Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAIL TRANSPORTATION SAFETY INVESTIGATION REPORT R18T0058

TRESPASSING ACCIDENT

Canadian Pacific Railway
Freight train 141-17
Mile 16.82, Galt Subdivision
Mississauga, Ontario
18 March 2018

Canada

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Summary

On 18 March 2018, shortly after 0115 Eastern Daylight Time, 2 teenagers climbed onto slow-moving westbound Canadian Pacific Railway (CP) freight train 651-796 (train 651) at the Howland Avenue grade-separated crossing in Toronto, Ontario. Once the train gained speed, they were unable to get off as they had planned at a nearby crossing. About 20 miles further, in Mississauga, Ontario, the train decelerated, and both teenagers jumped off at the Wolfedale Road public crossing and sustained injuries. Shortly thereafter, at about 0150, westbound Canadian Pacific Railway freight train 141-17 (train 141), while proceeding at 23 mph, struck one of the teenagers who had remained on the right-of-way, causing additional serious injuries. Both were taken to hospital for treatment.

1.0 FACTUAL INFORMATION

On 17 March 2018, 2 CP train crews were ordered at approximately 2300.[1] The first crew was scheduled to operate westbound train 651 from Toronto Yard (Mile 197.0 of the Belleville Subdivision) to London, Ontario (Mile 114.6 of the Galt Subdivision). Train 651 departed Toronto Yard via main track 2 at about 0040 on 18 March 2018. It consisted of a head-end locomotive, 2 loaded buffer cars, and 92 empty (residue) tank cars. The train weighed about 3600 tons and was about 5840 feet long. The crew consisted of a locomotive engineer (LE) and a conductor who were qualified for their positions, met fitness and rest requirements, and were familiar with the territory.

The second train crew was scheduled to operate westbound train 141, also destined for London. Train 141 departed Toronto Yard via main track 2 at about 0050 on 18 March 2018. Train 141 consisted of 2 locomotives, 57 loaded cars, and 87 empty cars; it weighed

[1] All times are Eastern Daylight Time.

about 10 700 tons and was about 8450 feet long. The crew consisted of an LE and a conductor who were qualified for their positions, met fitness and rest requirements, and were familiar with the territory.

1.1 The accident

At about 0105 on 18 March 2018, train 651 stopped with its head end at Dovercourt Road, Toronto, Ontario, in view of approach signal 45-2 indicating "Clear to Stop"[2] for a meet with an eastbound freight train.[3] Train 651 was occupying track 2 over 4 grade-separated[4] road crossings, including Howland Avenue (Mile 3.48 of the North Toronto Subdivision), about 4700 feet from the head end. At approximately 0110, the eastbound train arrived. At about 0115, train 651 received a permissive signal and started to depart.

Shortly after 0115, 2 teenage girls, who lived in the area, were walking south on Howland Avenue and observed train 651 slowly moving westward. They climbed the embankment immediately northwest of the Howland Avenue overpass and entered onto the railway right-of-way (Figure 1) without authority, through a gap between the fencing and the overpass barrier. The teenagers, who were intoxicated, climbed onto the train intending to travel to the nearby Christie Street grade-separated crossing, located some 2600 feet west of the Howland Avenue grade-separated crossing, on their way to Christie Pits Park.

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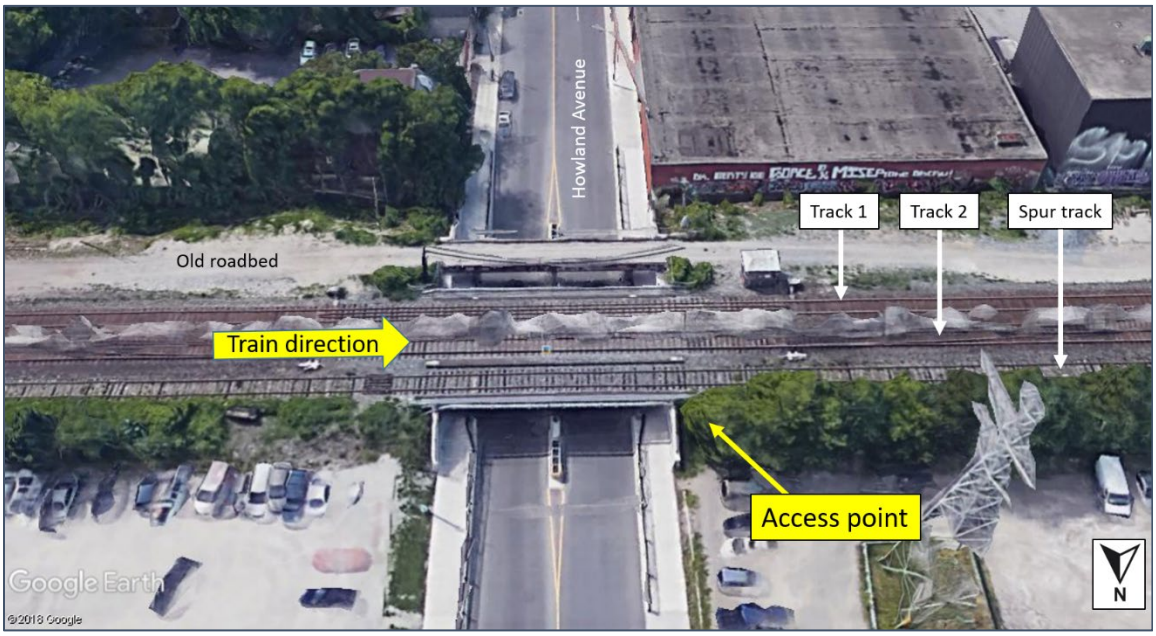
2 Transport Canada, TC O 0-167, *Canadian Rail Operating Rules* (CROR), (14 December 2016), Rule 411: "Clear to Stop – Proceed, preparing to stop at next signal," p. 61.

3 The crew stopped the train at approach signal 45-2 so that the train would not block the Bartlett Avenue grade crossing.

4 A grade-separated road crossing is an underpass or overpass where the railway intersects with a road at a different height so that the traffic can flow freely without interactions between trains and the public.

Figure 1. Howland Avenue grade-separated crossing where the teenagers accessed the right-of-way, looking south down Howland Avenue (Source: Google Earth, with TSB annotations)



Approaching the train, the 2 teenagers climbed onto a tank car positioned near the tail end of the train by climbing the side ladder to reach the platform on top of the car, where the manway is located (Figure 2).

Figure 2. A typical tank car with a manway and side ladder (Source: TSB)

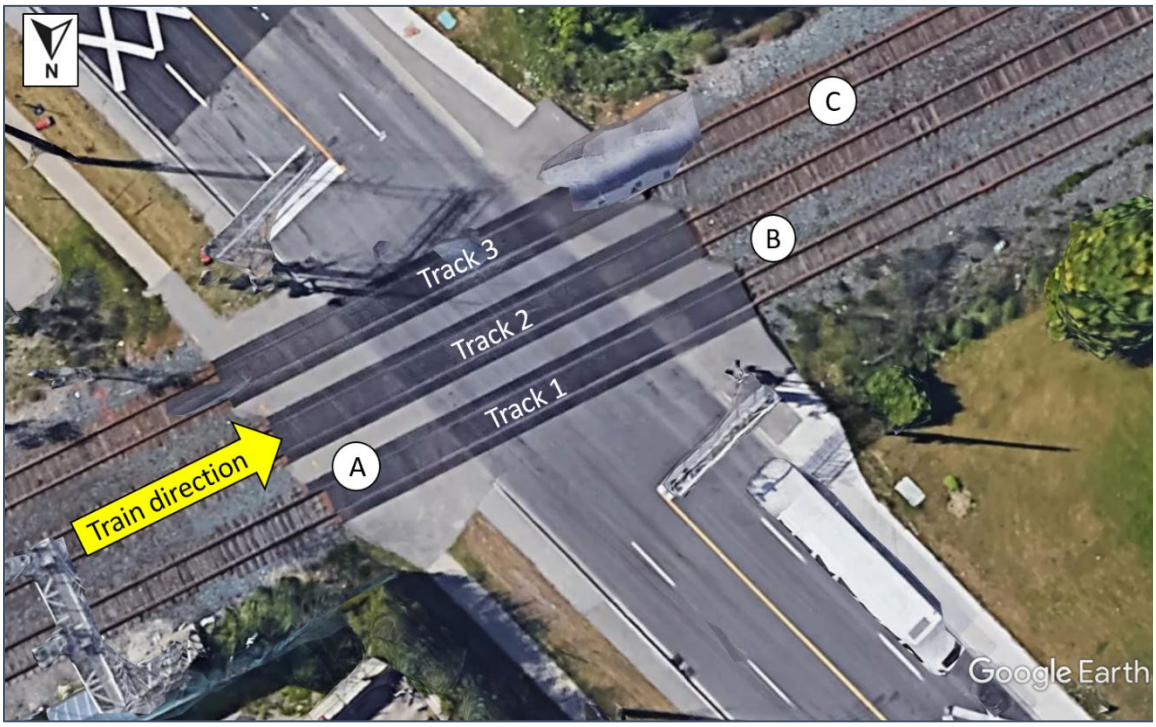
The crew members on train 651 were unaware of the teenagers' presence and continued proceeding westward. By the time the train arrived at the Christie Street grade-separated crossing, the train had reached a speed at which the teenagers believed they would not be able to disembark safely. They remained on top of the tank car as the train continued to accelerate, reaching a speed of about 50 mph (track speed).

