for local council roads and facilities, and in some cases, they may carry out work on behalf of RMS, however, the Councils, as a road authority, had strict limitations and were required to seek RMS’ approval through the LTC before implementing certain work plans or changes.

2.36 If the parties had contrary views, the RMS or the Police representative could forward the matter to the RMS Regional Traffic Committee for adjudication.

2.37 The Bega Valley Shire Council also had a Council Traffic Committee comprising members of the LTC and representatives from local bus companies. This meeting was held on a six monthly basis and discussed bus safety matters.

2.38 The Council and the traffic committees were not involved, and were not expected to be involved, in the selection or assessment of non-designated bus pick-up and drop-off locations.

2.39 The Bega Valley Shire Council is the road authority for the Cobargo-Bermagui Road. The Council had the required traffic committees in place.

Traffic Committees

2.40 To meet their responsibilities as a road authority, a local council must be party to the traffic committees. There are two types of Traffic Committees; the first is the Local Traffic Committee (LTC) involving the Council, the Police, RMS, and in some cases a representative from the local Member of Parliament.

2.41 RMS states the LTC had no decision-making powers\(^{10}\) and was primarily a technical review committee. It only advises the Local Government Council on matters for which the Council has delegated authority, being certain prescribed traffic control devices and traffic control facilities. The Council did not have to follow the advice provided by the LTC, however, the Council must advise RMS and the Police if they intend to act contrary to the LTC decision.

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\(^{10}\) As specified in RTA (2006); A guide to the delegation to council for the regulation of traffic.
2.42 The second is the Regional Traffic Committee (RTC) and OTSI was advised by RMS that these meetings are held infrequently. The RTC is chaired by an independent person appointed by RMS, and includes a Local Council Engineer and the RMS Regional Traffic Manager. Additional Council, Police and a local Member of Parliament representative may attend as observers.

2.43 The RTC adjudicates on appeals from RMS or the NSW Police representative of the LTC. Appeals can be lodged when council wishes to take action either contrary to the unanimous advice of the LTC or when the advice is not unanimous. The RTC decision is binding on all parties.

2.44 The Bega LTC comprised the Design Development & Traffic Co-ordinator from Bega Valley Council, the local RMS representative, a member of the local NSW Police and a representative from the local Member of Parliament’s local office.

**NSW Police**

2.45 NSW Police provide law enforcement, road accident investigation and were party to the local LTC. The NSW Police are investigating this accident on behalf of the NSW Coroner.

**Austroads and road standards**

2.46 Austroads is the peak organisation of Australasian road transport and traffic agencies. Austroads, among other things, publishes guides to promote a nationally consistent approach to the design, maintenance and operation of road networks. Austroads comprises of road authorities from each Australian state and territory. Austroads guidelines are adopted by the relevant road authority; however, the road authority may amend the Austroads guidelines to include local content.

2.47 A number of local government councils had referred to Austroads guidelines in their rural and regional bus route and bus stop guidance documents for technical data on safe sighting distances, and road gradient compensation factors.
2.48 The Bega Valley Shire Council applies the Austroads guidelines and the RMS extension to these guidelines.

**Centre for Road and Maritime Safety (unit of TfNSW)**

2.49 CRMS is a unit within TfNSW and provides practical solutions to reduce deaths and serious injuries on NSW roads and maritime through the development and implementation of targeted safety campaigns.

2.50 CRMS, among many things, holds specialist expertise in the fields of vehicle dynamics, crash physics, human factors, data analysis, research, safety education and safety promotion. CRMS also funds and supports the Department of Education’s road safety education advisors.

2.51 CRMS prepared and published key road safety information, including programs and publications directly targeting school children safety.

2.52 The CRMS had created the ‘Safety Town’ online resource to provide specific road safety advice to school children. The resource included, but was not limited to, walking to school, pedestrian crossings and bus stop safety.

2.53 The Safety Town website contained general advice on road crossing; however, it did not contain specific guidance for children crossing rural roads.

**Safety education**

2.54 The Department of Education road safety education advisory group deliver road safety programs, provide training and training material to primary and secondary schools and parents. Schools provide a forum for sharing information on safe travel to and from school. CRMS work collaboratively with the Department of Education on road safety promotion.

