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Bus Safety Investigation Report

Bus collision with road barrier, Belmont North, 13 November 2022

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Cover image: Keolis Downer Hunter

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Executive summary

Early on the morning of Sunday 13 November 2022, at 0347 Eastern Daylight-Saving Time, bus m/o8219 collided with a concrete barrier. At the time of the incident, the bus was conducting a west bound, public passenger service on Wommara Avenue in Belmont North with the driver and six passengers onboard. The collision resulted in the bus rolling over to the left and coming to rest against the side of a drainage channel. Several passengers, including two who were ejected from the bus in the rollover, sustained injuries requiring medical treatment. The bus sustained significant damage.

The investigation determined the driver of bus m/o8219 likely experienced several factors which reduced their visual acuity and contrast sensitivity in a low light operating environment with limited visual cues. This resulted in the driver being unable to effectively identify the road and concrete barrier ahead, and a loss of situation awareness leading to the bus being steered onto a travel path misaligned with the road. It was also identified that the driver may have been distracted by an onboard system speed warning as the bus approached the barrier, which led to them looking down at the bus's dashboard. This removed the opportunity for the driver to identify the imminent collision and take evasive action.

The design of the barrier involved had a sloped leading/front edge, resulting in the barrier acting as a ramp when impacted by the heavy vehicle, with the bus becoming airborne before rolling over into the drainage channel directly adjacent. The barrier had limited reflectors and no contrasting markings to provide increased driver visibility of its position.

The investigation also identified that the involved operator was unaware that the driver had a medical condition and was taking prescribed medication. This resulted in a missed opportunity for the operator to assess the potential operational risks associated with a driver with a diagnosed ocular disease, in the operational environment, and determine if additional risk control measures should be considered and/or applied, such as no night driving.

Opportunities for improvement in the system of health assessments currently delivered in Australia, with a particular focus on opportunities in health professional education and certification, have been previously identified by industry bodies such as Austroads.

The investigation identified safety improvement opportunities, including:

- the review of road markings and infrastructure in the incident site vicinity;
- reviewing onboard vehicle monitoring system alerts to mitigate the potential for driver distraction;
- bus driver awareness of the management of internal glare sources;
- the review of bus operator route risk assessment processes; and
- Transport for NSW to consider updating guidance provided to operators under the Bus Operator Accreditation Scheme, regarding the management of driver medical conditions including the medical assessment of bus drivers in their employ.

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

Part 1 — Information

The occurrence

1.1 Early on Sunday 13 November 2022, a public passenger route bus, registered m/o8219 and operated by Keolis Downer Hunter (KDH), was scheduled to conduct a Route 14 service. This route operated from Newcastle Central Business District (CBD) to Swansea, NSW.

1.2 The bus departed the first stop in Newcastle CBD at 0306.[1] The service continued normally with the driver making designated stops, as required, to allow passengers to board and disembark.

1.3 At 0346:48, the bus descended down Wommara Ave in Belmont North, in a westerly direction. At that time, there were six passengers onboard, who were all seated.

1.4 At 0346:57, the bus passed the intersection of Wommara Ave and Golding Ave, where the road curved to the right and gradient levelled. The bus continued straight ahead off the side of the road. This trajectory aligned the bus with the leading edge of a concrete road barrier positioned beside a drainage channel.

1.5 Onboard CCTV and telematics systems recorded the bus travelling at a speed of approximately 65 km/hr prior to initial impact.

1.6 The front frame of the bus, to right of centre, impacted the sloped leading edge of the concrete barrier. The bus then travelled up the sloped front of the barrier, lifting the front of the bus off the ground. The metal guard under the fuel tank, and the off side[2] rear sway bar located near the rear axle, impacted the barrier as the bus continued moving forward and lifting it into the air. This resulted in the bus rolling onto its near side, dropping down towards the channel.

1.7 The front of the bus then collided with the sidewall of the channel, with the vehicle coming to a final position on its near side, partially inside the drainage channel, with the near side front corner of the bus below ground level (Figure 1, Figure 2).

[1] Times in this report are in 24-hour clock form in Australian Eastern Daylight-Saving Time

[2] The left side when looking forward from the driver's seat in the bus is the near side (N/S). The right side is the off side (O/S).

Figure 1: Bus m/o8219 position after collision with road barrier and rollover into drainage channel

Source: OTSI. Note: Image taken in daylight and not indicative of conditions at time of collision

Figure 2: Image showing final position of m/o8219 from the front

Source: KDH. Note: Image taken in daylight and not indicative of conditions at time of collision

1.8 Onboard CCTV recorded that all passengers were ejected from their seats. Two passengers were ejected from the bus via the near side window, two seats behind the rear vestibule. One of these passengers sustained serious injuries. Several other passengers sustained injuries requiring medical treatment.

Events following the occurrence

1.9 Following the incident, several passengers used their mobile phones to call emergency services.

1.10 The driver, who did not sustain serious injury, was initially unable to open the driver cabin door using the handle as it was forced closed. The driver subsequently climbed out of the driver's cabin through the space in between the damaged windscreen and driver cabin shield.

1.11 The driver reported that they checked the welfare of the remaining passengers on board and proceeded to call the KDH Operations Control Centre[3] to report the incident and request emergency assistance.

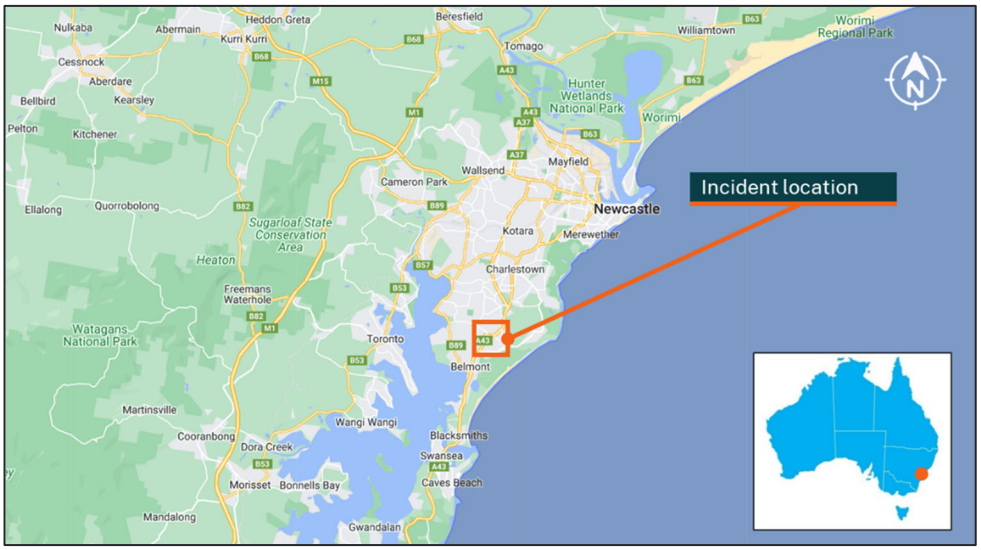
1.12 A few minutes after the incident, several residents from nearby houses on Wommara and Golding Avenues approach the bus to assist passengers and call emergency services.

1.13 Several passengers evacuated the bus via the rear rooftop emergency hatch.

Incident location

1.14 The incident occurred in Belmont North, within the Lake Macquarie City Council (LMCC) Local Government Area, approximately 14 km south-west of Newcastle's CBD (Figure 3).

Figure 3: Location of the incident site in NSW, showing Belmont North in relation to Newcastle

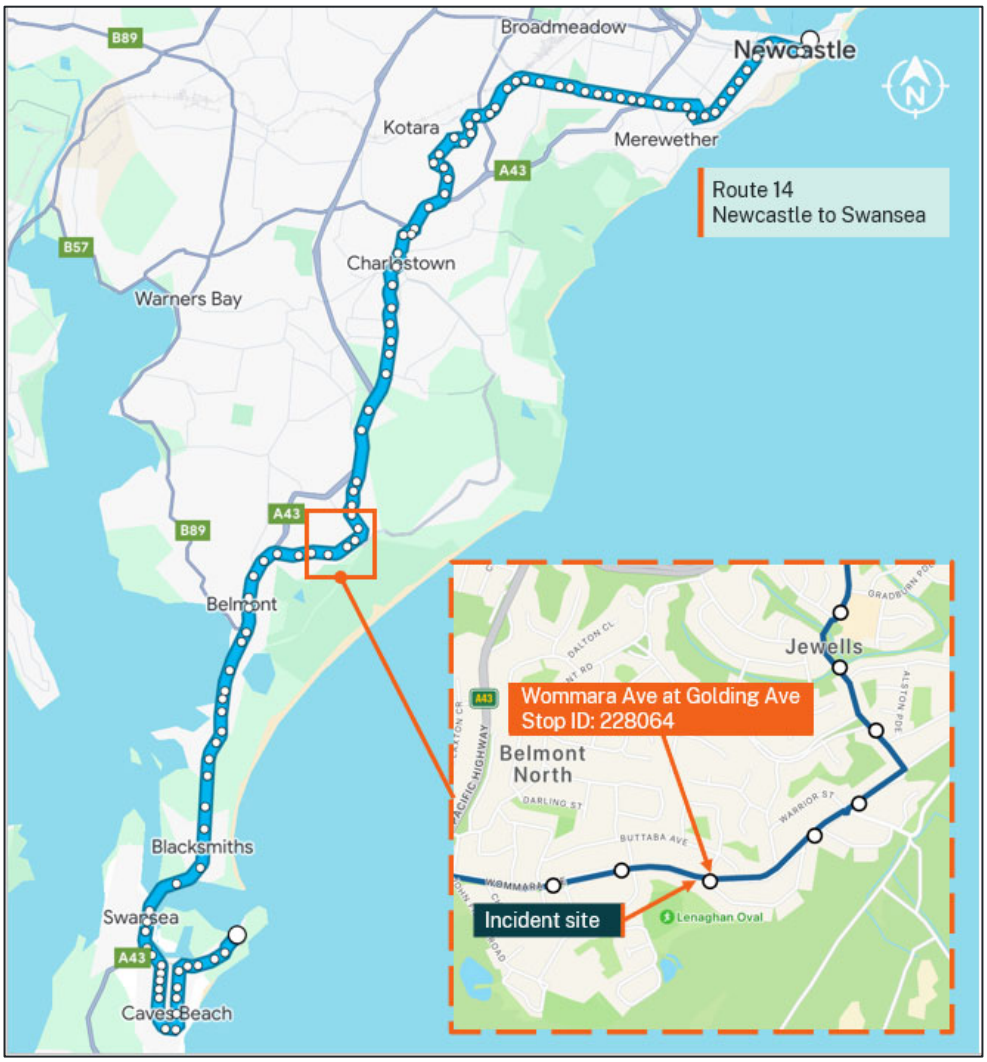


Source: Google Maps. Image annotated by OTSI

[3] A centralised location for all operational communications between bus drivers and the company, which also serves emergency contact purposes

1.15 The incident occurred immediately after the bus passed the 'Wommara Ave at Golding Ave' bus stop, following a westbound descent on Wommara Ave. The area was in proximity to Lenaghan Oval (Figure 4).