By this point, the teenagers were starting to feel very cold and were getting anxious, particularly when they traversed the high railway bridge over the Etobicoke Creek at Mile 11.7 of the Galt Subdivision. They called 911 in an attempt to have the train stopped. The Toronto Police Service received a call from a female indicating that she was on top of a moving train. However, the phone connection was lost before all the details were received. The calls to 911 were therefore unsuccessful. A trace of the number placed the phone in the vicinity of Wolfedale Road.

Train 651 began to ascend a long grade at Mile 13 of the Galt Subdivision. As the train began to decelerate, the teenagers made their way down the north side ladder of the tank car. At

about 0140, approaching the Wolfedale Road crossing (Mile 16.82, approximately 20 miles from where they had got on), the train was proceeding at about 20 mph. Believing that the train had decelerated sufficiently, the teenagers jumped from the car while at the Wolfedale Road crossing. The first jumped off the tank car onto the pavement and rubberized crossing material. The second followed, jumping off at the west end of the crossing and rolling onto the ballast between tracks 1 and 2 (Figure 3).

Figure 3. Wolfedale Road public crossing, where the teenagers jumped off train 651 and where one was struck by train 141 (Source: Google Maps, with TSB annotations)



Legend
A Area where the first teenager landed after jumping from train 651
B Area where the second teenager landed after jumping from train 651
C Area where the second teenager landed after being struck by train 141

Both teenagers sustained injuries when they hit the ground. One was mobile and left to seek assistance. However, the other sustained more serious injuries and was temporarily immobilized, remaining on the right-of-way.

Shortly thereafter, at about 0150, the following train (train 141) was approaching the Wolfedale Road crossing at 23 mph with the bell sounding.[5] The crew members noticed what they perceived to be an object next to the north rail of track 2 just beyond the crossing. As the train proceeded over the Wolfedale Road crossing, the second teenager (who was disoriented) stood up and began to walk southward in a crouched position across track 2 into the path of the oncoming train. It was at that time that the crew members realized that what they had seen beside the north rail was actually a person. The LE immediately initiated an emergency brake application and sounded the whistle. Train 141 could not stop

5 Whistling is prohibited at the Wolfedale Road public crossing, except in case of emergency.

in time and struck the teenager, who was now positioned near the south rail of track 2. She landed against the north rail of track 3, sustaining additional serious injuries. After train 141 came to a stop, the crew members alerted the rail traffic controller (RTC), who contacted first responders. Both teenagers were taken to hospital for treatment.

At the time of the occurrence, it was dark, the temperature was −5 °C and the wind was from the north at 8 km/h.

1.2 Subdivision and track information

CP trains proceeding from Toronto to London operate on 3 subdivisions—Belleville, North Toronto, and Galt—and traverse one of the most populated areas in Canada. These trains initially depart Toronto Yard (Mile 197.0 of the Belleville Subdivision) and proceed west for 9 miles, where they enter the North Toronto Subdivision. Travelling on the North Toronto Subdivision from Mile 0.0 to Mile 5.9, the trains enter onto the Galt Subdivision at Mile 4.9. The Galt Subdivision extends to Mile 114.6 (London). Train operations on the Belleville and North Toronto subdivisions, as well as in the occurrence area on the Galt Subdivision, are governed by the centralized traffic control system, as authorized by the *Canadian Rail Operating Rules* and supervised by a CP RTC located in Calgary, Alberta.

At Howland Avenue in Toronto, the North Toronto Subdivision is double main track (tracks 1 and 2) with a spur track running parallel and north of track 2. The maximum train speed through this area is 50 mph.

At Wolfedale Road in Mississauga, the Galt Subdivision has 3 parallel main tracks with an east–west orientation. The tracks are numbered 1, 2, and 3, with track 1 being the northernmost track.

In the vicinity of the Wolfedale Road crossing, the authorized speed limit for freight trains was 60 mph. However, due to an ascending westward grade extending from Mile 13 to Mile 16.82, westbound freight trains would operate through this area at much slower speeds, depending on their weight and length.

1.3 Trespassing on railway property

Section 26.1 of the *Railway Safety Act* states that "No person shall, without lawful excuse, enter on land on which a line work is situated."[6] Line work is defined in the *Railway Safety Act* as follows:

> (a) a line of railway, including any structure supporting or protecting that line of railway or providing for drainage thereof,

[6] Government of Canada, *Railway Safety Act* (R.S.C. 1985, c. 32 [4th Supp.]), section 26.1: No access to line works.

> (b) a system of switches, signals or other like devices that facilitates railway operations, or
>
> (c) any other structure built across, beside, under or over a line of railway, that facilitates railway operations,
>
> but does not include a crossing work.[7]

The *Contraventions Act*[8] allows the federal government to designate federal statutory offences as contraventions so that they can be processed using a ticketing system, instead of the summary conviction process included in the *Criminal Code*. Schedule X of the *Contraventions Regulations* lists section 26.1 of the *Railway Safety Act* "as a contravention for the purposes of the *Contraventions Act*."[9] This means that railway police constables and any other peace officers are permitted to enforce the trespassing provision and issue fines.

1.3.1 Enforcement of trespassing offences by railway police constables

The 3 Class I railways in Canada (CP, Canadian National Railway Company, and VIA Rail Canada Inc.) have their own police constables. These railway police constables are appointed by a judge of the superior court of Canada[10] for the enforcement of the laws of Canada or a province as long as their enforcement relates to the protection of property owned, possessed, or administered by a railway company and the protection of persons and property on that property. As stated in Part IV.1, subsection 44(3) of the *Railway Safety Act*, railway police constables have jurisdiction in any place within 500 m of property that the railway company owns, possesses, or administers.

Railway police constables have the same powers as other designated police officers in Canada. Although employed by railway companies, they are considered agents of the Crown and can therefore detain, arrest, use force, search, and compel people to court.

When trespassing is reported on CP property, such as along a railway right-of-way, a CP Police Service constable is typically dispatched to the site to investigate. In most cases, the person trespassing will no longer be on the railway property when the CP Police Service arrives. But if the person trespassing is apprehended, they can be issued a summons involving a monetary penalty at the discretion of the responding officer. The CP Police Service targets areas for trespassing enforcement based on personal knowledge and complaints from railway employees and the public. Enforcement measures include directed patrols and campaigns in higher-risk areas.

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7 Ibid., subsection 4(1): Definitions.

8 Government of Canada, *Contraventions Act* (SOR/96-313).

9 Ibid., section 1: Designation.

10 Per subsection 44(1) of the *Railway Safety Act*.

In southern Ontario (London, Windsor, Hamilton, and Toronto), the CP Police Service has a total of 16 constables and 2 sergeants, including 6 constables and 1 sergeant located in the Greater Toronto Area. Between 01 January 2018 and 01 October 2018, the CP Police Service's Toronto Detachment issued 154 tickets or summonses and 109 warnings to people trespassing. In comparison, in 2017 the same detachment issued 83 tickets or summonses and 91 warnings.[11]

1.3.2 Enforcement of trespassing offences by local police services

Unless there is an agreement in place with the track owner (the railway), local police do not normally enforce railway trespassing–related laws. The CP Police Service has established agreements with local police agencies across the CP network to expand the number of law enforcement officials who are aware of and working to improve railway safety. In Ontario, the CP Police Service has 14 local police agencies acting on its behalf to enforce the Ontario *Trespass to Property Act*. As part of the agreements, CP Police Service officers visit local police agencies to educate officers about railway trespassing issues and encourage them to partner in the enforcement of trespassing laws.

If railway police are not available to respond to a trespassing call, local police can be called in to assist. In many instances, by the time local police arrive, the person trespassing will have left. If the person is still on railway property, local police will typically ask them to leave the premises. Unless the person refuses to leave, there are normally no legal repercussions.

1.3.3 Enforcement of trespassing offences by Transport Canada inspectors

Schedule I of the *Railway Safety Administrative Monetary Penalties Regulations* lists the designated provisions of the *Railway Safety Act* against which Transport Canada (TC) can issue monetary penalties. TC inspectors are not considered peace officers, and section 26.1 of the *Railway Safety Act* is not included in Schedule I of the Regulations. This means that TC inspectors cannot issue fines or monetary penalties to people trespassing on railway property.

As part of TC's risk-based oversight program, when TC is made aware of trespassing events, it promotes the Rail Safety Improvement Program to railway companies and road authorities. The program provides funding to improve rail safety and reduce injuries and fatalities related to rail transportation.