2.55 The Board of Studies NSW had included road safety as a topic in the Personal Development, Health and Physical Education (PDHPE) syllabus for primary and secondary school children, however, it did not provide specific advice for children crossing rural roads.

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2.56 The NRMA, in conjunction with the NSW Police, also provides road safety promotion to schools through presentations to school children and parents.

**Background to rural school bus safety guidance**

2.57 In 2003, the Tumut Shire Council (now the Snowy Valleys Shire Council) identified the risk of heavy vehicles operating on the same roads as school buses in the region. As a result, the Tumut Shire Council raised the issue with the Riverina Eastern Regional Organisation of Councils\(^\text{12}\) (REROC). In 2004, the REROC created a working party comprising REROC management and engineers, the Tumut Shire Council road safety officer and the state road authority (RTA\(^\text{13}\) at the time) to establish a guideline for rural bus route and bus stop safety.

2.58 The guideline was developed specifically for rural areas. Part 1 outlined the responsibilities of road authorities, bus operators and parents involved in selecting suitable bus routes and bus stops. Part 2 provided guidance on assessing rural bus routes, and part 3 outlined the assessment of rural bus stops.

2.59 The guideline categorised rural bus stops as 1) single user site, a location transient by nature and utilised by members of a single family; 2) multi-user site, a location that caters for more than one family and typically a permanent location; and 3) transfer point, an off-road bus interchange where passengers may transfer from one bus to another. The single user site did reflect the attributes of a non-designated pick-up or drop-off point.

2.60 Part 3 of the guideline, assessing a rural school bus stop, proposed criteria that should be considered in the assessment process. The fixed criteria included sighting distance, access and egress for buses, car parking, waiting area, safe pedestrian movement and a traffic management plan. Additionally, the guideline provided a variable criterion that included consideration for

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\(^{12}\) The REROC is a voluntary association of nine General Purpose Councils and two water county councils located in the eastern Riverina region of NSW to promote co-operation and to realise opportunities for greater efficiency in service delivery where appropriate through sharing of human, financial and capital resources.

\(^{13}\) RTA was the NSW Road Traffic Authority. The RTA became RMS.
heavy vehicles, road geometry, pavement and road reserve width, pavement surface, size of the bus using the road, grade and climate conditions.

2.61 The REROC guideline also provided detail on the relationship between road speed and stopping sight distances, and detail on safe intersection sight distances, however, the guideline did not provide information on the capabilities or limitations of children crossing rural roads.

2.62 The REROC guideline was adopted by councils within the REROC group and the guideline was publicised by the RTA. This investigation could not find evidence to verify the RTA had published a version of the guideline for use by councils outside the REROC group. REROC revised their guideline in 2007.

2.63 In 2011, the NSW Government created the SBSCAC to investigate rural school bus safety issues and its report was published in 2012. The SBSCAC’s recommendation 18 suggested that guidelines for school route and school bus safety be developed.

2.64 From this recommendation, RMS prepared draft guidance for rural bus routes and bus stops and was strongly based on the content transposed from the REROC guidelines. The document entitled `Guidance for Rural Bus Routes and Bus Stops’ was not published by RMS and remained in draft. Following this accident, RMS has further reviewed their draft guideline, and RMS did not consider it ready for publication as of 4 November 2016.

2.65 REROC continued to receive requests for the REROC guidelines by councils outside of the REROC group.

2.66 The Bega Valley Shire Council is not part of the REROC and was not aware of the REROC guidance or the post 2012 RMS draft guidance.

**Vehicle total stopping time and distance**

2.67 A vehicle’s total stopping time comprises a number of elements.

- *Driver reaction time.* The time taken for the driver to detect a hazard and react to the observation by applying the vehicle’s brakes.
• **Vehicle reaction time.** The time from when the brake pedal is first applied until the vehicle’s brake system starts to decelerate the vehicle (brake lag).

• **Vehicle braking time.** The time taken for the vehicle’s brake system to decelerate the vehicle to a halt.

2.68 A typical sedan vehicle travelling at 100 km/h requires a total stopping distance of approximately 160 metres\(^ {14} \) for the vehicle to brake to a halt. The vehicle’s mass (loaded or unloaded), road speed, road surface, factors that may affect a driver’s performance such as fatigue, influence of drugs or alcohol, tiredness and distraction, can all effect the stopping distance of a vehicle.