Figure 4: Map showing Route 411 and incident site



Source: TfNSW. Image annotated by OTSI

Road information

1.16 Wommara Avenue in Belmont North was a 2.37 km bi-directional carriageway with an east-west orientation, classified as a 'Regional Road'.[4]

1.17 LMCC was responsible for the management and funding of the functioning, maintenance, and works undertaken on the road. LMCC was also responsible for the management of the roadside infrastructure such as road barriers.

[4] According to the Roads Act 1993, the management of roads in NSW were classified into three administrative classes: State, Regional, and Local. Regional roads included carriageways that generally provided access between State Roads and local communities such as small towns and regional centres, and function as the sub-arterial network inside major urban centres. Regional roads were part of the secondary road network, and generally managed, maintained and funded by local councils with some funding sometimes granted by the State Government.

1.18 LMCC reported that complete risk assessments were undertaken as part of all new road upgrades and changes, and they had both proactive and reactive systems in place to undertake road upgrades and improve road safety within their road network.

1.19 Risk assessments and subsequent road improvement works were also initiated by reports and feedback from the community. Their proactive road improvement program, to improve safety and minimise risk for road users, relied upon historical accidents and 'black spot' data within their road network. LMCC advised that 'prior to the incident, there had been no reported crashes at the location in the previous five-year reportable period'.

Environmental conditions

1.20 The Bureau of Meteorology recorded a temperature around the time of the incident of 17°C, at the Nobbys Head Weather Station, approximately 11 km north-east of the incident. There was a recorded dewpoint[5] of 16°C and relative humidity of 96 percent. There was a light breeze from the west of approximately 2 km/hr.

1.21 Available evidence supports that there was a likelihood of fog in the vicinity at and on approach to the incident site, at the time of the collision.

Bus information

1.22 The bus involved in the incident was a Volvo B8RLE chassis, fitted with a BusTech VST body, manufactured in August of 2020 and registered in NSW as m/o8219. The bus was 12.5 m long, and 2.5 m wide. There were two passenger entry/exit doors located on the near side. The bus was fitted with six emergency exits. Two emergency exit windows on the near side and two on the offside, with two emergency exit hatches located on the roof.

1.23 The bus was authorised to carry a total of 81 passengers, which included 45 seated and 36 standing. As the vehicle was a route bus, there were no seatbelts fitted to the passenger seating positions.[6]

1.24 The bus was fitted with headlights that operated with both low and high beam, which were reportedly serviceable at the time of the incident.

1.25 The Bus Tech VST body was fitted with saloon lighting, which was reportedly serviceable. During low light/night driving operations, the saloon lighting could be to set by the driver for the saloon lights in the forward area of the saloon, near the driver's position, to switch off during travel between stops. These lights would then activate when the bus was stopped, to provide lighting for passengers to safely board and disembark.

[5] The air temperature at which water droplets start to form and condense.

[6] Australian Design Rule (ADR) 68/00 which specified requirements for seatbelts in buses did not apply to 'Route Service Omnibuses'.

1.26 The bus was fitted with an onboard vehicle monitoring system, based on Global Positioning System data. This system monitored and recorded vehicle information including:

- harsh acceleration;
- harsh braking;
- overspeed events; and
- 'ride comfort'.

1.27 The overspeed alerts were configured to provide a visual warning, on the drivers dashboard, under certain parameters. An 'Overspeed Amber' would activate when the system detected the bus operating more than 1 km/hr over the sign posted speed, for more than four seconds. An 'Overspeed Red' would activate when the system detected the bus operating at or over 3 km/hr, for more than four seconds, or operating at or over 10 km/hr for more than 1 second.

1.28 The accuracy of the vehicle speed monitoring system and recorded data for this incident could not be determined as there was no evidence that the system was calibrated.

1.29 Vehicle maintenance records documented that a standard 15,000 km service was completed on m/o8219 on 5 October 2022, with the brake pads checked and serviceable. On 31 October 2022, the chassis Original Equipment Manufacturer replaced the fire sensors and a cracked exhaust pipe. There were no recorded technical defects for the involved bus, at the time of the incident, that may have contributed to the collision with the barrier and rollover.

1.30 There was no available evidence to support that a technical failure involving bus m/o8219 contributed to the incident.

Operator information

1.31 Keolis Downer Hunter Pty Ltd (KDH) operated and maintained of a fleet of buses owned by Transport for NSW (TfNSW) under contract, in accordance with the Bus Operator Accreditation Scheme (BOAS).

1.32 Under BOAS Safety Management System requirements,[7] the operator was required to:

- Establish appropriate policies in relation to driver health, including fitness for duty, drugs and alcohol, and driver fatigue.
- Ensure awareness of responsibilities in relation to health, including general fitness to drive, drugs and alcohol use and fatigue.
- Maintain a system for monitoring the licence and driver authorisation (and therefore health assessment) status of drivers.
- Establish practicable procedures to manage the onset of illness which may impact on fitness for duty, including appropriate "triggering" of health assessments and return to work program.
- Comply with drug and alcohol requirements, including establishment of a drug and alcohol policy and program.

[7] BOAS – SMS guideline RMS 14.395

- Comply with fatigue management requirements, including establishment of a fatigue management program and monitoring of drivers' hours.

1.33 KDH had these requirements in place at the time of the incident.

1.34 KDH reported that they were not aware of the involved driver having any declared or diagnosed medical conditions or taking any prescribed medications.

1.35 KDH also reported that apart from the State Insurance Regulatory Authority Workers Compensation scheme, for work-related injury management, they relied on the Transport for NSW Bus Driver Authority medical system to ensure that drivers met the commercial licensing standards and any required conditions for a licence were applied and documented as part of that process.

1.36 In addition, KDH reported that when they became aware of any reportable medical condition or change in medication for their drivers, they reported that to TfNSW via the designated email address.

Driver information

Licensing and experience

1.37 The driver of m/o8219 held a conditional Heavy vehicle HC/R class driver licence and a valid Bus Driver Authority (BDA), issued by Transport for NSW (TfNSW). The driver had also obtained TLI31216 – *Certificate III in Driving Operations* qualification, which was nationally recognised for roles in driving operations within the transport and logistics industry.

1.38 The driver had been operating heavy vehicles for about 10 and a half years prior to working with KDH. The last two and a half years of that period involved driving buses and coaches on a part time basis.

1.39 The driver commenced full-time employment with KDH in 2017 and was continuously employed by the company for a period of over five years at the time of the incident.

1.40 The driver was both familiar with and experienced in operating on the involved route, including during early morning scheduled services. They were wearing glasses at the time of the incident, in accordance with the documented condition on their driving licence.

Rostering

1.41 The driver reported at interview that over the previous two years, they had been rostered for many shifts which finished after midnight, into the early hours of the following morning. The driver reported that those shifts suited them.

1.42 The driver's last rostered day off before the incident was on 6 November 2022. They then worked four shifts with mid-afternoon sign on times, and durations ranging between 7 hours 42 minutes and almost nine hours (not including meal breaks).

1.43 On 11 November 2022, the driver worked a shift of 12 hours 19 minutes duration (not including meal breaks), from 2049 to 0349 the following morning (12 November). This was within the rostering rules and fatigue management requirements.

1.44 Later that day, on 12 November, the driver signed on at 1920 for 'voluntary overtime' to operate a charter to Pokolbin (with a crib break at Pokolbin) and return, before commencing their rostered shift at 2119. The incident occurred approximately eight hours and 47 minutes after the driver signed on for duty.

Incident service

1.45 The driver recalled at interview that they commenced the incident service on time from Newcastle CBD to Swansea Heads. There was no one at the first stop. The driver continued and picked up several passengers at a following stop, then more at another stop soon after.

1.46 The driver continued to provide a detailed recollection of the involved route, including designated speed zones. The driver reported that before they travelled past Jewellstown Plaza, on Ntaba Road, in a southerly direction (approximately three minutes' drive and 1.8 km before the incident site), they entered fog and started to lose forward visibility, so they slowed down below the speed limit. The driver noted that due to the low visibility they had positioned the bus too far to the left at one stage and had to go around a parked car.

1.47 At interview, the driver stated that they felt tired in the period leading up to the incident but not fatigued, and that they did not experience any microsleeps.

1.48 The driver reported that in the lead up to the incident, they were leaning over the steering wheel, to position their eyes closer to the windscreen. This was to assist with seeing more clearly and to focus on the road directly in front of the bus.

1.49 The driver reported that there were speed zone changes from 80 km/hr to 50 km/hr, then a further change to 60 km/hr on entering Wommara Avenue.

1.50 The driver stated that the bus entered fog on Wommara Avenue, which reduced visibility on the road ahead. The driver also reported experiencing glare coming from the left of their position, from the Bus Driver Console. The driver then explained that they were affected by glare, and that was why they wore glasses and covered the Bus Driver Console with a homemade cover when driving.

1.51 Prior to departure from Newcastle CBD on the incident service, the driver placed a homemade cover over the Bus Driver Console. The cover had a small cutout for the driver to observe and monitor the timing of the route service. Onboard CCTV footage recorded the driver occasionally lifting the cover, during the involved service, to check the progress of the route on the screen. The driver reported that there was some pressure from the operator for drivers to ensure that timings on services were on schedule.

1.52 The driver also reported that they experienced glare and reflections from the saloon lighting near the driver's position.

1.53 The driver recalled that it was dark with 'not much lighting' externally and low visibility due to fog as the bus travelled down Wommara Avenue. The driver noted that there was a guardrail on the left as a guide, and they were aware that the road turned slightly right ahead.

1.54 The driver reported that a sensor on the dashboard then illuminated, and they looked down to check the bus's speed. As the driver looked back up, there was a loud impact. The driver felt the bus rollover and come to a stop.

1.55 The driver was still in their seat due to their seatbelt. They then extracted themselves and checked on the passengers within the bus. Some passengers were ringing emergency services, so the driver called KDH's Operations Control Centre to report the incident.

Declared medical condition

1.56 The driver had been diagnosed with glaucoma, which was being treated by an Ophthalmologist.

1.57 The driver declared this medical condition to the Drivers Licensing Authority, TfNSW, as part of their commercial drivers licencing medical, which was part of the requirement to hold a NSW Bus Driver Authority.

1.58 Glaucoma is the name given to a group of ocular (eye) diseases where vision is lost due to damage to the optic nerve. It causes irreversible vision loss due to damage to the optic nerve. The loss of sight is usually gradual and a considerable amount of peripheral (side) vision may be lost before there is an awareness of any problem.[8]

1.59 Glaucoma Australia documented that:

> Glaucoma can cause peripheral visual field loss, reduced contrast sensitivity, decreased depth perception and impaired dark adaptation. This can result in reduced awareness of objects and pedestrians, difficulty adjusting to changing lighting conditions as well as difficulty discerning hazards on the road. Due to these issues, an eyesight test from an eye health care practitioner is required to renew your licence to ensure you are fit to drive.