1.4 Trespassing at Howland Avenue

In the vicinity of the Howland Avenue grade-separated crossing, trespassing on railway property was a common occurrence. The underpass provides road and pedestrian access to the Dupont Street business section for residents living north of the tracks. It was common

[11] Canadian Pacific Railway implemented a new records management system in 2017. Data from before the new system integration are unavailable, including some records for 2017.

for individuals to cross the tracks and/or walk along the railway right-of-way using the old roadbed adjacent to the tracks on the south side (Figure 1, section 1.1). Train crews had become accustomed to seeing people trespassing at this location on a regular basis. However, unless the people trespassing were obstructing or interfering with railway operations, the train crews did not normally report them to the RTC. When trespassing activity was reported, the RTC relayed the information to the CP Police Service, who would follow up by either visiting the site or contacting local police.

CP continuously monitors and replaces "no trespassing" signs as they are removed and new trespassing locations are identified. Being aware of trespassing activity at this location, in 2014, CP added approximately 4500 feet of new fencing and continuously repaired identified holes in the fencing. CP had erected several "No Trespassing" signs at identified access points. These signs had initially been installed on the fencing; however, they were often removed or vandalized. To prevent further tampering, it was decided to install the "No Trespassing" signs on a signal bungalow positioned along the railway right-of-way, next to the tracks, about 45 feet from the access point (the gap between the fencing and the overpass barrier). The writing on the warning signs on the signal bungalow could not be easily read from the areas where people would normally access the tracks. Although several well-worn pathways were noticeable in the vicinity, no additional barriers had been erected to deter trespassing.

Figure 4. Gap in the fencing at the Howland Avenue grade-separated crossing, where the teenagers accessed the right-of-way (Source: TSB)

During site observations following the occurrence, it was noted that a worn pathway extended from the parking lot northwest of Howland Avenue up the embankment and through a gap between the fencing and the overpass barrier where the teenagers had accessed the right-of-way (Figure 4). Several access points were present on the south side of the right-of-way through broken fencing and up the embankment.

The gap between the fencing and the overpass barrier on the north side was wide enough to accommodate a person without significant effort. There was no indication of any pre-existing barriers to prevent trespassing through this gap, and a number of individuals were present on railway property during the site visit.

"No Trespassing" signs were posted on the signal bungalow located immediately south of track 1. Graffiti was present on the signal bungalow, but did not cover the signage.

An old roadbed running parallel and south of track 1 extended from Yonge Street to Bartlett Avenue, about 2.5 miles. The roadbed had become a regular pathway by which people would access the railway right-of-way without authority.

1.5 Risk perception by individuals trespassing

Individuals who repeatedly experience (either directly, or indirectly by observing others) a dangerous activity or environment without negative repercussions may not appreciate the actual level of associated risk. Without mitigations in place to inform and calibrate risk perception, the subjective evaluation of low personal risk may lead people to perform more high-risk activities.[12] The perception of risk can decrease further when higher-risk decisions become normal and accepted within a given group.

All acts of trespassing on railway property carry risk. The teenagers involved in this occurrence had regularly observed people walking their dogs on railway property on the old roadbed alongside the railway in the vicinity of the Howland Avenue grade-separated crossing. In this occurrence, however, crossing tracks and climbing onto moving railway equipment was a much higher-risk activity. The teenagers had never previously observed people climbing onto moving equipment.

The conspicuity of a warning sign refers to how well it can capture the attention of an observer who does not necessarily expect it to be present.[13] In this occurrence, the only "No Trespassing" signs were those affixed to the signal bungalow immediately south of track 1. These warning signs were red and white, which were also the colours of some of the graffiti on the signal bungalow (Figure 5).

Figure 5. Red and white "No Trespassing" signs installed on the signal bungalow over red and white graffiti (Source: TSB)

The limited visual contrast between the "No Trespassing" signs and the graffiti reduced the conspicuity of the signs, making it less likely that people would see and read them. The level

12 G.J.S. Wilde, "Homeostasis drives behavioural adaptation," *Behavioural Adaptation and Road Safety: Theory, Evidence and Action*, 1st edition (Boca Raton, FL: CRC Press, 2013).

13 P.L. Olson, R. Dewar, and E. Farber, "Vision, audition, vibration and the processing of information," *Forensic Aspects of Driver Perception and Response*, 3rd edition (Lawyers & Judges Publishing Company, Inc., 2010).

of conspicuity, which was already low, would have been even more limited in darkness. The teenagers involved in this occurrence were not aware of the posted "No Trespassing" signs.

1.6 Decision making

1.6.1 Decision-making process in teenagers

Typically, teenagers differ from adults in the way they behave and how they make decisions due to neurobiological, social, and emotional factors that change over a person's lifespan. For example, teenagers score higher than adults on measures of impulsivity[14] and sensation seeking;[15] peak levels in these areas occur during adolescence.[16,17] Teenagers are also more sensitive than adults to the potentially rewarding consequences of behaviour, and their judgment is more strongly influenced by factors such as the presence or absence of peers.[18]

Teenagers' decision-making processes may similarly influence their judgment and decision making regarding railway safety behaviour, making them more likely than adults to take risks on railway property by trespassing.[19]

1.6.2 Effects of psychoactive substances on decision making

An individual's psychophysiological state will also affect their decision making and propensity to take risks. Psychoactive substances such as drugs and alcohol are important contributors to this state.[20] In the hours before this occurrence, the teenagers had taken non-prescription alprazolam and psilocybin. The effects of these substances were still present when they decided to climb onto the train.

Alprazolam, also known as Xanax, is a benzodiazepine prescription medication used to treat anxiety and panic attacks. Benzodiazepines are depressants that slow down brain activity, producing a drowsy or calming effect. Problematic use of benzodiazepines can cause

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14 "Impulsivity" refers to a lack of self-control or deficiencies in response inhibition; it leads to hasty, unplanned behaviour.

15 "Sensation seeking" is the tendency to seek novel, varied, complex, and intense sensations and experiences.

16 L. Steinberg, D. Albert, E. Cauffman, et al., "Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model," *Developmental Psychology*, Vol. 44, Issue 6 (2008), pp. 1764–1778.

17 M. Zuckerman, *Behavioral Expressions and Biosocial Bases of Sensation Seeking* (Cambridge University Press, 1994).

18 D. Albert and L. Steinberg, "Judgment and decision making in adolescence," *Journal of Research on Adolescence*, Vol. 21, Issue 1 (2011), pp. 211–224.

19 P.E. Waterson, V.L. Kendrick, and P.J. Underwood, "Teenage trespass on the railways – a systems approach," *Proceedings of the Institution of Civil Engineers – Transport*, Vol. 170, Issue 5 (2017), pp. 287–295.

20 C.M. Steele and R.A. Josephs, "Alcohol myopia: Its prized and dangerous effects," *American Journal of Psychology*, Vol. 45, Issue 8 (1990), pp. 921–933.

substance use disorder, overdose, and death. Common short-term effects of benzodiazepines include dizziness, confusion, drowsiness, muscle weakness, and loss of coordination and balance.[21] Alprazolam is also available as a street drug in Canada, and its use among teenagers has been documented.[22]

Psilocybin is a hallucinogen found in certain species of mushroom. Side effects of ingesting mushrooms containing psilocybin include seeing, hearing, or feeling things that are not really there. Users may also experience anxiety, nausea, and muscle twitches. Other negative mental effects include light-headedness, loss of coordination, confusion, and disorientation.[23]

Intoxication from ingesting psychoactive substances is strongly related to disinhibition and impulsive behaviour.[24] In experimental research studies, alprazolam in humans increases their risky decision making, depending on the dose.[25]

1.7 Rail trespassing awareness programs

Awareness, or educational, programs are designed to influence a person's knowledge of and attitudes toward safety and encourage more responsible decision making.[26] Recent reviews of rail trespassing awareness programs have found that such programs can be effective in improving safety around railway tracks, particularly when they are aimed at a targeted, high-risk group (such as young people)[27] and when combined with other types of preventive measures (such as enforcement and engineering approaches).[28, 29]

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21 Health Canada, "Benzodiazepines," at https://www.canada.ca/en/health-canada/services/substance-use/problematic-prescription-drug-use/benzodiazepines.html (last accessed on 08 August 2019).

22 G. Dumont, "Outaouais teens abusing non-prescription Xanax they buy online," CBC News online, May 2018, at https://www.cbc.ca/news/canada/ottawa/xanax-high-schools-counterfeit-teens-1.4646820 (last accessed on 08 August 2019).

23 Health Canada, "Psilocybin and Psilocin ("Magic mushrooms")," at https://www.canada.ca/en/health-canada/services/substance-use/controlled-illegal-drugs/magic-mushrooms.html (last accessed on 07 August 2019).

24 H. de Wit, "Impulsivity as a determinant and consequence of drug use: A review of underlying processes," *Addiction Biology*, Vol. 14, Issue 1 (2009), pp. 22–31.

25 S.D. Lane, O.V. Tcheremissine, L.M. Lieving, et al., "Acute effects of alprazolam on risky decision making in humans," *Psychopharmacology*, Vol. 181, Issue 2 (2005), pp. 364–373.

26 G.M. Havârneanu, J.-M.M. Burkhardt and F.F. Paran, "A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents," *Accident Analysis and Prevention*, Vol. 81 (2015), pp. 30–50.

27 Ibid.

28 F. Horton and F. Foderaro, "Law enforcement strategies for preventing rail trespassing," U.S. Federal Railroad Administration Report No. DOT-VNTSC-FRA-14-07 (2016).