2.69 Austroads Guide to Traffic Engineering Practice, Part 5 recommended a minimum stopping sight distance of 170 metres be provided for vehicles travelling at 100 km/h.

\(^ {14} \) Distance based on empirical data from tests conducted by the Centre of Road and Maritime Safety.

![Figure 3: Displays the elements of a vehicle’s total stopping time and distance at 100 km/h. (Not to scale)](image)
**Figure 4:** Stopping distances for a typical family sedan motor vehicle on a rural road. These distances will increase with a degraded road surface and during wet weather.

**Child human factors associated with crossing roads**

2.70 Currently available research suggests that children are vulnerable pedestrians and they do not perform the same as adults when carrying out tasks such as crossing roads. Evidence across the world shows that children up to 15 years of age are at three times more risk than older children and adults to be involved in a fatal accident (Road Accidents, 2000; Rivara, 1990).

2.71 A pedestrian requires a mature level of perceptual, cognitive and motor skills to be able to reliably cross a road safely. Children do not have the same abilities as adults and may have limited ability to safely cross a road.

**Selecting a safe place to cross**

2.72 Drivers and children must be able to recognise blind spots created by obstacles and local topography that may hinder their line of sight (Dunbar et al, 2001) and additionally, the outcome will be affected by the child’s abilities and limitations of observation.

2.73 Children only begin to recognise safe crossing locations after approximately 9 years of age and this is dependent on the child’s individual experience.
Research indicates that many accidents involving children occur at unsafe crossing locations (Van der Molen, 1981).

2.74 A suitable crossing location must provide a safe sighting distance for both the vehicle driver and the child pedestrian.

**Visually detecting road vehicles**

2.75 Children’s sensory capabilities, and their ability to synthesise information from peripheral fields of vision and auditory sense is limited. This may result in a child missing critical danger cues, therefore increasing the risk in relation to traffic (Whitebread & Neilson, 2000).

2.76 Children’s visual search capabilities for detecting oncoming traffic is poor and evidence suggests that it worsens up to the age of approximately 9 to 10 years. This is most likely due to the increased, but uncontrolled, distribution of their attention (Rivara et al, 1991). Research also indicates that children are not as capable as an adult with their visual fields (Woods et al, 2013).

**Judgement about the time needed to cross**

2.77 Once a child pedestrian has detected approaching traffic, they must be able to select a suitable crossing gap in traffic, have the ability to assess the approaching vehicle’s speed and estimate the time needed to safely walk across the road. This will be dependent on the child pedestrian’s concept of their own walking speed and the speed of the approaching vehicle, either of which may be quite inaccurate due to the child’s inexperience and underdeveloped abilities to make the relevant estimates.

2.78 Studies indicate children may not be reliable in selecting a suitable crossing gap in traffic (Hoffman et al, 1980).

**Adopting appropriate crossing behaviour**

2.79 There is considerable variability in road crossing times by children most likely due to them attempting to adapt, somewhat inconsistently, their crossing behaviour to the time available to cross the road safely (Lee et al, 1984).
2.80 Notably, the research highlighted the most frequent child pedestrian accidents occur when a child dashes out onto the road (Van der Molen, 1981). In many such cases, the child makes what is termed a “critical behavioural error” by either failing to stop or slow down or otherwise choosing the incorrect response. This type of behaviour is due to a child’s inability to switch from one task to another (Pitcairn & Edlemann, 2000).

2.81 This research also highlights the characteristic impulsiveness of younger (and even some older) children with little appreciation of the immediate consequences of their actions. This is a feature of incomplete cognitive development (particularly in relation to analysis and planning) which doesn’t reach mature levels until young adulthood (Anderson et al, 2001).

2.82 The ability of pedestrians to cope with the unexpected in a traffic encounter may be more dependent on complex reaction time – a capability that requires immediate and accurate recognition of the circumstances, selection of the correct response from among numerous possibilities, and then effectively complete the task. Even adult reaction times under such circumstances can be in the order of several seconds or, conversely (due to a speed-accuracy trade-off), may be faster but more likely in error. Children’s reaction times are considerably longer (slower) than adults and do not reach mature levels until early adulthood (Hommel et al, 2004).