1.60 Glaucoma Australia also documented that there were a new generation of spectacle lenses that may assist in reducing glare for night driving and address problems of depth perception and visual acuity. OTSI's investigation was unable to determine if the spectacle lenses worn by the involved driver were of the type that may assist with reducing glare for night driving or assist with depth perception and visual acuity.

1.61 In August 2021, the driver's General Practitioner assessed the driver as meeting the conditions for an unconditional licence, though the driver had glaucoma and required corrective vision to meet the conditional commercial license requirements. This did not comply with Assessing Fitness to Drive (AFTD) requirements (see *Medical standards for bus and coach driver licensing* for further information). An Ophthalmologist's report was provided as part of the medical assessment to TfNSW.

1.62 The discrepancy in the driver's General Practitioner's assessment that the driver met the conditions for an unconditional license was identified by TfNSW, and the driver issued with a conditional commercial drivers licence as part of their BDA in 2021.

1.63 TfNSW records indicated the driver held a conditional licence since 2014. The licence was issued on the conditions that: (a) the driver wore glasses or contact lenses whilst driving, and (b) underwent period reviews of his fitness to drive by an eye specialist. While the doctor indicated the driver met the 'unconditional' ATFD standard, the information provided indicated that the driver did not meet the standards to hold an unconditional licence. As such, TfNSW considered the driver fit to continue to hold the 'conditional' licence the driver had held since 2014, and consequently a BDA.

[8] Glaucoma Australia

1.64 The driver's medical condition of glaucoma was coded and recorded under their driver licensing profile but did not appear on their licence, which was in accordance with TfNSW licencing provisions.

1.65 In 2022, the driver's Ophthalmologist provided a letter, dated 9 May 2022, to their General Practitioner, which stated that intraocular pressures were controlled with continued use of prescribed medications and no progressive change in visual field.

1.66 On 10 August 2022, the driver completed a NSW Fitness to Drive Medical Assessment. In that assessment, it was declared that the driver had glaucoma. With glasses, the driver's visual acuity met the requirements for a commercial conditional drivers licence (see *Medical standards for bus and coach driver licensing* for further information). However, the General Practitioner, who completed the medical assessment in both 2021 and 2022, recorded that the driver fulfilled the medical criteria for an unconditional commercial drivers licence.

1.67 On 5 September 2022, TfNSW documented that a 'non-complying Bus DA medical' was received.

1.68 On 8 September 2022, TfNSW suspended the driver's BDA as no Ophthalmologist's letter had been provided. The driver's employer, KDH, suspended the driver from operations.

1.69 On 13 September 2022, the bus operator contacted TfNSW to advise that the driver had reported being told at a Service NSW office that their medical status was cleared. However, the TfNSW 'My Records' site showed the driver's BDA as 'not current'. A TfNSW Licence Review Officer from the Licence Review Unit requested a review by the TfNSW Scheme Review team.

1.70 On 14 September 2022, the Ophthalmologist's letter, dated 9 May 2022, was documented as received by TfNSW. It was noted by TfNSW that no further action was required. TfNSW records at the time indicated the driver held a conditional licence due to ' must wear glasses or contact lenses'. TfNSW reported that 'the report dated 9 May 2022 did not raise a concern regarding the driver's vision. Further, the Fitness to Drive medical report already on TfNSW's file had the eyesight section completed by the Ophthalmologist (dated 8 August 2022) confirming the driver met the commercial vision standards wearing glasses. As such, TfNSW allowed the driver to keep their conditional commercial class licence and lifted the BDA suspension on 14 September 2022 in accordance with Passenger Transport Regulation 2017 Clause 30 (4)'.[9]

[9] (4) In this clause-"relevant licence" means the following--

(a) an unrestricted Australian driver licence,

(b) a conditional licence

(i) subject only to a condition that the holder must wear corrective lenses while driving, and

(ii) issued under a law in force in a State or Territory authorising the holder to drive a motor vehicle on a road or road related area.

Management of health information

1.71 The Health Records and Information Privacy Act 2002 (HRIP Act) in NSW outlined how public sector agencies and health providers managed health information. It regulated accessibility, sharing, and patient rights over health data, including access and correction, The Act applied to both public and private sector organisations handling health information.

1.72 TfNSW, as the Driver Licencing Authority, was subject to the requirements of the HRIP Act and the Privacy and Personal Information Protection Act 1998. TfNSW reported that:

> Transport for NSW has measures in place to protect personal and health information in accordance with the Privacy and Personal Information Protection Act 1998 and the Health Records and Information Privacy Act 2002. Transport for NSW collects personal information in connection with the fitness to drive assessment. Transport for NSW cannot accept the assessment unless the applicant and health professional provide this information. Transport for NSW may retain, use, and disclose the personal information in connection with verifying the applicant's identity and their assessment.

1.73 In accordance with the Act, driver medical conditions, declared through the commercial driver licencing process, were recorded on the driver's file on the Transport licence system and visible to limited TfNSW staff, and health professionals, only.

1.74 The driver had a licence condition and code meaning '*Must wear glasses or Contacts whilst Driving*'. TfNSW reported that this code meant that TfNSW had approved the driver to hold a licence subject to conditions (a 'conditional licence'). This condition had been on the driver's licence since 2014.

1.75 The driver had a medical condition code for '*Vision-Glaucoma*' recorded on their driver's file on the Transport licence system. TfNSW reported that this code did not appear on the driver's license card as it did not represent a licence condition that the driver had to comply with. Rather, it was a medical condition which TfNSW would review accordingly on medical grounds, as per the Assessing Fitness to Drive standards. This medical condition had been on the driver's file since 2021.

1.76 The driver also had an administrative code for '*Public Passenger Driver*' which was not visible to the driver or appeared on their licence card. TfNSW reported that this code was used to allow system to trigger a medical assessment on a periodic basis. This code was on the driver's file since 2018.

1.77 The driver's employer, the involved operator, obtained copies of the driver's licence, with the condition of wearing glasses or contact lenses while driving listed. The driver's medical condition of glaucoma was not visible to the operator on the driver's license or MyRecords system,[10] and the condition was not reported or declared to the operator, by the driver. The operator was unaware that the driver was diagnosed with glaucoma, or that an Ophthalmologist had assessed that the driver's condition was controlled with continued use of prescribed medications and there was no progressive change in visual field.

[10] MyRecords was a TfNSW system which allowed bus drivers, operators, licence holders and other related parties to access and update their information online.

1.78 TfNSW reported that:

> In the issue and administration of a bus driver authority, Transport does not track who a bus driver is employed by at any given point in time. We also do not share personal and sensitive information of a regulated entity with a third party.

Medical standards for bus and coach driver licensing

1.79 The publication '*Assessing fitness to drive for commercial and private vehicle drivers*'[11] (AFTD) documented the medical standards for licensing and clinical management. This was a joint publication of Austroads and the National Transport Commission, and detailed medical standards for driver licensing purposes for use by health professionals and driver licensing authorities.

1.80 The AFTD[12] stated that the publication 'sets out clear minimum medical requirements for unconditional and conditional licences that form the medical basis of decisions made by the driver licensing authority'.

1.81 The AFTD[13] also stated that:

> For a conditional licence to be issued, the health professional must provide to the driver licensing authority details of the medical criteria not met, evidence of the medical criteria met, as well as the proposed conditions and monitoring requirements. While a person may meet individual disease criteria, concurrent medical conditions may combine to affect fitness to drive – for example, hearing, visual or cognitive impairment.

1.82 From June 2022, adjustments were made to the fitness to drive criteria for vision and eye disorders. These revisions involved extensive consultations with the Royal Australian and New Zealand College of Ophthalmologists (RANZCO), Optometry Australia and Orthoptics Australia. There were no significant changes related to glaucoma specifically.

1.83 Part A, section 2.2.7 '*Older drivers and age-related changes*' of the AFTD, stated that various aspects of vision may decline with age, including acuity, visual fields and contrast sensitivity, and eye conditions such as glaucoma were more common in older people. Difficulty driving at night and problems with glare were noted as early signs of age-related visual decline.

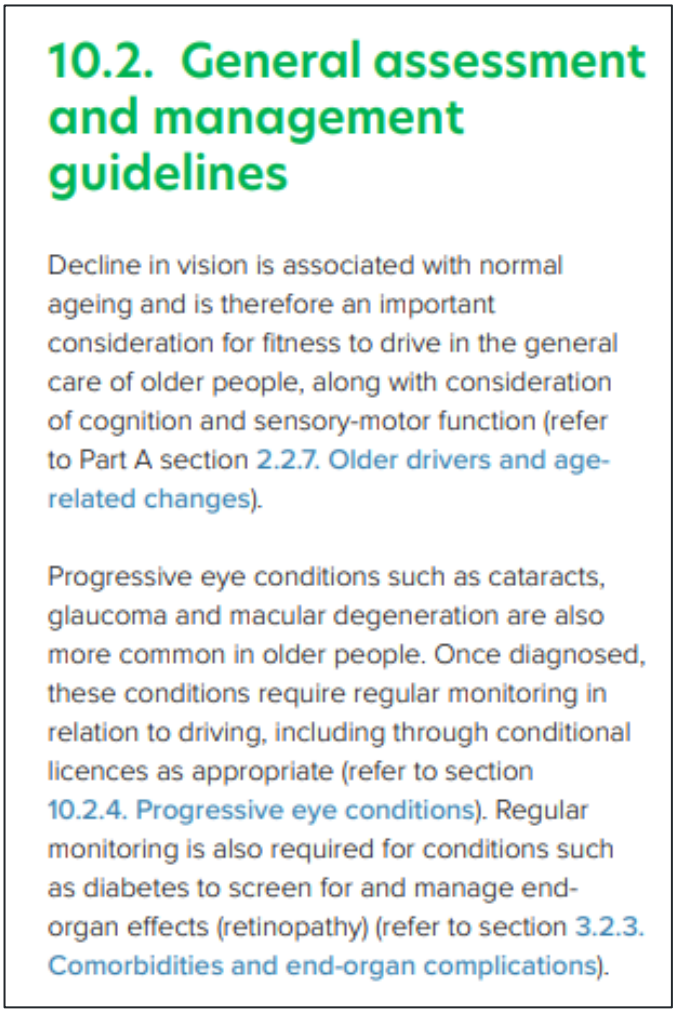
1.84 Part B, section 10.2 '*General assessment and management guidelines*' of the AFTD, stated that progressive eye conditions, such as glaucoma, required regular monitoring in relation to driving 'including through conditional licenses as appropriate' (Figure 5).