29 F. Stewart and M. Colwill, "Rail trespassing occurrences and countermeasure strategies," Transport Canada publication TP-1520E (April 2012).

1.7.1 Operation Lifesaver

Operation Lifesaver Canada is a not-for-profit organization that works to prevent deaths and serious injuries from railway crossing and trespassing incidents by raising awareness about the hazards associated with railway tracks and trains.

Funded by TC and the Railway Association of Canada (RAC), Operation Lifesaver works with the rail industry, governments, law enforcement, labour groups, the media, and communities to raise awareness about rail safety.

Operation Lifesaver's staff, partners, and rail safety ambassadors (who are volunteers) across the country educate Canadians of all ages through presentations to schools, youth clubs, driver associations, snowmobile and all-terrain vehicle clubs, and other community groups. Operation Lifesaver also produces and distributes out-of-home advertising (e.g., bus posters and billboards). Since April 2017, Operation Lifesaver has launched several social media campaigns, including its "Look. Listen. Live." virtual-reality campaign, its #STOPTrackTragedies campaign (which tells the personal stories of those affected by railway crossing and trespassing incidents), and its Train to Drive campaign.

Since its inception, Operation Lifesaver's virtual-reality campaign, particularly the anti-trespassing video, has generated public interest. In addition, Operation Lifesaver's rail safety ambassadors conduct face-to-face outreach events, activities, presentations, and interviews with local media across the country. Between January 2016 and the time of this occurrence, Operation Lifesaver and its partners had delivered several presentations within the City of Toronto. However, neither of the teenagers involved in this occurrence had attended a presentation, nor were they aware of the Operation Lifesaver program.

1.7.2 Direction 2006

Direction 2006 was a TC-funded initiative supported by the railway industry, provincial and municipal governments, law enforcement agencies, and railway unions as a result of the 1996 *Railway Safety Act* review. The key result areas included engineering, education, enforcement, legislative, resource, research, and communications perspectives with the objective to reduce the number of grade crossing and trespassing accidents by 50% by 2006, compared with 1996.[30]

Through Direction 2006, each key result area (committee) was given government funding to implement new rail safety initiatives, above and beyond what was already being done. For example, Direction 2006 partnered with multimedia companies to develop public service announcements that were seen across Canada through the use of billboards, posters, and radio and television advertisements.

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30 K. Lancastle, "Direction 2006 Built the Foundation for Future Success," *Operation Lifesaver* [blog] (01 January 2006), at https://www.operationlifesaver.ca/blog/january-2006/direction-2006-(d2006)/ (last accessed on 13 August 2019).

1.7.3 Canadian Pacific Railway's safety program

CP has a comprehensive community safety and security program based on education, enforcement, and engineering.

The education element of the program consists of collaboration with other stakeholders (such as TC, Operation Lifesaver, industry, and municipalities) on public outreach activities delivered at schools and other associations, and as part of initiatives such as Rail Safety Week.

The enforcement and engineering elements of the program consist of controlling unauthorized access to and trespassing on CP property by such means as "No Trespassing" signs, training for railway employees on security awareness, a 24/7 toll-free number that people can call to report trespassing on or near railway tracks, and enforcement by the CP Police Service.

Furthermore, as part of its risk-based approach, CP implemented its own branded safety program, RailSense, and continues to participate as a partner in Operation Lifesaver. The RailSense program, which is based on Operation Lifesaver material, uses social media campaigns to reinforce rail safety messages to the public, including specific targeted demographics.

1.7.4 Rail safety awareness campaign by Metro Trains (Melbourne, Australia)

In 2012, to promote and increase awareness of rail safety, Metro Trains in Melbourne, Australia, created a public service announcement campaign entitled "Dumb Ways to Die." The purpose of the campaign was to target a young audience using comedy and convince them to be safe around trains. The campaign video was uploaded to YouTube in November 2012. Within a week, it had reached over 20 million views worldwide on YouTube and gained national news coverage. At February 2019, the video had over 175 million views.

The campaign was expanded to include posters and billboards at train stations and public places, a children's book, and a website where people could make the pledge to be safe around train stations.

1.8 Trespassing occurrences reported to the Transportation Safety Board of Canada

Under paragraph 5(1)(a) of the *Transportation Safety Board Regulations*, railways must report to the Transportation Safety Board of Canada (TSB) all railway occurrences where "a person is killed or sustains a serious injury as a result of coming into contact with any part of the rolling stock or its contents."[31] When railways make a report involving trespassing, information that they must provide includes

- the time and date of the occurrence

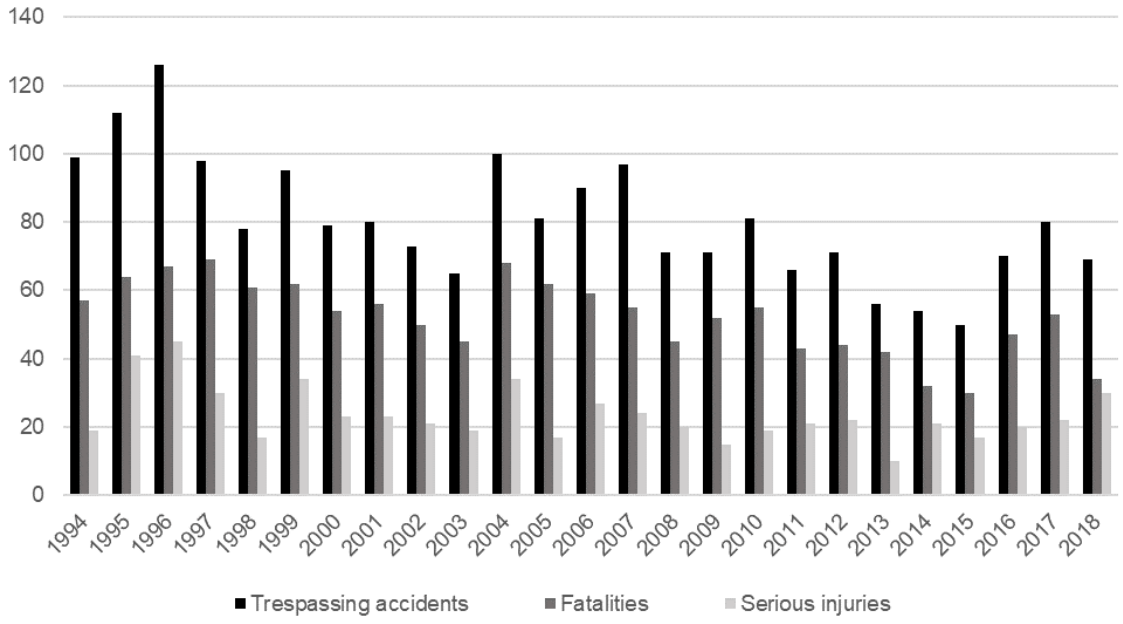
[31] Transportation Safety Board of Canada, *Transportation Safety Board Regulations* (SOR/2014-37), paragraph 5(1)(a).

- the location of the occurrence
- train information
- weather information
- a description of the events

Railways do not consistently collect personal information such as age, gender, and medical information, or the determination of cause (suicide or misadventure), nor is this information required to be provided to the TSB, unless specifically requested for selected occurrences. Consequently, the information in the TSB's Rail Occurrence Database System (RODS) does not contain enough details to help identify the demographics of people who trespass.

Figure 6 presents a summary of RODS data on trespassing accidents for the past 25 years (1994–2018), as well as the number of fatalities and serious injuries resulting from these accidents.[32]

Figure 6. Number of trespassing accidents, fatalities, and serious injuries, 1994 to 2018 (Source: TSB Rail Occurrence Data System)



While there was a substantial decrease in trespassing accidents from 1994 to 2008, there has been little change in the data over the most recent 10-year period (from 2009 to 2018).

A review of the most recent 10-year Canadian trespassing accident data revealed that between 2009 and 2018,

- there were 668 trespassing accidents, which resulted in 432 fatalities and 197 serious injuries;

[32] Occurrences that do not fall under federal jurisdiction are not included in this summary.

- there was an annual average of 67 trespassing accidents, which resulted in an average of 43 fatalities and 20 serious injuries; the number of such accidents fluctuated from a low of 50 (2015) to a high of 80 (2010 and 2017); and
- there has been little change in the data in this period.

In 2018, there were 69 trespassing accidents, which is slightly higher than the previous 10-year average of 67. The 69 accidents in 2018 resulted in 34 fatalities and 30 serious injuries.

1.8.1 Other recent trespassing occurrences in southern Ontario

Shortly after this occurrence, there were 2 other trespassing accidents involving misadventure in southern Ontario.

1.8.1.1 TSB Rail Transportation Occurrence R18T0070

On 05 April 2018, at about 1800, a CP yard assignment was proceeding at approximately 5 mph in Hamilton, Ontario, with a cut of cars destined for CP's Hamilton Yard. Near Mile 0.5 of the Hamilton Belt Line Spur, a group of young children were playing unsupervised near the railway right-of-way. In the vicinity, a well-worn footpath led to the railway tracks (Figure 7). As the train passed through this location, one of the children accessed the footpath, approached the train, fell, and was run over by the train, sustaining serious injuries. The railway tracks pass through a residential area with apartment buildings and homes backing onto the tracks. Access to the tracks is protected partially by fencing in some areas. However, in other areas, such as where the children were playing, the public can easily access the railway tracks.