**Child crossing capabilities**

2.83 There is consistent evidence that children’s perceptual, cognitive and motor (movement) capabilities continue to develop from young childhood to young adulthood.

2.84 However, in almost all cases, children’s capabilities are significantly underdeveloped compared to those of adults. Therefore, reliance for their safety in a hazardous environment (such as the road traffic environment) cannot be placed on the assumption that they will behave as “little adults”.

2.85 If the road environment is constructed and/or managed with consideration for adult capabilities, and not with specific consideration of the particular
limitations of children, then when children come into contact with the road they are placed at significantly greater risk than necessary.

Post Incident

2.86 Since the accident, TfNSW has;

- written to all bus operators requesting they, in conjunction with their bus drivers, carry out further risk assessments to assess the suitability of non-designated bus pick-up and drop-off locations.
- the bus operators were also asked to assess whether the location was a safe place for a child to cross the road considering the road speed zone at the location, and to consider children’s performance and behaviour at the location and whether the child has safe passage after they get off the bus.

2.87 TfNSW advised that, in conjunction with RMS, they were planning to release guidelines to assist bus operators to assess stopping locations.

2.88 A number of families in the Bega area had asked bus operators to allow their children to stay on the bus for the entire bus route loop to remove the need for their children to cross a road.

Remedial safety actions

2.89 TfNSW had issued a risk model to bus companies to assist the improvement of their safety risk management.

2.90 TfNSW had created an independently chaired working group involving local councils, TfNSW, RMS, bus operators, BusNSW, IPWEA\(^{15}\) and NSW Department of Education to improve the safety of rural school children travelling to and from school.

2.91 The bus company associated with the accident had revised its risk register to include the risks associated with non-designated bus pick-up and drop-off points.

\(^{15}\) IPWEA – Institute of Public Works Engineering Australasia
PART 3 FINDINGS

3.1 A combination of the crossing location, the road topography and insufficient stopping sight distance between the vehicle and the children contributed to the accident.

3.2 This accident highlights the necessity for a community solution for ensuring children can cross a road from one safe place to another safe place and then have safe passage away from the road environment.

3.3 Parents, bus companies, schools, local councils, Police, RMS and traffic committees must have a common understanding of the key elements that determine a suitable crossing location. This includes safe sighting distances for children to detect oncoming traffic, stopping sight and braking distances for vehicles and the recognition that children are not ‘little adults’.

3.4 Children may not be capable of selecting a suitable crossing location or able to accurately assess a vehicle’s approach speed to select a suitable gap between traffic to cross safely.

3.5 There was no available NSW regulatory based guidance to assist the community to select a suitable rural location for bus operators to pick-up and set down children at non-designated bus stops.

3.6 There were circumstances where children had remained on a bus during a loop route to provide the child a greater level of safety by embarking or disembarking the bus on the same side of the road as their residence. Since the accident, more families in this region have opted for their child to remain on the bus on the loop route to avoid having to cross the road.

3.7 Where the bus route does not provide such an opportunity, then careful consideration of the risks is needed when selecting a suitable location for a child to cross a road.

3.8 A suitable location for a child to cross a road has to provide the child with an unobstructed view of approaching traffic, and provide adequate all weather sighting distance in both directions relative to the gazetted road speed.
3.9 The location has to provide drivers with a clear sighting distance equivalent to the total stopping distance relative to the vehicle types that may be utilised on that road and relative to the gazetted road speed.

**Contributory factors**

3.10 The local topography did not provide the driver of the vehicle with sufficient distance to react, slow or bring the vehicle to a halt in order to avoid the accident.

3.11 The locally agreed bus drop-off point influenced the children to cross the road at an unsuitable location. The 100 km/h gazetted road speed increased the risk.

3.12 Research suggests that, in general, children were less accurate than adults in judging a suitable gap to safely cross a road.

3.13 In this situation, the children and the driver of the vehicle were confronted with, and had little time to respond to, the pending accident.

**Other safety factors**

3.14 Generally, the placement of a designated bus stop was required to be assessed by the relevant road authority, and subsequently, by the local traffic committee. The placement of the non-designated bus pick-up and drop-off point was at the discretion of the local bus company through consultation with bus users and parents.