[11] https://austroads.com.au/__data/assets/pdf_file/0037/498691/AP-G56-22_Assessing_Fitness_Drive.pdf

[12] Part A, Section 1.3 *Scope*

[13] Part A, Section 9.3 *Medical standards for licensing*

Figure 5: Excerpt from AFTD, Part B, section 10.2 'General assessment and management guidelines'



10.2. General assessment and management guidelines

Decline in vision is associated with normal ageing and is therefore an important consideration for fitness to drive in the general care of older people, along with consideration of cognition and sensory-motor function (refer to Part A section 2.2.7. Older drivers and age-related changes).

Progressive eye conditions such as cataracts, glaucoma and macular degeneration are also more common in older people. Once diagnosed, these conditions require regular monitoring in relation to driving, including through conditional licences as appropriate (refer to section 10.2.4. Progressive eye conditions). Regular monitoring is also required for conditions such as diabetes to screen for and manage end-organ effects (retinopathy) (refer to section 3.2.3. Comorbidities and end-organ complications).

Source: Assessing fitness to drive for commercial and private vehicle drivers, June 2022

1.85 Part B, section 2.2.7 '*Older drivers and age-related changes*' of the AFTD stated that ocular diseases, such as glaucoma, may result in reduction of visual fields. It also noted that peripheral vision assists the driver to be aware of the total driving environment (Figure 6).

Figure 6: Excerpt from AFTD, Part B, section 2.2.7 'Older drivers and age-related changes'

> Visual fields may be reduced due to a range of neurological conditions (e.g. stroke, multiple sclerosis) as well by ocular diseases (e.g. glaucoma), or injuries, resulting in hemionopia, quadrantanopia or monocularity.
>
> Peripheral vision assists the driver to be aware of the total driving environment. Once alerted, the central fovea area is moved to identify the importance of the information. Therefore, peripheral vision loss that is incomplete will still allow awareness; this includes small areas of loss and patchy loss. Additionally, affected drivers can adapt to the defect by scanning regularly and effectively and can have good awareness. Patients with visual field defects who have full intellectual/cognitive capacity are more able to adapt, but those with such impairments will have decreased awareness and are therefore not safe to drive.

Source: Assessing fitness to drive for commercial and private vehicle drivers, June 2022

Transport for NSW Fitness to Drive requirements for bus drivers

1.86 In NSW, TfNSW was the Driver Licensing Authority.

1.87 The AFTD (Section 4.4.2 '*Who allocates a conditional license*') documented that 'the final decision regarding conditional licences rests with the driver licensing authority'.

1.88 To be a bus driver in NSW, a Bus Driver Authority (BDA), issued by TfNSW, was required. When applying for a BDA, a driver was required to pass a commercial medical assessment, in accordance with the AFTD medical standards. Completion of the TfNSW '*NSW Fitness to Drive Medical Assessment Commercial Standards Form*' required the driver to declare any medical conditions.

1.89 All bus drivers under the age of 60, with no medical conditions, needed to complete a medical assessment every three years. For drivers with an existing medical condition, or aged over 60, a medical assessment was required to be completed annually.

1.90 The involved driver was subject to annual medical assessments based on their age and declaration to TfNSW of an existing medical condition (glaucoma).

1.91 The AFTD stated that:

> ‘An understanding of the driving task, both generally and for the specific driver, underpins the assessment of fitness to drive and guides the determination of risk associated with impairment due to ill health’
>
> and
>
> ‘Assessing health professionals should document the individual’s driving requirements and driving history as part of the assessment process’.

1.92 However, there was no documented requirement for the registered medical practitioner or specialist conducting the commercial medical assessment to be familiar with the individual or experienced in conducting these assessments.

1.93 The involved driver’s commercial drivers licence medical, conducted in August 2021, was completed by a General Practitioner who documented on the form that they had been treating the driver as a patient for two months at that time.

1.94 TfNSW documented the criteria for drivers to undertake an eyesight test (Figure 7) and the requirement for drivers who declared a vision or eye condition ‘for the first time’ to provide an eyesight report completed by an optometrist or ophthalmologist’.

Figure 7: TfNSW driver eyesight testing requirements

Transport for NSW requires an eyesight test when you're applying for a driver or rider licence.

You may also need a test when renewing a licence, depending on your age and licence class.

You must pass an eyesight test:

- when applying for a licence for the first time
- when upgrading a licence to a higher class
- every 10 years, if you're under 45 years of age
- every 5 years once you turn 45
- every year from 75 years of age
- when renewing a Class Light Rigid (LR), Medium Rigid (MR) or Heavy Rigid (HR), Heavy Combination (HC) or Multi Combination (MC) driver licence if you have not passed an eyesight test in the previous 12 months
- when replacing a Class Light Rigid (LR), Medium Rigid (MR) or Heavy Rigid (HR), Heavy Combination (HC) or Multi Combination (MC) driver licence if you have not passed an eyesight test in the previous 12 months
- when applying for a 10-year licence.

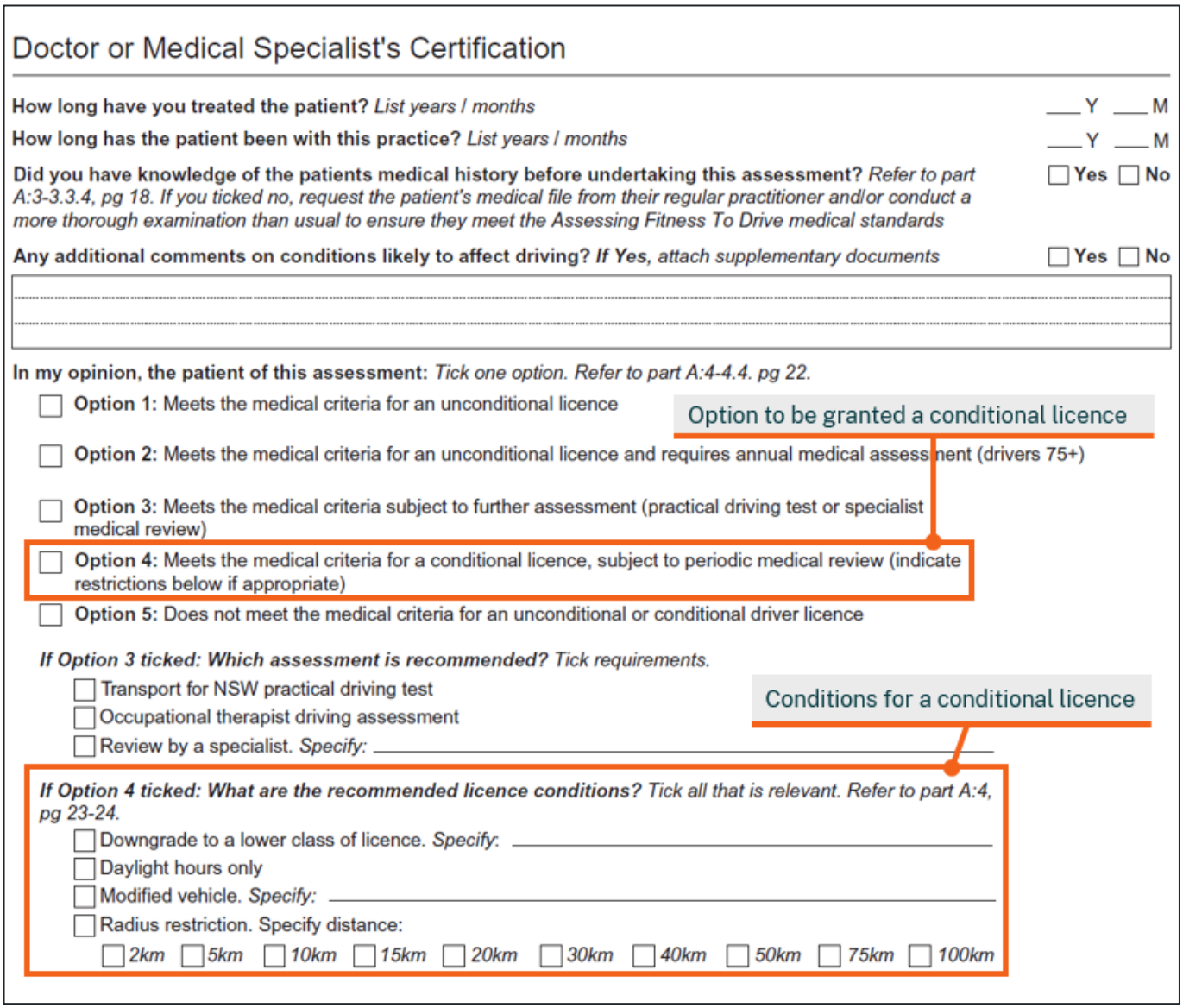
If you declare a vision or eye condition for the first time, you need to provide an eyesight report completed by an optometrist or ophthalmologist.

Source: Transport for NSW

1.95 As part of the NSW Fitness to Drive Medical Assessment Form, medical examiners could place conditions or restrictions on the driver's licence based on certain medical conditions, to reduce health and safety risks when operating a vehicle. The application of conditions resulted in a driver being issued a 'conditional' licence. TfNSW reported that possible licence conditions could include, but were not limited to (Figure 8):

- limit driving hours to daylight hours only
- driving within a prescribed radius from a base location
- modifications to a vehicle due to a medical disability.

Figure 8: Excerpt of the NSW Commercial drivers licence Medical Assessment Form for medical practitioner certification



Source: Transport for NSW. Image annotated by OTSI

Assessing Fitness to Drive implementation

1.96 In May 2024, Austroads published Research Report AP-R707-24 '*Assessing Fitness to Drive Implementation - Survey of Medical Practitioners Conducting Fitness for Duty Assessments*'.

1.97 The report described the results of surveys conducted among medical practices and medical practitioners in March/April 2023. The surveys investigated the barriers to conducting fitness for duty assessments in the transport industry, and the resource and training requirements to support ongoing implementation. The surveys were conducted among practices engaged with the Australian Trucking Association TruckSafe Program and among members of the Australian and New Zealand Society of Occupational Medicine.

1.98 Several findings were documented, including:

- Despite recent efforts to improve the forms associated with commercial vehicle driver assessments, over half of respondents (61% practitioners, 59% practices) felt there was scope for improvement.
- A lack of awareness among drivers of their fitness for duty obligations was identified as a significant barrier to effective conduct of fitness for duty assessments and driver health management (90% of medical practitioners and 73% of practices). This was compounded by concerns about loss of livelihood associated with identification of health issues (76% of practitioners and 63% of practices).
- While few respondents indicated that Assessing Fitness to Drive was difficult to apply for fitness for duty assessments, some suggested that clarity of the standards themselves and variation between requirements in states and territories needed to be addressed to support consistency.
- The survey reinforced the need for education of medical practitioners undertaking health assessments for commercial vehicle drivers and confirmed that initiatives to provide education would be well received. One preferred mechanism of education did not stand out.