Figure 7. Worn footpath leading to the railway tracks near Mile 0.5 of the Hamilton Belt Line Spur, indicated by the arrow (Source: TSB)

1.8.1.2 TSB Rail Transportation Occurrence R18T0075

On 12 April 2018, at about 1455, a Goderich-Exeter Railway (GEXR) train was proceeding westward at about 35 mph when it struck and fatally injured an individual at Mile 47.9 of the GO Transit Guelph Subdivision, in Guelph, Ontario. The individual was walking westward on the railway tracks, wearing headphones, and facing away from the train. Although it is not known exactly where he had accessed the tracks, several well-worn pathways were present, extending from the east side of the road (Victoria Road North) to the right-of-way (Figure 8).

Figure 8. Worn pathway at Victoria Road North in Guelph, indicated by the arrow (Source: TSB)

1.9 *Railway Safety Act* review panel

On 26 April 2017, the Minister of Transport announced the appointment of a panel to conduct an independent review of the *Railway Safety Act*. This review would build on the work of the 2007 *Railway Safety Act* review panel. Its mandate was to focus on the effectiveness of the federal rail safety legislative and regulatory framework to determine the degree to which the Act meets its core objective of ensuring rail safety and serving the best interests of Canadians.[33]

The review panel examined the state of the rail safety regime and the future challenges. The final report was published in May 2018 and discussed, among other things, trespassing occurrences, and the proximity of communities to railway tracks and the interaction between the public and trains.

1.9.1 Trespassing occurrences

In September 2017, Operation Lifesaver made a submission to the *Railway Safety Act* review panel for consideration. The submission referred to an earlier study sponsored by the Université du Québec à Montréal that analyzed trespassing and pedestrian accidents in Canada between 1999 and 2008, and found that approximately 38% of trespassing or

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33 Transport Canada, *Enhancing Rail Safety in Canada: Working Together for Safer Communities: The 2017* Railway Safety Act *Review* (2018), section A: Introduction – Mandate.

pedestrian accidents were suicides, meaning that approximately 62% were a result of misadventure.[34]

In its submission, Operation Lifesaver noted an increase in trespassing and pedestrian[35] accidents and was concerned that this number would continue to rise as rail traffic grows and the rail network expands. In 2016, Operation Lifesaver analyzed 5 years of data (2012–2016) collected from participating railways, which represented most of the trespassing and crossing occurrences reported to the TSB, and noted the following:

- A large proportion of the people trespassing were men between the ages of 18 and 35.
- Men are 3 times more likely than women to be involved in a crossing or trespassing accident.
- A March 2017 survey about rail safety awareness and attitudes across Canada showed that most of the survey respondents (nearly two thirds) had either engaged in or witnessed questionable behaviours near railway tracks.

The submission identified 4 areas that Operation Lifesaver recommended for consideration:

- more awareness and engagement from all levels of government
- more investment in and transparency about data gathering
- harnessing existing technologies to improve safety
- suicide prevention

With respect to data gathering, Operation Lifesaver noted that the specific demographic data available were not comprehensive enough to be fully accurate. Further, the strategies required for suicide prevention are likely different from the strategies to address accidents due to misadventure. Because there were no recent data relating to suicides, Operation Lifesaver stated that

> accurate data about rail-related suicides and potential suicide "clusters" would also provide valuable information for designing interventions. Access to these sources of data would allow [Operation Lifesaver] to be much more strategic and impactful with its rail safety outreach and campaigns.[36]

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34 B.L. Mishara and C. Bardon, "Characteristics of railway suicides in Canada and comparison with accidental railway fatalities: Implications for prevention," *Safety Science*, Vol. 91 (2017), pp. 251–259.

35 Pedestrian occurrences involve people being struck by railway equipment at a recognized railway crossing.

36 Operation Lifesaver, *Preventing Rail-Related Injuries and Deaths in Canada: A submission to the Railway Safety Act Review Panel* (September 2017), p. 10.

1.9.2 Proximity to railway tracks and interaction between the public and trains

As cities expand, new developments near railway tracks have led to increased interaction between the public and trains. This issue was highlighted in the report published by the 2007 *Railway Safety Act* review panel, which contained the following recommendations:

> The *Railway Safety Act* should be amended to require the developer and municipalities to engage in a process of consultation with railway companies prior to any decision respecting land use that may affect railway safety.[37]
>
> The railway companies should expand their outreach programs to encourage better communication with the entire community.[38]

A formal proximity initiative began in 2003, with the signing of a memorandum of understanding (MOU) between the Federation of Canadian Municipalities (FCM) and the RAC that established the FCM/RAC Proximity Initiative. The MOU has been renewed several times. The 2007 version of the MOU recognized the stakeholders' shared responsibility and the need for better communication among various stakeholders, including railways, municipalities, and developers. As a result, the parties were to develop commonly understood proximity guidelines intended, among other things, to reduce the potential for trespassing.

In May 2013, through a collaboration between the RAC and the FCM, an updated version of the *Guidelines for New Development in Proximity to Railway Operations* was published. These guidelines were set out to provide a consistent approach to the design of buildings in context with their proximity to railway tracks, and the type of mitigation that needs to be implemented. The guidelines included, among other things, recommended setbacks for new buildings in proximity to railways, and security fencing to discourage trespassing.

With regard to security fencing, the guidelines made the following policy recommendation:

> Tresspass [*sic*] issues can be avoided through careful land use planning. Land uses on each side of a railway corridor or yard should be evaluated with a view to minimizing potential trespass problems. For example, schools, commercial uses, parks or plazas should not be located in proximity to railway facilities without the provision of adequate pedestrian crossings.[39]

Despite recent progress, only some provincial, territorial, and municipal governments have formally incorporated the proximity guidelines into their respective legislative frameworks, regulations, or bylaws governing land development (including land near rail infrastructure). Some provinces have been more proactive than others, such as the Province of Ontario, which has enacted legislation and developed guidelines that include many aspects of the proximity guidelines. However, the guidelines have not been adopted across the country.

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37 Railway Safety Act Review Secretariat, *Stronger Ties: A Shared Commitment to Railway Safety: Review of the Railway Safety Act* (November 2007), Chapter 7: Proximity Issues, p. 107.

38 Ibid., p. 125.

39 Railway Association of Canada and Federation of Canadian Municipalities, *Guidelines for New Development in Proximity to Railway Operations* (J.E. Coulter Association Limited, May 2013), p. 41.

Other than encouraging provinces, territories, and municipalities to adopt the guidelines, TC committed to raising issues of rail safety at the ministerial level through forums such as the Council of Ministers Responsible for Highway and Transportation Safety. No other specific federal initiatives were put in place to coordinate the implementation of these guidelines.

The FCM/RAC Proximity Initiative also made a submission to the *Railway Safety Act* review panel, in which it recommended that the review panel include the following recommendations in its final report:

- A recommendation to urge the federal government to work closely with its provincial counterparts to advance land use planning best practices in proximity to railway operations, that would include adopting mandatory setbacks and/or crash walls or other site-specific measures per the Guidelines for New Development in Proximity to Railway Operations by municipalities and provincial governments, and support provincial efforts to develop a notification to railways process that is aligned with provincial land use regulations.
- A recommendation to amend the Railway Safety Act to require road authorities to first consider alternatives to creating new grade crossings, including upgrading and improving safety at existing crossings and grade-separated crossings, before constructing a new grade crossing.
- A recommendation that the federal government ensure that new crossings or existing public or private crossings are upgraded to meet the current and future safety needs of the local community, and that federal funding for safety improvements to crossings, including possible grade separations and closures, is in place.[40]

In the RAC's submission to the 2017 Railway Safety Act review panel, it was estimated that, at the municipal level, about 60 municipalities, such as Montréal, Quebec, have adopted all or part of the proximity guidelines.[41] About 10 other large cities, including Toronto, are examining the proximity guidelines. In addition, more than 175 municipalities have adopted or are using this tool in their decisions on land use planning. As a result, the RAC made the following recommendation in its submission:

> As a means to reducing public safety incidents in municipalities and ensuring that there are nationally consistent standards for new developments in proximity to the railway network, the RAC recommends that the Minister of Transport directs provincial transportation ministers to adopt the RAC/FCM Proximity Guidelines in full. Included in this requirement should be a mandatory setback for new

40 FCM/RAC Proximity Initiative, *Prevention of Municipal–Railway Proximity Safety Issues through Effective Land Use Planning: A Submission to the Railway Safety Act Review Panel* (September 2017), p. 13.

41 According to the 2016 Census, there were 5162 municipalities in Canada; approximately 2000 municipalities are in proximity to railway tracks.