3.15 The bus operator did not have specific guidance and access to a broader body of knowledge, such as within the LTC, to assist in the selection of a suitable bus pick-up and drop-off point.

3.16 The *RMS Safety Management System (SMS) Handbook, a Guide for Bus and Coach Operators* offered limited value to bus operators to select suitable non-designated bus pick-up and drop-off points, and suitable locations to cross a rural road.
PART 4 RECOMMENDATIONS

Key Issues

3.17 Contemporary safety risk management technique recommends, wherever possible, that risks are eliminated. Where risks cannot be eliminated, suitable risk controls must be in place to make the situation safe.

3.18 To prevent children being exposed to the risks associated with crossing rural roads during their travel to and from school, OTSI recommends that rural communities work together to enable children to remain on rural loop bus routes whereby children are only picked up or dropped off near, and on the same roadside, as their residence.

3.19 Where this option is not practical, then careful consideration must be made when determining suitable children pick-up and drop-off points to minimise the risk to children crossing rural roads. The location of a bus pick-up or drop-off point will greatly influence where children cross a road. Persons involved in assessing a suitable crossing location must consider vehicle approach speeds, sighting distances, road topography, sighting obstructions, vehicle braking distances and a child’s capability to cross a road on their own.

3.20 Adult supervision must be provided in cases where children do not hold the required capabilities to cross a road on their own. Current guidance suggests adults hold the hands of children near roads up to the age of 8 years old (TfNSW) and other guidance suggest up to the age of 10 years old (NSW Education road safety website).

3.21 It is imperative that the whole community clearly understand the key elements that determine a suitable non-designated bus pick-up and drop-off point, and more importantly, what determines a suitable location for children to cross the road from one safe place to another safe place, then safe passage to their residence.

3.22 Noting that remedial safety actions were implemented, it is recommended that the following additional safety actions be undertaken by the specified responsible entities.
Transport for NSW

3.23 CRMS shall prepare guidance on safe sighting distance for children, vehicle drivers, and for those involved in selecting suitable locations for non-designated bus pick-up and drop-off points and locations where children will cross a road.

3.24 The guidance shall include information on the human factors of children with respect to road crossing behaviour, including child capabilities and limitations.

3.25 CRMS, in consultation with RMS, shall reinforce the public message for the community to select suitable crossing locations for children. The Department of Education should be a catalyst for this information. Additionally, reinforce the public message for the community to drive cautiously on rural roads at times when school children may be waiting for, embarking or disembarking from school buses and possibly crossing rural roads.

3.26 TfNSW bus contracts shall refer in Schedule 1 item 5 of the contract to the CRMS guidance on rural bus non-designated pick-up and drop-off points as recognised good practice.

3.27 Where possible through the rural and regional bus service contracts, TfNSW shall explore opportunities for children to embark and disembark on the same roadside, and close to their residence. This can be achieved by children staying on a bus for the entire loop route and remove the need to cross a road.

3.28 Where this is not practical, TfNSW is be considerate of alternative risk controls being applied by bus operators, which may include minor changes in bus timetabling related to school bus safety.

Roads and Maritime Services (as the road regulator)

3.29 RMS shall adopt the CRMS guidance.

3.30 RMS shall incorporate the content of the CRMS guidance into RMS’ standards and into the BOAS process and documentation. RMS should engage with CRMS at the earliest to ensure continuity.
3.31 RMS should have processes in place to ensure CRMS and RMS information on rural bus safety does not conflict.

3.32 RMS shall enhance the risk management element of the BOAS training and examination to include greater detail of probable hazards that a bus operator and passenger may encounter (eg: passenger struck by vehicle).

3.33 RMS will re-enforce to local councils that the LTC is a source of technical support. RMS to ensure the LTC continues to provide an additional body of knowledge to assist the community to deliver suitable crossing locations for children and bus pick-up and drop-off locations.

3.34 RMS, in consultation with CRMS, shall reinforce the public message for the community to select suitable crossing locations for children. Additionally, reinforce the public message for the community to drive cautiously on rural roads at times when school children may be waiting for, embarking or disembarking from school buses and possibly crossing rural roads.