1.99 The report also stated that considering the findings of the survey, and the implementation work already underway including the online learning module for general practitioners, the following were proposed as next steps for Austroads:

- Austroads consider a broader strategy for improving the conduct of fitness for duty assessments for commercial vehicle drivers that will address the range of issues highlighted in the survey.
- Austroads consider education regarding fitness for duty assessments as a follow-on initiative pending implementation of the initial module for general practitioners.
- Austroads consider developing a series of driver information leaflets to support medical practices and practitioners in communicating with drivers. These resources could also be used by driver licensing authorities and transport accreditation companies, with implementation strategies considered for each of these target audiences.
- Austroads consider liaising with TruckSafe and other accreditation programs regarding the opportunities to communicate with transport operators and drivers.
- Austroads engage with medical practitioners and practices regarding further updates to the assessment forms and the need for a more defined health assessment process.

Part 2 — Analysis

Introduction

2.1 Early on the morning of Sunday 13 November 2022, bus m/o8219, conducting a public passenger service westbound on Wommara Avenue in Belmont North, with the driver and six passengers onboard, collided with a concrete road barrier. Several passengers, including two who were ejected from the bus in the rollover, sustained injuries requiring medical treatment. The bus sustained significant damage.

2.2 The investigation considered a range of possible contributory safety factors, related to the bus's deviation from the road and collision with the concrete barrier, including:

- bus system/technical failure
- inconsistent visual cues from infrastructure in the vicinity
- adverse weather/reduced visibility
- driver incapacitation, such as sudden illness or medical event, and the potential that a microsleep occurred
- driver diminished capacity, such as fatigue and medical conditions which may result in reduced visual acuity
- driver inattention, distraction and a loss of situation awareness
- driver not driving appropriately to the conditions
- a combination of the above factors.

Several of these factors are discussed further in the analysis below.

Bus examination

2.3 A post incident inspection of the involved bus determined that there were no identified technical defects or failures that contributed to the collision with the barrier.

2.4 Bus m/o8219 had a Gross Vehicle Mass (GVM) of 19,000 kg. However, the actual weight of the bus at the time of the incident was likely less than the GVM as the bus did not have a full load of passengers on board and likely did not have full tank of fuel.

2.5 During the impact sequence, the front of the bus, just to the right of centre, collided with the sloped leading edge of the barrier. This resulted in significant damage to the front of the bus (Figure 9).

Figure 9: Image of bus m/o8219 during vehicle recovery process, showing impact marks and front damage

Source: OTSI

2.6 After initial impact (Figure 10), the bus travelled up the sloped front of the barrier and across the level top section. The metal guard under the fuel tank, then the off side rear sway bar, located under the vehicle (Figure 10, Figure 11), impacted the top of the barrier as the bus continued moving forward. This resulted in the bus becoming airborne, then rotating onto its near side, dropping down towards the channel.

Figure 10: Image of bus m/o8219 in rollover position showing initial and secondary impact marks

Source: OTSI

Figure 11: Image of bus m/o8219 in rollover position showing secondary impact marks

Source: KDH. Image annotated by OTSI

2.7 The investigation noted that the forward facing onboard CCTV camera recording, for the incident service, had significant limitations for use as a source of evidence. This was due to the night vision infrared light reflecting back into the camera lens off the windscreen, resulting in a large reflection in the recording, similar to taking a flash photograph in front of a window at night.

Site inspection

Overview

2.8 In this incident, a drainage channel ran perpendicular to Wommara Avenue, with a culvert[14] under the road (Figure 12). This drainage channel, which was filled with vegetation at the time of the incident, was approximately 2 metres deep where the bus rolled over.

2.9 A 'Type-F' concrete barrier was positioned along the side of Wommara Avenue, across the top of the drainage channel and a water main pipe. Markings found on the water main were consistent with contact with the bus in the rollover sequence.

2.10 Steel railings were positioned along the eastern and western sides of the drainage channel, with a pedestrian footbridge across the southern side. An overhead light pole was located at the southwest corner of the channel (Figure 12). This provided downward illumination of both the edge of the drainage channel and adjacent sealed drive.

Figure 12: Overview showing the layout of infrastructure in the incident location

Source: SIX Maps. Image annotated by OTSI

[14] A culvert is a conduit or passage that allows water to flow under a road, railroad, trail, or similar obstruction.

Street lighting

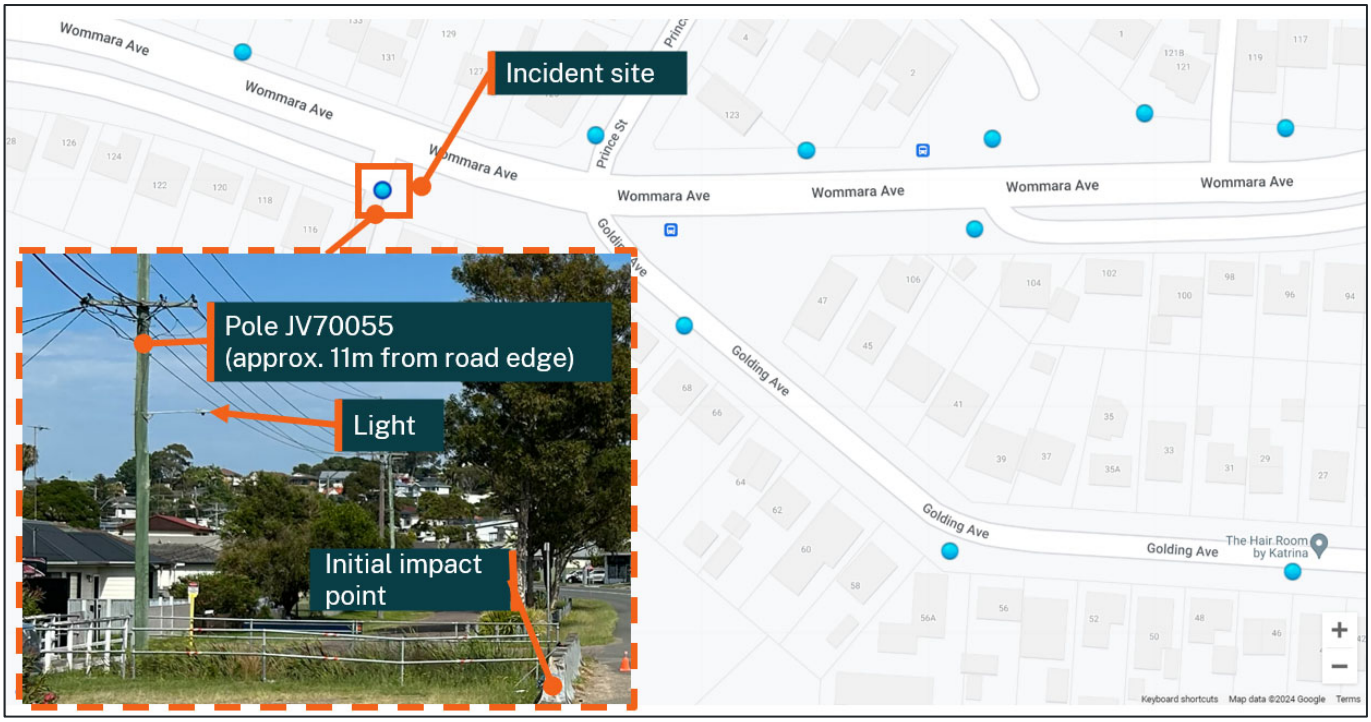
2.11 Wommara Avenue, on approach to the incident site, had single sided road lighting positioned at regular intervals along the northern side of the road. This was on the opposite side of road to the bus's direction of travel.

As required by the NSW Public lighting Code,[15] the overhead lighting in vicinity of the incident site complied with Category V.[16]

2.12 There was no reported street light unserviceabilities on Wommara Avenue at the time of the incident.

2.13 There were five streetlights positioned along the right-hand (northern) side of Wommara Avenue with the one remaining streetlight positioned on a utility pole (JV70055) located on the southwest corner of the drainage channel (Figure 13). This light was offset approximately 11 m from the edge of Wommara Avenue.

Figure 13: Image showing location of streetlights in Wommara Avenue area, with light near incident site highlighted



Source: Ausgrid. Image annotated by OTSI. Note: blue circles indicate streetlight placements

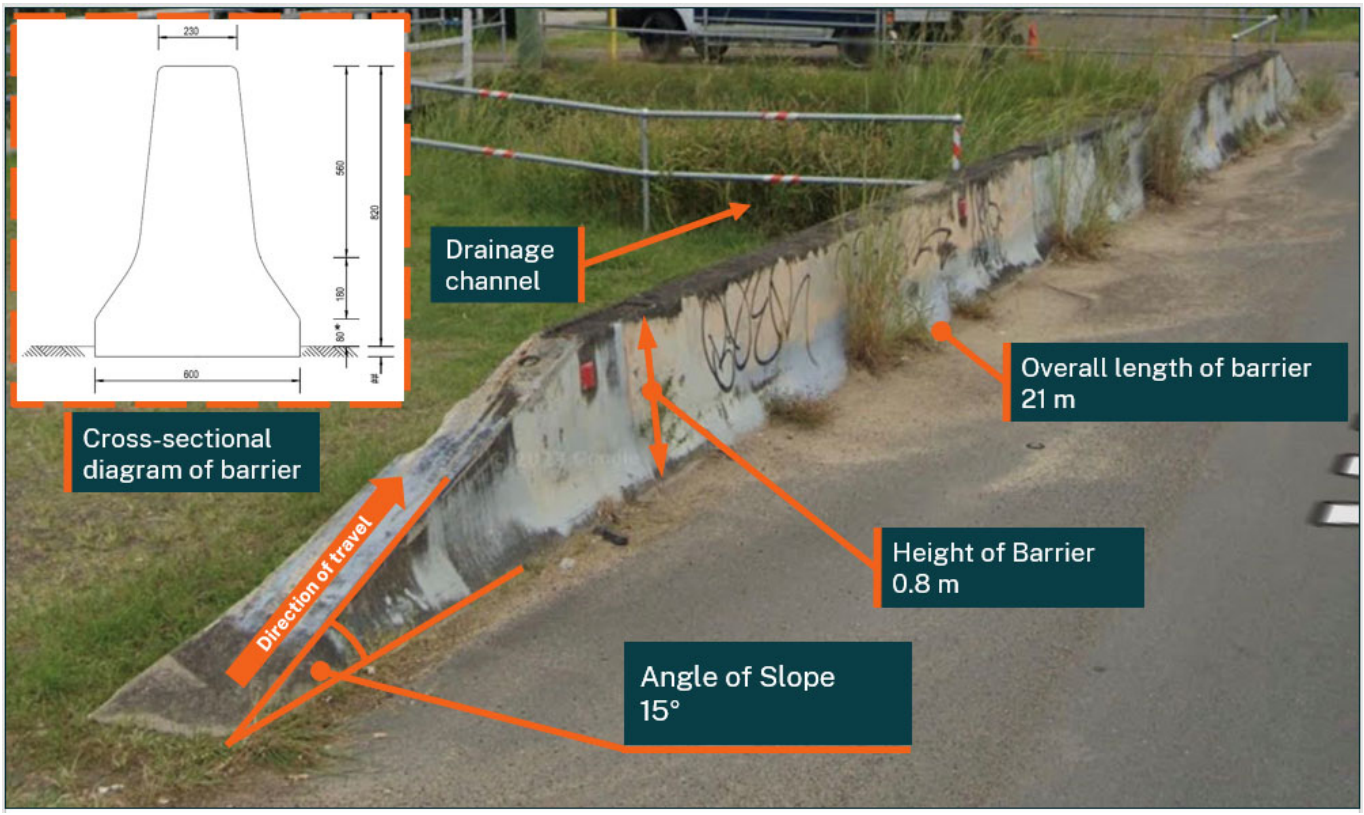
[15] Version 1.3, December 2022

[16] Category V Lighting means lighting situated on a road where the visual requirements of motorists are dominant, being a road with lighting of subcategories ranging from V1 to V5.