> development within proximity of rail operations of 30 metres with a federal backstop provision.[42]

In its 2017 submission to the Railway Safety Act review panel, Operation Lifesaver stated the following with regard to proximity issues:

> […] municipalities should be encouraged to adopt the Guidelines for New Development in Proximity to Railway Operations, which was co-authored by the Federation of Canadian Municipalities and Railway Association of Canada, and would require new developments to erect barriers to prevent trespassing, and municipalities to carefully plan road-railway crossings.[43]

1.9.3 Recommendations from the *Railway Safety Act* review panel relating to trespassing and the proximity of communities to railways

In its final report, published in 2018, the 2017 *Railway Safety Act* review panel addressed several issues concerning trespassing and proximity between railways and communities.

For trespassing, the report stated: "According to some roundtable session participants, rail safety education and awareness-raising can have the greatest impact on reducing trespassing when it is part of curricula and school activities intended for children."[44] The report indicated that communication and enforcement or the installation of fences and signage are essential for a prevention strategy based on education.

Railways emphasized to the review panel that all levels of government, railway companies, communities, and the public must collaborate in the initiatives to reduce trespassing because communities are expanding and their proximity to railway operations is increasing.

Fencing is normally considered an effective measure to prevent trespassing accidents. However, due to Canada's scattered population and the extent of its rail network, installing fences along rail lines would not be an appropriate strategy for preventing trespassing everywhere in Canada. Nevertheless, in urban areas where there is a high concentration of population around railway tracks, appropriate barriers could be an effective engineering solution.

The review panel also indicated that statistics currently available in Canada do not make it possible to accurately identify how many trespassing accidents are suicides. Therefore, the review panel suggested that more demographic data should be collected on grade crossing and trespassing accidents, including the identification of accidents that are suspected suicides. This information is essential to determine target groups in awareness campaigns and to take into account the characteristics of these groups in the development of trespassing and suicide prevention strategies.

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42 Railway Association of Canada, *Railway Safety Act Review: A submission by the Railway Association of Canada* (September 2017), pp. 19–20.

43 Operation Lifesaver, *Preventing Rail-Related Injuries and Deaths in Canada: A submission to the Railway Safety Act Review Panel* (September 2017), p. 9.

44 Transport Canada, TP 15145E, *Enhancing Rail Safety in Canada: Working Together for Safer Communities – The 2018* Railway Safety Act *Review* (2018), p. 66.

Because of the population growth, urbanization, and construction near railway tracks expected in the next few decades, the review panel recommended the following:

> Recommendation 7 – As human behaviour remains a persistent causal factor in rail-related deaths and serious injuries due to trespassing and grade crossings accidents, it is recommended that the federal government, in collaboration with other levels of government, the railway industry, academia and communities develop a national strategy to reduce the number of fatalities and injuries that result from trespassing on railway property. This strategy should comprise a number of components, including:
>
> A. a trespassing prevention program to create safer communities by promoting the development of long-term trespassing prevention measures through community-based partnerships. This includes sufficient and sustainable support for education and awareness programs, such as Operation Lifesaver Canada, to help them continue their activities in promoting rail safety among target groups;
>
> B. funding for research projects at universities and research centres to tackle trespassing and suicide issues; and
>
> C. linking to other initiatives, such as the Federal Framework for Suicide Prevention to work with other stakeholders to develop railway suicide prevention/intervention strategies that are evidence-based and supported by research.[45]

The review panel's report also discussed proximity issues and made the following recommendation:

> Recommendation 8 – It is recommended that the federal government provide leadership in addressing incompatible land use around rail operations by driving a substantive dialogue between all jurisdictions and stakeholders, with a view to developing a solution to land use near rail operations on a national scale. Measures to this effect should include:
>
> A. launching a senior government-level dialogue with the provincial/territorial governments to promote the formal adoption of measures equivalent to the "Guidelines for New Development in Proximity to Railway Operations," developed jointly by the Federation of Canadian Municipalities and the Railway Association of Canada, in land use planning policies that apply to municipalities;
>
> B. amendments to Part III (Non-Railway Operations Affecting Railway Safety) of the Railway Safety Act be made to provide the Governor in Council with the authority to make regulations requiring land use planning authorities to provide pre-notice to affected railway companies before authorizing land use or zoning changes, as well as construction within a prescribed distance (e.g., 300 metres) of a railway corridor; and
>
> C. amendments to Part III (Non-Railway Operations Affecting Railway Safety) of the Railway Safety Act to provide the Governor in Council with the authority to make regulations that define safety criteria for construction and activity within

[45] Ibid., p. 68.

> a prescribed distance (e.g., 30 metres) of a railway operation. Regulations should be developed in consultation with relevant provinces/ territories, Indigenous groups, municipalities, railways, associations, and citizen groups.[46]

1.9.4 Minister of Transport response to the report by the 2017 *Railway Safety Act* review panel

In April 2019, the Minister of Transport responded to the recommendations in the report published by the 2017 *Railway Safety Act* review panel.

With respect to Recommendation 7 on trespassing, TC agreed with the recommendation and stated the following:

> We are working with academia, industry and governments through the Railway Research Advisory Board (RRAB) to advance technological and behavioral research on grade crossing innovation and management strategies for vehicles and pedestrians at grade crossings. Our aim is to improve safety at crossings and adjacent to railway operations by:
>
> - targeting risk-taking behavior
> - improving and/or developing new warning and communication systems and technologies for all pedestrians
>
> The Rail Safety Improvement Program includes support to organizations to raise public awareness of safe practices near rail operations. This is helping to reduce the number of railway crossing and trespassing accidents in communities across Canada. An example is Operation Lifesaver's public education campaign "Look, Listen, Live."[47]

TC's next steps will be to work on trespassing prevention, including suicide research and prevention, with industry and with other federal departments and jurisdictions. It will also finalize work to identify and assess engineering options for pedestrian safety, including for people using assistive devices. To accomplish these next steps, TC's consultation document was completed and distributed in June 2019. New rail safety content, including a rail safety public education element, will be posted on TC's website at a later date.

With respect to Recommendation 8 on proximity, TC agreed in principle with the recommendation and stated the following:

> We need to do more work, in collaboration with partners, to determine the best way to respond to this recommendation. Transport Canada will continue to support rail crossing improvements, closures, technological innovation and public education through the Rail Safety Improvement Program (RSIP). This includes encouraging railway companies and road authorities to apply for funding for high-risk locations, and promoting the program to smaller road authorities and short line railways to increase their awareness of the program and application process.[48]

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46 Ibid., p. 74.

47 Transport Canada, Transport Canada's response to the 2017–2018 Railway Safety Act review report, April 2019, available at https://www.tc.gc.ca/en/reviews/transport-canada-response-2017-2018-railway-safety-act-review-report.html (last accessed on 21 May 2019).

48 Ibid.

TC stated that it would finalize current work toward grade separation guidelines in consultation with industry and community stakeholders. In addition, TC would continue to encourage provinces, territories, and municipalities to adopt the *Guidelines for New Development in Proximity to Railway Operations*.

1.10 Trespassing and pedestrian accident studies and tools for visualizing accident data

1.10.1 Tools developed by Canadian organizations

Two tools are available to visualize information about trespassing and pedestrian accidents on Canada's almost 45 000 km railway network.

The RAC has the Canadian Rail Atlas, an online interactive map of the railway network that was upgraded in 2016. Natural Resources Canada has developed the Geospatial Data Extraction tool, which can be used for the dynamic extraction of vector data.

However, because both of these tools use data from the TSB's Rail Occurrence Data System, personal information such as age, gender, medical information, and determination of cause (suicide or misadventure) is not included.

1.10.2 United States trespassing demographic studies

The U.S. Federal Railroad Administration (FRA) and the U.S. Department of Transportation sponsored demographic studies in 2008[49] and 2013[50] to provide data to policy makers and other groups to target individuals who are most at risk of being struck by trains while trespassing on railroad property. The data were obtained by reviewing accident reports submitted by railroads in accordance with FRA reporting requirements.

In the 2013 study, a review was conducted of 2750 trespassing accidents occurring between 2005 and 2010 in which the people trespassing were fatally injured. Coroners and chief medical examiners were contacted to obtain additional demographic information that had not been provided in the original accident report. The research has given organizations, such as U.S.-based Operation Lifesaver Inc., a better understanding of trespassing demographics that will allow them to better focus their efforts. Table 1 summarizes some of the demographic details from the 2 studies.

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49 Cadle Creek Consulting, *Rail Trespasser Fatalities: Developing Demographic Profiles* (U.S. Federal Railroad Administration, March 2008).

50 North American Management, *Rail Trespasser Fatalities: Demographic and Behavioral Profiles* (U.S. Federal Railroad Administration, June 2013).

Table 1. Selected data from the trespassing demographic studies conducted in the U.S. in 2008 and 2013: age and sex of individuals who died in trespassing accidents, involvement of drugs or alcohol, and confirmed suicides

Datum	Results from the 2008 study	Results from the 2013 study
Mean age of the person trespassing	37.5	37.9
Percentage of people trespassing who were male	87	82
Percentage of people trespassing who were female	13	18
Percentage of incidents in which drugs and/or alcohol were involved	57	52
Percentage of incidents that were confirmed suicides*	n/a	28

* The percentage of confirmed suicides in 2013 does not take into account the 12% of trespassing-related fatalities where suicide was suspected but could not be confirmed.