**Road authorities - RMS & Local Government Councils**

3.35 Road authorities shall make their local experienced body of knowledge, such as engineers and the traffic committees, available to advise parents, bus operators and the community to select suitable non-designated bus pick-up and drop-off points and the associated crossing locations to be used by children.

3.36 Where possible, road authorities shall explore opportunities for children to embark and disembark on the same roadside, and close to their residence. This can be achieved by children staying on a bus for the entire loop route and remove the need to cross a road. Where this is not practical, the road authorities should to assist in the selection of suitable crossing locations.

3.37 Road authorities shall adopt the CRMS guidance.
Bus operators and the bus industry

3.38 Implement the revised BOAS requirements when available.

3.39 Bus operators seek a broader body of knowledge, such as advice from road authorities and the LTC, in their risk assessment activities.

3.40 One of the cornerstones of safety risk management is learning from lessons obtained from past incidents and accidents. The bus industry should review the contributing factors of previous bus industry incidents to expand their knowledge of hazardous situations. Bus operators must regularly reflect on past incidents and continuously inform their risk management framework.

3.41 Bus operators shall explore opportunities for children to embark and disembark on the same roadside, and close to their residence. This can be achieved by children staying on a bus for the entire loop route and remove the need to cross a road, however, careful consideration to ensure that new risks are not introduced to traffic.

3.42 When this option (3.41) is not practical, the bus operator in consultation with the road authority and the community, shall apply a robust risk-based assessment considering parameters such as road speed, safe sighting distances, vehicle braking distances and child human factors when assessing non-designated bus pick-up and drop-off points and locations where children will be required to cross a road.

Adults, parents and guardians (through community education programs)

3.43 Children may not always have the capabilities to cross a road safely. Current guidance suggests adults hold the hands of children near roads up to the age of 8 years old (TfNSW) and other guidance suggest up to the age of 10 years old (NSW Education road safety website). Where a child is recognised as not yet ready to cross roads on their own, and safe arrangements are not in place, then it is imperative that an adult, parent or guardian is present to ensure a child is aided to cross the road safely, using recognised safe sighting distance guidance. If a parent or guardian is not available, then they must ensure a capable adult is present for this task.
PART 5   APPENDICES

Appendix 1: Sources, Submissions and Acknowledgements

Sources of Information

- Transport for NSW
- Centre for Roads and Maritime Safety (unit of TfNSW)
- Roads and Maritime Services (Previously RTA)
- Bega Valley Coaches
- Bega Valley Shire Council
- Eurobodalla Shire Council
- Snowy Valleys Shire Council (previously Tumut Shire Council)
- Riverina Eastern Regional Organisation of Councils (REROC)
- NSW Department of Education
- BusNSW
- Sydney University Institute of Transport and Logistics Studies
- Max Hely, Human Factors Specialist, Office of National Rail Safety Regulator

References and reading material

• TfNSW (2015) School bus safety guidelines. For contract holders of Transport for NSW rural and regional bus services.
• TfNSW (2015) Road safety; Keeping our kids safe around schools.
• TfNSW (2016) (Literature review) Factors associated with safe crossing abilities in child pedestrians. Brief summary of literature. The Centre for Road and Maritime Safety.

• Centre for Road and Maritime Safety
• Department of Education; Walking; Advice for parents and carers:
• Board of Studies NSW Personal Development, Health and Physical Education (PDHPE) syllabus for primary and secondary school children syllabus year K-6
  http://k6.boardofstudies.nsw.edu.au/wps/wcm/connect/330e5ccb-782a-432b-8ce5-122a8c42967e/k6_pdhpe_syl.pdf?MOD=AJPERES and 7-12:
Submissions

The Chief Investigator forwarded a copy of the Draft Report to the Directly Involved Parties (DIPs) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:

- Transport for NSW and its Centre for Roads and Maritime Safety
- Roads and Maritime Services
- Bega Valley Coaches
- Bega Valley Shire Council
- Eurobodalla Shire Council
- NSW Police Service

Submissions were received from all the DIPs. The Chief Investigator considered all representations made by DIPs and responded to the author of each of the submissions advising which of their recommended amendments would be incorporated in the Final Report, and those that would not. Where any recommended amendment was excluded, the reasons for doing so were explained.

Acknowledgements

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