Road barrier

2.14 The overall length of the involved road barrier, inclusive of the sloped end terminals, was approximately 21 m. It consisted of seven individual units, which were made up of five Type-F concrete barrier units with two Type-F sloped-end concrete terminal units attached to each end of the barrier. Each of the seven units, including the sloped terminals, were three metres long at the base. The height of the parallel sections of the road barrier were approximately 0.8 m. The slope of the end terminals was approximately 15 degrees (Figure 14).

Figure 14: Road barrier involved in the incident



Source: Google, TfNSW. Image annotated by OTSI

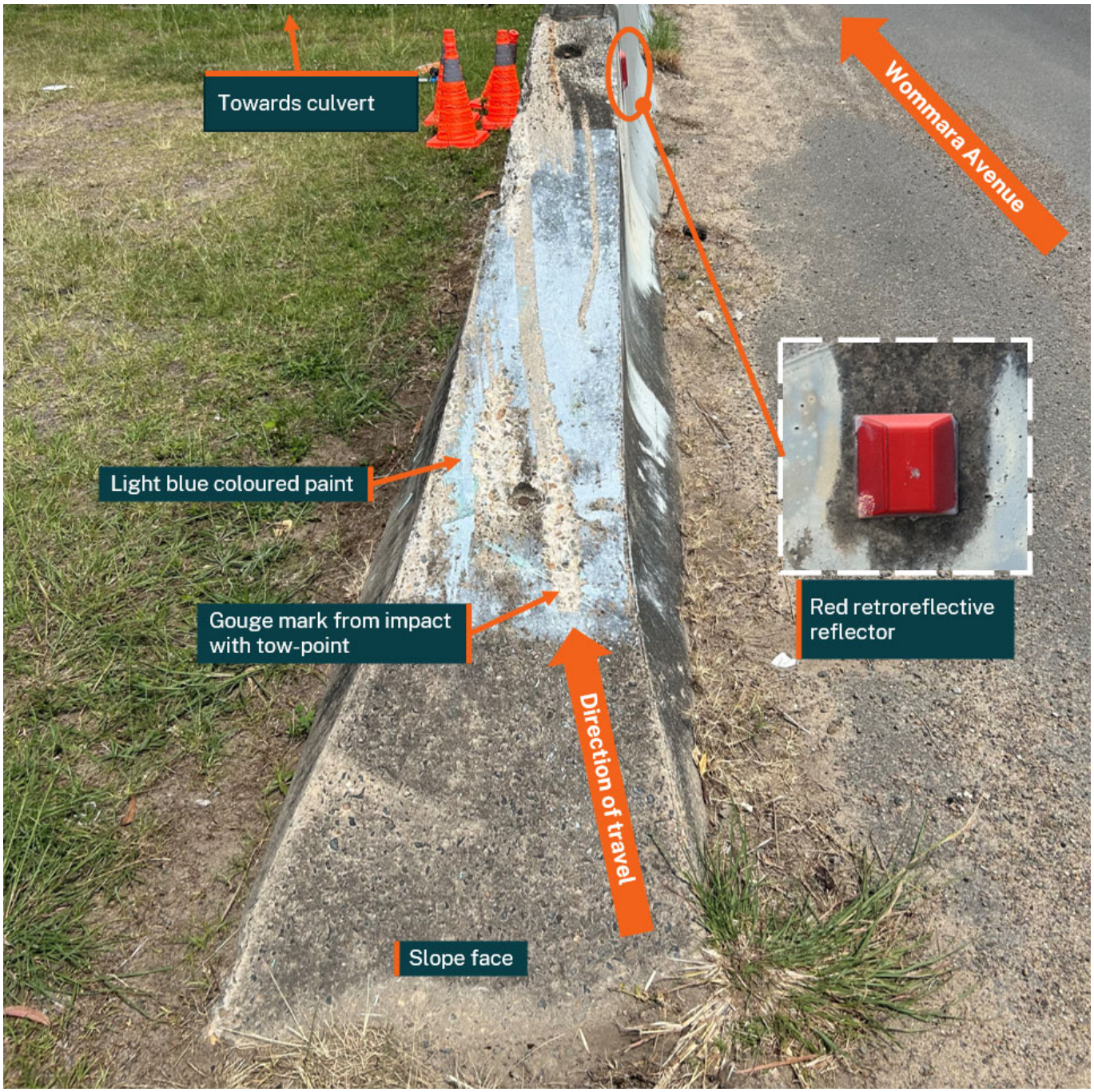
2.15 TfNSW standards for sloped end terminals had a prescribed slope limit of 1 in 7.4 for the approach end sloped terminal, or an incline of approximately 7.7 degrees. However, it is noted that Local Council managed roads, such as Wommara Avenue, were not required to meet TfNSW road and infrastructure standards. It is also noted that standards change with time, and a different slope limit may have applied at the time of installation.

2.16 There were two red coloured Raised Retroreflective Pavement Markers (RRPM)[17] positioned near the leading edge of the road barrier on the road facing side. There were no other reflectors present on the concrete road barrier besides the two RRPMs attached to the road facing sidewall of the barrier.

[17] Raised reflective delineators that are typically placed on the road pavement and attached to objects on the roadside to increase visibility and improve anticipation of incoming hazards for road users when driving in low light conditions.

2.17 On the face of the approach end sloped terminal, there was a gouge mark of approximately 500 mm long and 50 mm wide likely created by the initial impact with the front lower frame of the bus (Figure 15).

Figure 15: Post incident damage to the involved barrier and reflector placement

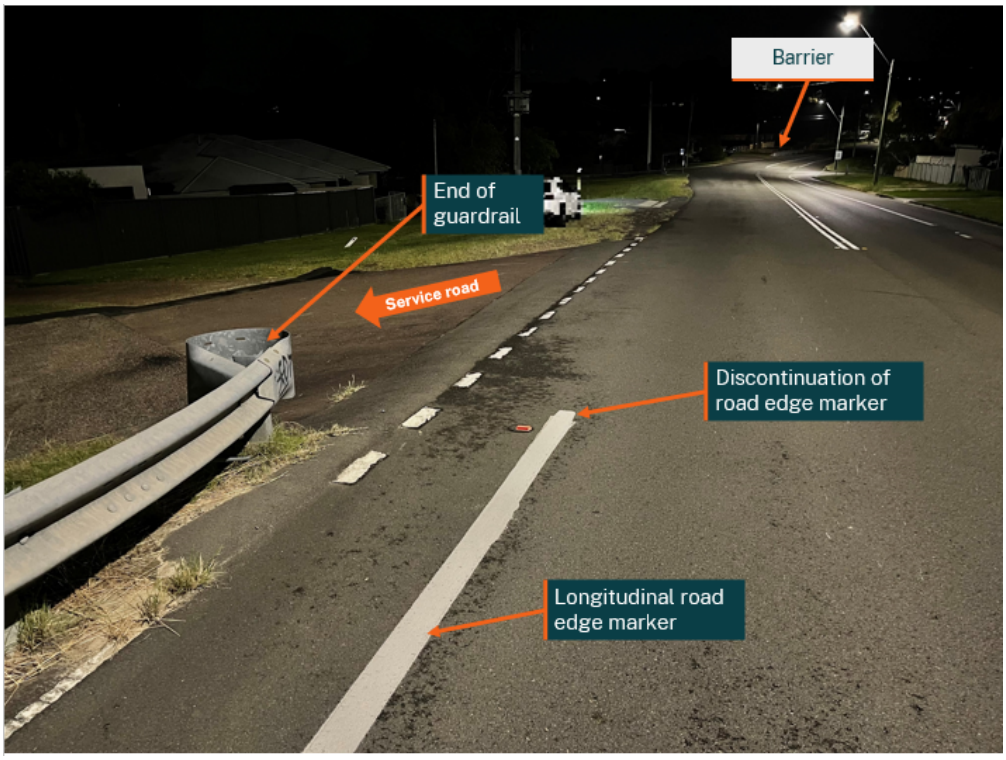


Source: OTSI

2.18 On inspection the top of the barrier was missing the section joining plates designed to keep the sections together, and metal screws had deteriorated with rust.

2.19 There was a W-Beam metal guard rail with a length of approximately 281 m positioned along the southern edge at the top of the crest, around a right-hand bend. The rail was accompanied by a white longitudinal road edge marker of the same length. The guard rail and road edge marker ended approximately 156 m prior to the incident site and did not continue westbound along Wommara Avenue towards the drainage channel (Figure 16).

Figure 16: Discontinuation of longitudinal road edge marker and guardrail on Wommara Avenue, towards barrier



Source: OTSI. Note: image taken using artificial lighting and conditions not indicative of those at time of incident

2.20 Wommara Avenue had an average descent gradient of approximately 8 percent slope from the top of descent to the incident site.

2.21 An unsealed driveway was positioned immediately before the incident site as the road curved to the right. This driveway was at the front of several houses and provided local residential access (Figure 17).

Figure 17: Wommara Avenue facing towards incident site

Source: OTSI Note: image taken using artificial lighting and conditions not indicative of those at time of incident

Human factors

Overview

2.22 The driver of bus m/o8219 was presented with a series of simultaneous challenging conditions that likely contributed to the driver experiencing difficulty in maintaining the safe operation of the bus. Limited visual cues and reference points, such as street lighting, were available to the driver on the approach to the base of the downhill decent on Wommara Ave.

The combination of the challenging local conditions and the limited visual cues experienced by the driver contributed to the driver not having visibility of the road barrier as m/o8219 descended westbound on Wommara Avenue.

Night driving

2.23 Research evidence suggests that visual function is reduced under mesopic[18] lighting conditions of night driving, and that these effects are exacerbated by increasing age and visual impairment.[19] In addition, light and glare from road lighting and headlights have significant impacts on vision and night driving and these effects are likely to change with evolving technologies, such as LED streetlighting and headlights, and 'nighttime driving is challenging, and this is particularly true for older drivers and those with ocular disease'.

[18] Mesopic vision refers to the visual perception that occurs in low to moderate lighting conditions, where both the rods and cones in the eye are functioning.