1.10.3 Volpe Center geographical information systems map for trespassing occurrences

The U.S. Department of Transportation Research Branch, Volpe Center, has developed a geographic information systems map to study where trespassing and suicide incidents occur along railway rights-of-way. Trespassing accidents are indicated on the map along with specific information relating to each occurrence, such as the date, time, location, trespassing activity, and a brief description of events. Geographic information systems mapping allows researchers to find information, including the following:

- when trespassing occurs (time of day, time of year)
- areas with high incident rates (hotspots)
- environmental or societal factors
- areas where there are worn pathways or communities that need to cross tracks

1.10.4 Collaborative European project on the reduction of suicides and trespassing on railway property

In October 2011, the European Union initiated a 3-year research project entitled REduction of Suicides and Trespassers on RAILway property (RESTRAIL). The output of the research project was the RESTRAIL Toolbox, an online problem-solving, step-by-step guide to educate railways on feasible implementation measures to prevent suicide and trespassing accidents. The toolbox summarizes practical information collected and produced during the project. For each proposed measure, the toolbox also includes links to scientific publications and a wide list of references to provide lessons learned.

RESTRAIL has resulted in measures to prevent and mitigate rail-related trespassing and suicide risks and has provided an opportunity for researchers worldwide to assess the effectiveness of some of these measures.

1.11 Forward-facing cameras on head-end locomotives

Forward-facing cameras are designed to record continuously when the locomotive is operating. Many railways have taken the initiative to install forward-facing cameras on head-end locomotives, even though they are not required by regulation.

As follow-up to this occurrence, the TSB was informed that the lead locomotive on train 141 was equipped with a forward-facing camera. The TSB requested the video recording from the camera; however, the TSB was informed that the forward-facing camera had not been recording at the time when the teenager was struck. The railway could not provide further details on why the forward-facing camera was not recording at the time.

1.12 Critical Incident Response Program for employees

Following traumatic railway events, involved employees can be prone to post-traumatic stress disorder (PTSD). Symptoms of PTSD include depression, nervousness, irritability, and restlessness. PTSD is not likely to subside and, if left untreated, the symptoms can become much worse with time. Reactions to traumatic events vary considerably from one individual to another.

In 2016, CP introduced the latest version of its Critical Incident Response Program for train crews. The program provides the following:

> Early intervention through defusing and debriefing benefits the employee through timely access to counseling, peer support and minimizes long term physical and emotion effects of an incident and assists an employee in returning to work in a safety and timely manner.[51]

In this occurrence, in accordance with CP's Critical Incident Response Program, the crew members on both trains were offered time off and received a debrief from a company manager. The crew members were also offered a more formal debrief with a trauma counsellor.

One of the crew members on Train 141 took time off and received a formal debrief before returning to work 2 weeks after the occurrence. The other crew member booked off for 24 hours after the occurrence before returning to work. Neither of the 2 crew members on Train 651 took time off or accepted a formal debrief.

All crew members were satisfied with the critical incident response assistance that the railway provided following the occurrence and believed that the assistance was beneficial to their well-being. There had been no pressure on the crew members to return to work before they were comfortable doing so.

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51 Canadian Pacific Railway, *Critical Incident Response Policy (Canada only)*, 01 April 2016.

2.0 ANALYSIS

Neither the actions of the train crews nor the condition of the rolling stock and track contributed to the accident. The analysis will focus on the factors that influence decision making by people trespassing on railway property, the mitigation of hazards associated with trespassing, and proximity issues that affect trespassing along railway corridors.

2.1 The accident

The accident sequence began when 2 teenagers entered, without authority, the railway right-of-way near the Howland Avenue grade-separated crossing. They were intoxicated at the time, having ingested psychoactive substances. When they saw the slow-moving westbound train (train 651), they climbed onto one of the tank cars, intending to travel to the nearby Christie Street grade-separated crossing. Once they were on board, the train accelerated, reaching a speed at which they could not easily disembark at their intended destination. They became anxious and were getting cold, so they called 911 in an attempt to have the train stopped. However, the phone connection was lost and the calls were unsuccessful.

After travelling about 20 miles, and as the train was decelerating to approximately 20 mph while it was ascending a long grade, the teenagers climbed down the side ladder in preparation to jump. Believing that the train had decelerated sufficiently for them to get off, they jumped from the tank car at the Wolfedale Road public crossing, sustaining injuries when they hit the ground. One was injured but still mobile, and left the crossing area to get help. The other sustained more serious injuries; she was temporarily immobilized and remained on the right-of-way.

About 10 minutes later, as westbound train 141 approached the Wolfedale Road public crossing at 23 mph, the teenager who was still on the tracks, and who was disoriented, stood up and began to walk south across track 2 and in front of the train. The crew applied the emergency brakes and sounded the whistle. The train could not stop in time and struck the teenager, who was then thrown southward and landed against the north rail of track 3, sustaining additional serious injuries. Both teenagers were taken to hospital for treatment.

2.2 Factors influencing the decision to trespass

An individual's decision to trespass on railway property is influenced by many factors, including

- perception and understanding of the level of risk associated with the activity
- personality factors (which can be age-related) such as impulsivity and sensation seeking
- the presence or absence of peers
- the person's psychophysiological state

In this occurrence, the teenagers were not specifically aware of the personal safety risks of accessing the railway tracks.

Compared with adults, teenagers' decision-making processes and perceptions of risk put them at an increased likelihood of making risky decisions regarding safety, including their own safety around railway property.[52] The presence of same-age peers[53] and the use of psychoactive substances also impair judgment and increase risky decision making.[54, 55]

In this occurrence, the teenagers had taken non-prescription alprazolam and psilocybin. The effects of these substances were still present when they decided to board the train. The teenagers' psychophysiological state, as well as their age, contributed to their decision to access railway property and board the slow-moving train.

2.3 Trespassing at the Howland Avenue crossing

In the vicinity of the Howland Avenue grade-separated crossing, there were a number of physical indicators that trespassing was common. These included a well-worn pathway at the gap between the fencing and the overpass barrier, an old roadbed running parallel to the track, and graffiti on the side of the signal bungalow. The occurrence teenagers lived in the area and had regularly observed other people trespassing on the railway property without any negative safety consequences.

In the vicinity of the Howland Avenue grade-separated crossing, "No Trespassing" warning signs were posted on the side of the signal bungalow. The warning signs were red and white, which were also the colours of some of the graffiti on the signal bungalow. With the limited visual contrast between the warning signs and the background graffiti, the signs were less conspicuous, making it less likely that trespassing individuals would see and read them. The signs would have been even less conspicuous in darkness.

If the "No Trespassing" warning signs are not sufficiently conspicuous and access to the railway tracks near the Howland Avenue grade-separated crossing is not prevented, people will continue to trespass on the railway right-of-way at this location, increasing the risk of injuries and fatalities.

2.4 Mitigating the hazards associated with trespassing

TSB data on trespassing occurrences show that there has been no significant decrease in the number of trespassing occurrences in the past 10 years (2009–2018). Understanding and mitigating the hazards associated with trespassing require a multi-faceted approach involving shared responsibility between the railways, municipalities, and other levels of

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52 P.E. Waterson, V.L. Kendrick, and P.J. Underwood, "Teenage trespass on the railways – a systems approach," *Proceedings of the Institution of Civil Engineers – Transport*, Vol. 170, Issue 5 (2017), pp. 287–295.

53 D. Albert and L. Steinberg, "Judgment and decision making in adolescence," *Journal of Research on Adolescence*, Vol. 21, Issue 1 (2011), pp. 211–224.

54 H. de Wit, "Impulsivity as a determinant and consequence of drug use: A review of underlying processes," *Addiction Biology*, Vol. 14, Issue 1, 2009, pp. 22–31.

55 S.D. Lane, O.V. Tcheremissine, L.M. Lieving, S. Nouvion, and D.R. Cherek, "Acute effects of alprazolam on risky decision making in humans," *Psychopharmacology*, Vol. 181 (2005), pp. 364–373.

government. Minimizing this risky behaviour can only be achieved by implementing effective engineering, enforcement, and education strategies. The absence of any one of these elements can result in an underestimation of the risks associated with trespassing on railway property, increasing the likelihood of this unsafe activity. If people continue to trespass on railway property, there is a continued risk of injury and fatality.

2.4.1 Engineering strategies and proximity issues

Effective engineering strategies provide one of the best measures to inhibit trespassing by way of effective physical barriers that prevent access to railway rights-of-way where possible. At the Howland Avenue grade-separated crossing, the railway tracks were easily accessed from either side. On the north side, there was a gap between the fencing and the overpass barrier. The gap was wide enough to accommodate a person without significant effort, and there was no indication of any pre-existing barriers. On the south side, there were several access points through broken fencing.

Although it may not be possible to completely fence the railway corridor in Canada, locations where trespassing commonly occurs need to be identified and additional engineering strategies need to be considered. In comparison, in Europe, the REduction of Suicides and Trespassers on RAILway property (RESTRAIL) project provides an online toolbox where railways share best practices on effective measures to prevent trespassing and suicides. Furthermore, signs should be located where they are clearly visible, but cannot be easily tampered with or vandalized. If collaborative engineering strategies are not developed and implemented effectively by all stakeholders to prevent access to railway rights-of-way, trespassing will continue, increasing the risk of personal injuries to the people who trespass.

As cities expand, new developments near railway tracks have led to increased interaction between the public and trains. Often, new developments in the vicinity of railway property will introduce additional risks to the public, particularly if effective safety strategies are not implemented.

Proximity of new developments to railways has long been recognized as a significant area of public safety concern. This issue was highlighted in the report by the 2007 *Railway Safety Act* review panel and was restated in the report published by the follow-up review panel in 2017. As a result of recommendations made in the report by the 2007 *Railway Safety Act* review panel, updated proximity guidelines were published to help communities manage development near railway property while keeping the safety of local residents in mind.

While many municipalities have adopted the proximity guidelines, others have not. These guidelines suggest minimum setbacks for new buildings and engineering strategies to help prevent trespassing. However, the use of the guidelines is not mandatory and they have not been consistently applied across all communities.

Other than encouraging provinces, territories, and municipalities to adopt the *Guidelines for New Development in Proximity to Railway Operations*, Transport Canada committed to raising issues of rail safety at the ministerial level, through forums such as the Council of

Ministers Responsible for Highway and Transportation Safety. No other specific federal initiatives were put in place to coordinate implementation of these guidelines, which would help ensure consistency for new developments in proximity to railway property.

If proximity guidelines are not adopted and applied by municipalities when new developments are constructed in the vicinity of railway property, public interaction with the railway will increase at these locations, increasing the risk of accidents.

2.4.2 Enforcement strategies

A person trespassing on railway property is in contravention of the *Railway Safety Act* and thus could be fined within the authority of the *Contraventions Regulations*. Currently, Canadian Pacific Railway (CP) Police conduct regular patrols on railway property, including being on the lookout for people trespassing, but have limited resources. When the CP Police Service is not available to respond to a report of trespassing, local police may be called in to assist. However, local police do not normally enforce railway trespassing-related laws unless there is an agreement in place with the railway. In cases where the person trespassing is still on railway property when the local police arrive, they are typically asked to leave the premises. Furthermore, for law enforcement to be effective, response times need to be as short as possible.

The CP Police Service has established agreements with local police agencies across the CP network to expand the number of law enforcement officials that are aware of and working to improve railway safety. In Ontario, the CP Police Service has 14 local police agencies acting on their behalf to enforce the Ontario *Trespass to Property Act*. To help ensure quick response times and increased patrols in areas of known trespassing, further agreements between the railway police and the local police could be made in Canadian municipalities where there is a significant presence of railway tracks.

Because section 26.1 of the *Railway Safety Act* is listed as a provision under the *Contraventions Act*, railway constables and any other peace officers are the only ones permitted to enforce the trespassing provision and issue fines. Thus, section 26.1 of the *Railway Safety Act* is not included in Schedule I of the *Railway Safety Administrative Monetary Penalties Regulations* and Transport Canada inspectors cannot issue fines to people trespassing on railway property.

If collaborative enforcement strategies are not developed and implemented effectively by road authorities and railways to discourage access to railway rights-of-way, trespassing will continue, increasing the risk of personal injuries to the people who trespass.

2.4.3 Education strategies

Education strategies involve ensuring that people are aware of the hazards of trespassing on railway property. In Canada, Operation Lifesaver has implemented a number of active public awareness campaigns that include a mix of social media, face-to-face presentations, and out-of-home advertising (such as bus posters and billboards). However, neither of the teenagers involved in this occurrence had attended an Operation Lifesaver presentation,

nor were they aware of the Operation Lifesaver program. Several education strategies in Canada and internationally have targeted the hazards associated with trespassing on railway property.

Risky behaviour is highest among teenagers. Traditional methods of educating the public have become less effective. Social media has become a more effective way to reach younger audiences. While capturing the imagination of the public can be done in a relatively economical way through social media, targeting this younger audience properly can be more difficult.

If targeted education strategies are not developed and implemented effectively, trespassing on railway property will likely continue, increasing the risk of personal injuries to the people who trespass.

2.4.4 Demographic and geographic data

The 2017 *Railway Safety Act* review panel recommended the need for more comprehensive demographic and geographic data on trespassing accidents to identify the population groups to focus on and the location of trespassing hotspots. By identifying and understanding the demographics of the typical person who trespasses on railway property, specific strategies can be developed to address the issue. For example, the strategies required for suicide prevention are likely different from the strategies to address accidents due to misadventure. However, for trespassing occurrences, railways do not consistently collect demographic information such as age, gender, medical information, and determination of cause (suicide or misadventure), nor is this information required to be provided to the TSB, unless specifically requested. As a result, the information in the TSB's Rail Occurrence Database System about people who trespass does not contain enough detail to help identify the typical demographics of these individuals. Without a comprehensive demographic and geographic dataset for trespassing occurrences, it may not be possible to maximize the effectiveness of the engineering, enforcement, and education strategies to address the hazards associated with this high-risk activity.

2.5 Availability of recordings from forward-facing cameras

While forward-facing cameras are not required by regulation, recordings from these cameras are often helpful for understanding the circumstances leading to an accident.

Following this occurrence, the TSB was informed that, although the lead locomotive was equipped with a forward-facing camera, the camera had not been recording. The railway could not provide further details on why the camera was not recording at the time of the occurrence. Forward-facing cameras can be helpful in accident investigations, but in this occurrence, data were not available from the camera installed on the train.

3.0 FINDINGS

3.1 Findings as to causes and contributing factors

1. The accident sequence began when 2 teenagers entered, without authority, the railway right-of-way near the Howland Avenue grade-separated crossing.

2. The 2 teenagers, who were intoxicated at the time, having ingested psychoactive substances, climbed onto a tank car in the slow-moving westbound train (train 651), intending to travel to the nearby Christie Street grade-separated crossing.

3. The teenagers jumped off the tank car at the Wolfedale Road public crossing, sustaining injuries when they hit the ground.

4. One of the teenagers sustained more serious injuries than the other, was temporarily immobilized, and remained on the right-of-way. Shortly thereafter, train 141 struck the teenager, who was then thrown southward and landed against the north rail of track 3, sustaining additional serious injuries.

5. The teenagers were not specifically aware of the personal safety risks of accessing the railway tracks. Their psychophysiological state at the time of the occurrence, as well as their age, contributed to their perception that accessing railway property and boarding the slow-moving train was acceptable.

3.2 Findings as to risk

1. If the “No Trespassing” warning signs are not sufficiently conspicuous and access to the railway tracks near the Howland Avenue grade-separated crossing is not prevented, people will continue to trespass on the railway right-of-way at this location, increasing the risk of injuries and fatalities.

2. If people continue to trespass on railway property, there is a continued risk of injury and fatality.

3. If collaborative engineering strategies are not developed and implemented effectively by all stakeholders to prevent access to railway rights-of-way, trespassing will continue, increasing the risk of personal injuries to people who trespass.

4. If proximity guidelines are not adopted and applied by municipalities when new developments are constructed in the vicinity of railway property, public interaction with the railway will increase at these locations, increasing the risk of accidents.

5. If collaborative enforcement strategies are not developed and implemented effectively by road authorities and railways to discourage access to railway rights-of-way,

trespassing will continue, increasing the risk of personal injuries to the people who trespass.

6. If targeted education strategies are not developed and implemented effectively, trespassing on railway property will likely continue, increasing the risk of personal injuries to the people who trespass.

7. Without a comprehensive demographic and geographic dataset for trespassing occurrences, it may not be possible to maximize the effectiveness of the engineering, enforcement, and education strategies to address the hazards associated with this high-risk activity.

3.3 Other findings

1. Forward-facing cameras can be helpful in accident investigations, but in this occurrence, data were not available from the camera installed on the train.

4.0 SAFETY ACTION

4.1 Safety action taken

4.1.1 Transportation Safety Board of Canada

On 17 May 2018, the TSB issued Rail Safety Advisory (RSA) 02/18 to Transport Canada (TC) and Operation Lifesaver relating to the deterrence of trespassing activity on railway property. The RSA noted that unauthorized pathways were present leading to the railway right-of-way. The worn pathways indicate that trespassing was likely highly frequent at these locations. The RSA indicated that, given the inherent risks of trespassing on railway property, TC, Operation Lifesaver, railway companies, and local municipalities might wish to review and modify their strategies (as necessary) to control access to railway property, to enforce trespassing-related laws effectively, and to educate people on the associated risks.

In response to RSA 02/18, Operation Lifesaver indicated that it would continue to focus on delivering anti-trespassing messages to Canadians in the coming years in an effort to reduce the number of trespassing incidents.

On 25 June 2018, Canadian Pacific Railway (CP) responded to RSA 02/18, providing information relating to its comprehensive community safety and security program.

4.1.2 Canadian Pacific Railway

In May 2019, CP installed more fencing at Howland Avenue between the overpass barrier and the edge of the existing fence and installed another “No Trespassing” sign.

This report concludes the Transportation Safety Board of Canada’s investigation into this occurrence. The Board authorized the release of this report on 31 July 2019. It was officially released on 24 September 2019.