[19] Wood JM. Nighttime driving: visual, lighting and visibility challenges. Ophthalmic Physiol Opt 2020; 40: 187–201. https://doi.org/10.1111/opo.12659

Incident conditions

2.24 In this incident, there were several conditions which may have adversely influenced the involved driver's ability to safely operate a public passenger service. These included:

- time of operation
- low light conditions
- likely presence of fog
- light and glare from external sources, such as streetlighting
- light, glare and reflections from internal sources, such as the BDC and saloon lighting
- streetlighting behind the barrier was offset from the road edge by approximately 11 m
- driver age profile
- diagnosed ocular disease (glaucoma).

2.25 The driver cab area of bus m/o8219 was subject to the influence of internal light sources, such as the BDC and saloon lighting, and reflections which may have detracted from the driver's ability to clearly view the road ahead, particularly in fog.

2.26 Disability glare is a visual phenomenon that decreases visibility due to light entering the eye from reflections and external light sources. This glare reduces visual acuity as it impairs one's detection of objects and can also affect their situational and spatial awareness.

2.27 Onboard CCTV footage showed that the saloon lights were at the 'full' setting during operation of the service. At interview, the driver was unaware that the front portion of the saloon lighting could be turned off to dim the interior saloon. The operator reported that that drivers were trained on the proper use of saloon lighting as part of their driver training.

2.28 The driver was observed to partially manage driver cabin disability glare from the bus driver console by placing a homemade cover over it.

2.29 It is likely that there was fog in the incident area at the time of the collision, as reported by the involved driver. In fog, the density of the air can increase difficulty to seeing road signs, markings and other structures. The water particles that form fog can also reflect the light from the bus's headlights, making forward visibility more difficult. Specifically, fog may affect a driver's vision in the following ways:

- Depth perception can be reduced due to the thickness of the fog.
- Low contrast caused by fog may result in difficultly in distinguishing between light and dark areas and objects on the road.
- Your vision can fixate on what is close, due to the *Mandelbaum Effect*: an effect that causes your vision to rest at a distance of only about one metre when visibility is weakened.

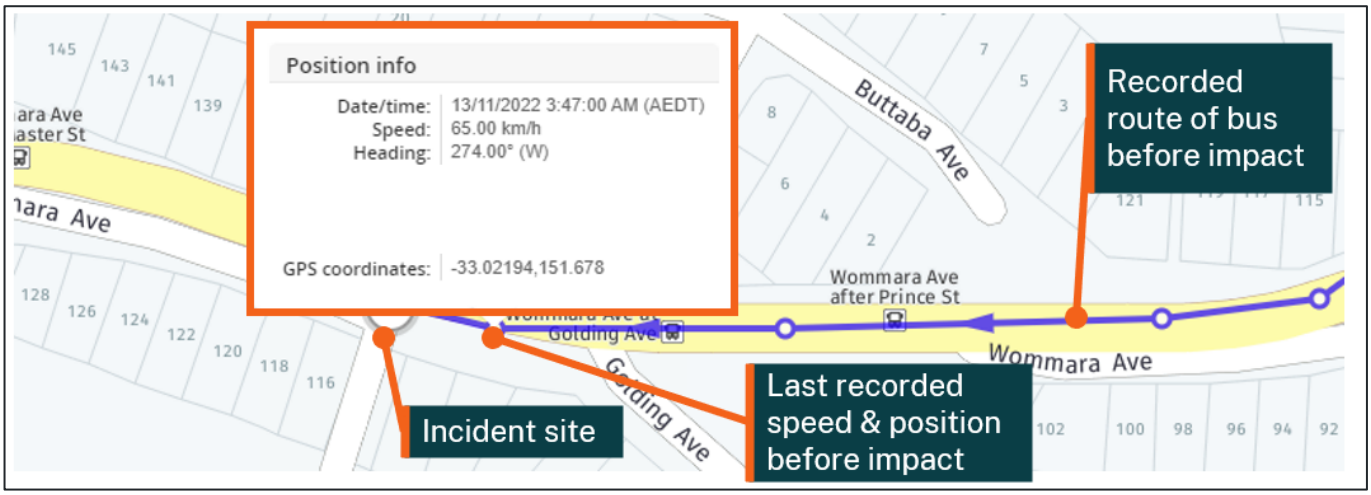
2.30 The bus's headlights, on normal beam, provided limited forward illumination which was likely further reduced in fog conditions.

Driver behaviours

2.31 The investigation considered the likely speed of the vehicle in consideration of the driver's reported challenges in maintaining visibility ahead. The driver reported slowing the speed of the bus earlier on the route due to reduced forward visibility on fog. It is likely that the driver was focused on maintaining forward visibility and considered at that time that they had correctly positioned the bus, so did not need to significantly reduce speed.

2.32 The onboard telematics system recorded the speed of the bus as 65 km/hr immediately prior to the collision (Figure 18). However, this speed was likely to have been uncalibrated. As such, the investigation could not determine the actual speed of the bus at time of impact with the barrier.

Figure 18: Copy of the onboard telematics, showing data for route and position immediately before point of impact



Source: KHD. Image annotated by OTSI

2.33 Figure 18 also displays the recorded position of the bus approaching the incident site. The bus was recorded as operating in the oncoming lane as it travelled down the incline of Wommara Avenue, then aligning with the leading face of the barrier, which was undetected by the driver.

2.34 It is likely that the driver experienced a level of expectation bias regarding the bus's position and the road ahead, which contributed to a loss of situation and spatial awareness.

2.35 The position of the streetlight, immediately behind the drainage channel, and offset back from the road by approximately 11 m, likely provided a misleading visual indication that the road continued towards that streetlight, not curved to the right. Streetlights in suburban metropolitan areas are generally positioned in close proximity to the left of a road and the driver likely experienced an unconscious bias in considering that streetlight an effective visual cue related to the direction of the road ahead in fog and low light conditions.

2.36 The absence of a road edge marking on the left of Wommara Avenue, as the bus travelled westbound, removed a potential visual indication of the continuation of the road in the correct direction. The guardrail positioned on the left of the bus provided some visual indication of the edge of the road. As a service road intersected with Wommara Avenue on the southern side, the guardrail ended at that point (Figure 16).

2.37 The driver reported that a speed alert illuminated on the dashboard. This aligns with data in Figure 18, in which a speed alert would have triggered at 65 km/hr in a 60 km/hr zone. This resulted in driver distraction at a critical time and position of imminent collision with the barrier. Distracted from monitoring the road ahead in low visibility conditions, and the adverse influence of glare and reflection from internal sources, the driver dropped their head down to review the dashboard. This removed the final opportunity for the driver to identify the imminent collision and take evasive action. There were no recorded speed alerts prior to this, on this service.

Fatigue/microsleeps

2.38 According to TfNSW,[20] a microsleep is a 'brief and unintended loss of consciousness. It happens when you try to stay awake while doing a monotonous task, such as driving. It can last from a few seconds to a few minutes. Signs of microsleep are:

- head snapping
- nodding
- closing your eyes for more than a couple of seconds'.

2.39 While the driver reported that they felt tired leading up to the time of the incident, there was no available evidence to support that fatigue directly contributed. There was no evidence to support that the driver experienced microsleeps during operation of the involved route, including in the period leading up to the collision.

2.40 The onboard CCTV recorded the driver dropping their head down towards the windscreen, which the driver later reported to be attempts to see more clearly through the windscreen in reduced visibility conditions with the influence of internal glare from the vehicle's saloon lighting and other systems. This aligned with the driver's observable behaviours in the period leading up to the collision and during the incident sequence, and the environmental and local conditions present at that time, which indicated that they were conscious throughout and actively trying to maintain visibility with the road ahead and keep the bus on the road.

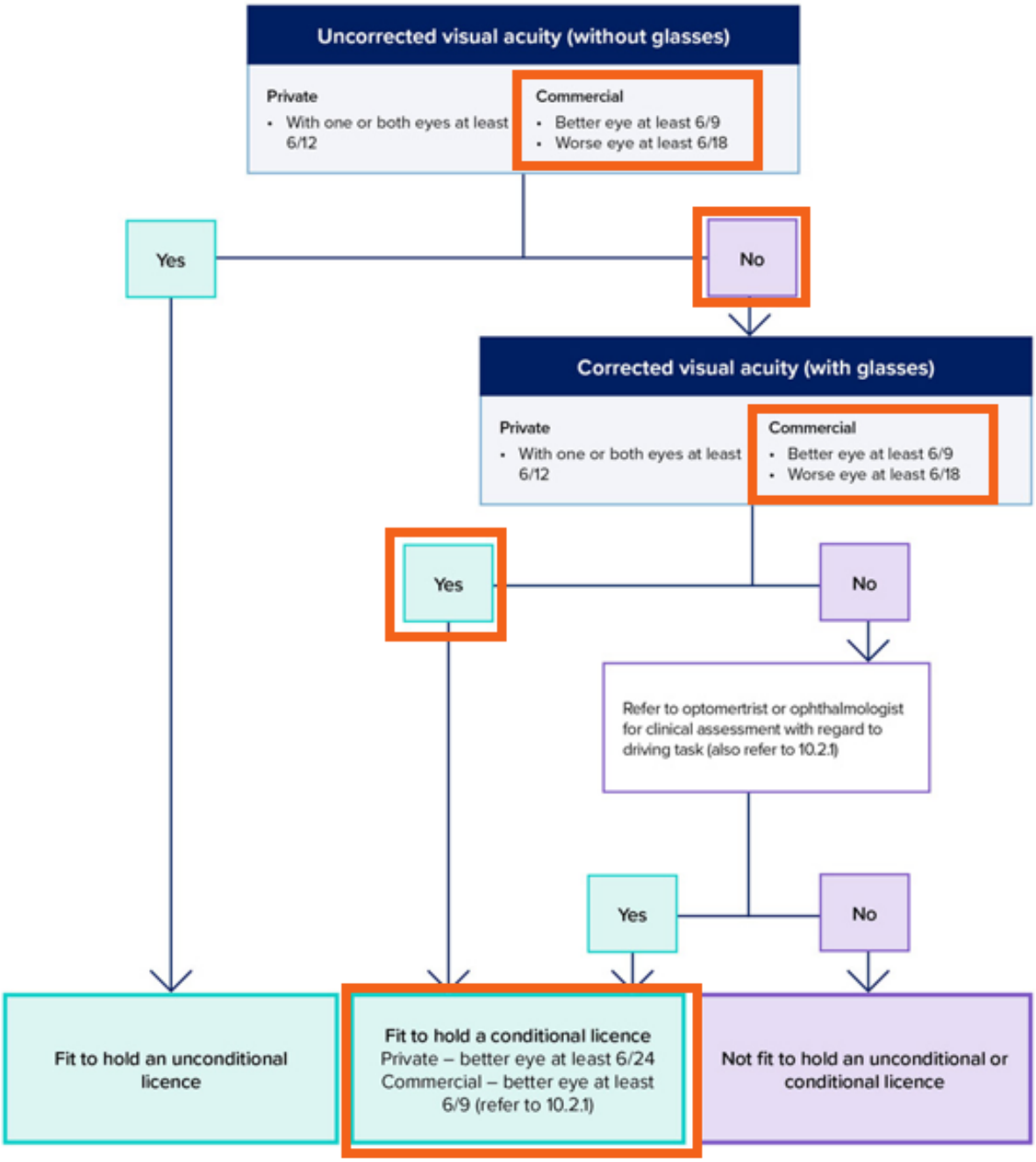
2.41 The investigation noted that there can be a risk in interpreting driver behaviours using CCTV recordings, without consideration of angle of recording limitations, and other sources of evidence. These cameras primarily serve as security monitoring devices for the bus and can be limited in suitability for use in assessing a driver's level of fatigue. Advanced driver fatigue detection cameras are designed to effectively monitor and detect signs of driver fatigue. This technology was not installed on the involved bus.

[20] https://www.nsw.gov.au/driving-boating-and-transport/roads-safety-and-rules/safe-driving/fatigue#:~:text=A%20microsleep%20is%20a%20brief%20and%20unintended%20loss,eyes%20for%20more%20than%20a%20couple%20of%20seconds.

Application of Fitness to Drive medical standards

2.42 When the driver completed their NSW commercial drivers licence assessments in 2021 and 2022, the driver's visual acuity scores, with glasses worn, were recorded as meeting the commercial licence corrected visual acuity (with glasses) scores. These results met the AFTD requirements of the driver to be issued a conditional commercial licence (Figure 19).

Figure 19: Visual acuity requirements for private and commercial drivers, marked to show involved driver's results



Source: AFTD. Image annotated by OTSI

2.43 However, the General Practitioner who completed the medical assessments in both 2021 and 2022 recorded that the driver fulfilled the medical criteria for an unconditional commercial drivers licence.

2.44 As identified by Austroads in the survey of Medical Practitioners conducting Fitness for Duty assessments results, published in May 2024, there are opportunities for improvement in the system of health assessments currently delivered in Australia, with a particular focus on opportunities in health professional education and certification.

2.45 In NSW, there are also opportunities for improvement to ensure that a bus or coach operator is aware of medical conditions declared by their drivers, as part of the driver licensing medical assessment process. This may require consideration of a review of the Health Records and Information Privacy Act 2002 or changes to bus operator processes for managing driver health. At the time of this incident, there was no system to advise the involved bus operator of relevant medical conditions declared to the NSW driver licence authority, TfNSW, and recorded on their system.

Operator knowledge of driver declared conditions

2.46 While there are legislative requirements for TfNSW to be notified by bus and coach drivers and operators of 'any apparent change in the physical or mental condition of a driver of a public passenger vehicle operated by the operator that may detrimentally affect the driver's ability to drive public passenger vehicles safely', there was no provision to ensure that an operator employing the driver was advised of a driver declared condition.

2.47 The involved operator, KDH, was unaware that the driver had a medical condition or of any prescribed medication. This resulted in a missed opportunity for the operator to assess the potential operational risks associated with a driver with a diagnosed ocular disease, in the KDH operational environment, and determine if additional risk control measures should be considered and/or applied, such as no night driving.

2.48 There is a safety improvement opportunity for TfNSW to examine guidance under the Bus Operator Accreditation Scheme provided to operators, for their consideration of extra preventative measures for the medical assessment of bus drivers in their employ.

Safety actions taken

Bus operator

2.49 Since the incident, KDH updated its employee onboarding process to include mandatory medical assessments for all new employees, conducted exclusively by medical assessors designated by KDH. Additionally, KDH implemented an in-house review system to determine the suitability of employees being onboarded. KDH reported that since implementation of these additional controls, issues not identified in the Bus Driver Authority commercial licensing process had been detected and these persons were subsequently not employed.

2.50 During the Directly Involved Parties Draft Report review process, KDH advised that they considered 'the recommendations for Keolis Downer Hunter appropriate and look forward to collaborating with the responsible entities to facilitate any necessary actions'.

Lake Macquarie City Council

2.51 Lake Macquarie City Council conducted a review of the road conditions along Wommara Avenue, including the involved concrete barrier and advised the following safety actions:

- Council will review the line marking and delineation along Wommara Avenue and, if improvements are identified, recommend changes for consideration by the Lake Macquarie Traffic Facilities and Road Safety Committee.
- Council has included the replacement of the concrete barrier with a barrier that meets current TfNSW standards in its future infrastructure register for consideration of funding priority against competing road safety projects city wide. The replacement is not identified in the current 2024/25 Council Operational Plan, and the location does not meet TfNSW requirements for consideration of Australian Government Black Spot funding.
- Council will improve the delineation/reflectorisation of the existing barrier to improve nighttime awareness until such time as it is able to be replaced.
- Council will review the street lighting on Wommara Ave. If changes are required, upgrades will be considered for funding priority against competing projects city wide.

Part 3 — Findings

From the evidence available, the following findings are made with respect to the collision and rollover incident involving bus Volvo B8RLE, fitted with a BusTech VST body, and registered as m/o8219, that occurred in Belmont North, NSW on 13 November 2022.

Contributory factors

3.1 The driver of bus m/o8219 experienced several factors which likely reduced their visual acuity and contrast sensitivity in a low light operating environment with limited visual cues. This resulted in the driver being unable to effectively identify the road and concrete road barrier ahead and a loss of situation and spatial awareness, leading to the bus positioned on a direction of travel which was misaligned with the road.

3.2 The activation of an onboard vehicle speed alert resulted in bus driver distraction at a critical time and position of imminent collision with the barrier. This removed the final opportunity for the driver to see the barrier, identify the imminent collision and take evasive action before impact.

3.3 The design of the involved barrier, with a sloped leading edge/face, resulted in the barrier acting like a ramp when impacted by the heavy vehicle, with the bus becoming airborne before rolling over into the drainage channel directly adjacent.

Other safety factors

3.4 The barrier had limited reflectors and no contrasting markings to increase driver visibility of its position in low light and reduced visibility conditions, such as fog.

Part 4 — Recommendations

Noting that some remedial safety action has already been implemented, it is recommended that the following additional safety actions be undertaken by the specified responsible entity.

Keolis Downer Hunter

4.1 Review the involved onboard vehicle monitoring system driver alert activation mechanisms, to ensure that the potential for driver distraction, at a safety critical moment, is effectively considered.

4.2 Ensure that bus drivers are aware of the means of effectively managing glare from internal lighting sources, including saloon lighting in various body configurations.

4.3 Review current route risk assessment processes to ensure that areas of potential increased operational risk are identified and incorporated into driver route training.

Lake Macquarie City Council

4.4 Review the road markings and infrastructure in the incident site vicinity to identify any potential safety improvement opportunities, including consideration of the risks to road users, associated with the design and visibility characteristics of the involved barrier, and streetlight positioning.

(OTSI assessment: Recommendation adequately addressed, see *Safety actions taken*)

Transport for NSW

4.5 Transport for NSW to consider updating guidance provided to operators under the Bus Operator Accreditation Scheme, regarding the management of driver medical conditions including the medical assessment of bus drivers in their employ.

Part 5 — Appendices

Appendix 1: Sources, submissions and acknowledgements

Sources of information

- Ausgrid
- Austroads: Assessing fitness to drive for commercial and private vehicle drivers
- Bureau of Meteorology
- Glaucoma Australia
- Keolis Downer Hunter
- Lake Macquarie City Council
- Transport for NSW

References

Boadi-Kusi, S.B. et al. (2024) 'Visual function correlates of self-reported vision-related nighttime driving difficulties', *Journal of Optometry*.

Wood JM. Nighttime driving: visual, lighting and visibility challenges. Ophthalmic Physiol Opt 2020; 40: 187–201. https://doi.org/10.1111/opo.12659

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:

- Keolis Downer Hunter
- Lake Macquarie City Council
- Transport for NSW

Submissions were received from all DIPs:

- Keolis Downer Hunter
- Lake Macquarie City Council
- Transport for NSW

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.

About the Office of Transport Safety Investigations

The Office of Transport Safety Investigations (OTSI) is the independent transport safety investigator for NSW.

The role of OTSI is to improve safety and enhance public confidence in the safety of the NSW transport network through:

- independent investigation of transport incidents and incidents
- identifying system-wide safety issues and their contributing factors
- sharing safety lessons and making recommendations or highlighting actions that transport operators, regulators and other stakeholders can take to improve the safety of bus, ferry and rail passenger and rail freight services.

OTSI is empowered under the *Transport Administration Act 1988* to investigate rail, bus, and ferry incidents and incidents in accordance with the provisions of the *Passenger Transport Act 1990* and *Marine Safety Act 1998*. It also conducts rail investigations under the provisions of the *Transport Safety Investigation Act 2003* (Cth) and a Collaboration Agreement with the Australian Transport Safety Bureau (ATSB).

The aim of an OTSI investigation is to enhance transport safety by sharing safety lessons and insights with those organisations that can implement actions to improve safety. OTSI uses a 'no-blame' approach to identify and understand contributing safety factors and underlying issues. It does not assign fault or determine liability in relation to the matters it investigates.

An OTSI investigation is independent of any investigation or inquiry that a regulator, NSW Police or the Coroner may undertake. While information gathered by OTSI in the conduct of its work is protected, the Chief Investigator, under the *Transport Administration Act 1988*, may disclose information if they think it is necessary for the safe operation of a transport service.

OTSI is not able to investigate all transport safety incidents and incidents or matters that are reported. The Chief Investigator focuses the agency's resources on those investigations considered most likely to enhance bus, ferry or rail safety by providing new safety lessons and insights that may be shared.

Many incidents result from individual human or technical errors which do not involve safety systems so investigating these in detail may not be justified. In such cases, OTSI will not generally attend the scene, conduct an in-depth investigation, or produce an extensive report.

OTSI may request additional information from operators or review their investigation reports which may lead to several activities, such as the release of a Safety Advisory or Alert to raise industry awareness of safety issues for action.

OTSI investigators normally seek to obtain information cooperatively when conducting an investigation. However, where it is necessary to do so, OTSI investigators may exercise statutory powers to conduct interviews, enter premises and examine and retain physical and documentary evidence.

Publication of the investigation report

OTSI produces a written report on every investigation for the Minister for Transport, as required under section 46BBA of the *Passenger Transport Act 1990*.

Investigation reports strive to reflect OTSI's balanced approach to the investigation, explaining what happened and why in a fair and unbiased manner. All Directly Involved Parties in the investigation are given the opportunity to comment on the draft investigation report.

The final investigation report will be provided to the Minister for tabling in both Houses of the NSW Parliament in accordance with section 46D of the *Passenger Transport Act 1990*. The Minister is required to table the report within seven days of receiving it.

Following tabling, the report is published on the OTSI website — www.otsi.nsw.gov.au — and information on the safety lessons promoted to relevant stakeholders.

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