

In the matter of the Resource Management Act 1991 ("the Act")
and of submissions by Waka Kotahi NZ Transport Agency (submitter 275) on Proposed Waimakariri District Plan Review – Hearing Stream 5

Statement of Evidence of
Robert Swears for Waka Kotahi - Transport Engineering



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CONTENTS

1	QUALIFICATIONS AND EXPERIENCE.....	1
1.1	Credentials.....	1
1.2	Code of Conduct.....	2
2	SUMMARY OF EVIDENCE.....	2
3	ROAD SAFETY OVERVIEW	4
3.1	Vision Zero	4
4	SIGNS	9
4.1	SIGN-S3	9
4.2	Duration of Sign Message Display.....	19
4.3	Digital Sign Transition	23
4.4	Sign Content.....	25
5	TABLE TRAN-1: HIGH TRAFFIC GENERATION THRESHOLDS.....	32
6	APPENDIX A: REFERENCES.....	38

1 Qualifications and Experience

1.1 Credentials

1. My full name is Robert Clive Swears. I am employed as a Technical Principal - Road Safety and Traffic Engineering in the Hamilton Office of WSP New Zealand Limited. I have been in this role for approximately eight years.
2. My qualifications include a New Zealand Certificate in Engineering, a Bachelor of Engineering degree with Honours from the University of Canterbury, and a Master of Engineering Science degree (Transport) from the University of New South Wales. I am a Chartered Member of Engineering New Zealand (CMEngNZ), a Member of the Engineering New Zealand (EngNZ) Transportation Group, and a Fellow of Engineering New Zealand (FEngNZ).
3. I am a Chartered Professional Engineer (CPEng) with an assessed practice field of "Transportation".
4. I have been carrying out professional engineering tasks related to the investigation, design, and construction of roading and highway projects for 33 years. I have worked on a variety of transportation projects throughout my career for various clients including public agencies (such as Waka Kotahi and local authorities) and, to a lesser extent, private individuals and / or organisations. I have been involved with the development of various proposed district plans and plan changes throughout my engineering career. Most recently, I provided advice to Waka Kotahi in relation to their submissions, further submissions, and Environment Court appeals regarding the Thames Coromandel District Council Proposed District Plan

(PDP) and their submissions on the Porirua and Upper Hutt City Proposed District Plans.

5. I have been engaged by Waka Kotahi to prepare road safety and transportation engineering evidence in relation to the Waka Kotahi submission on the proposed Waimakariri District Plan Review Hearing Stream 5 (HS5). My evidence is complementary to the statement prepared by Mr Pearson for Waka Kotahi.

1.2 Code of Conduct

6. I confirm that I have read, and am familiar with, the Environment Court's Code of Conduct for expert witnesses¹ and agree to abide by that Code. This evidence is within my area of expertise, except where I state that I am relying on the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2 Summary of Evidence

7. In summary, my evidence considers the matters described below and reaches the conclusions listed:
- (i) Waimakariri District Council has committed itself to reducing death and serious injury on the road network within the District. Therefore, the Council seeks to improve road safety within the District.

¹ Section 9 of the Environment Court of New Zealand Practice Note 2023.

- (ii) Road user distraction is a factor that contributes to the incidence of crashes. Therefore, increasing distraction for road users increases the potential for crashes to occur.
- (iii) Digital billboards are more likely than not to distract road users. Therefore, if they are permitted, they should be located where there are low levels of demand on drivers. In addition, the signs should function so that their dwell time, message transitions, luminance, and content minimise the potential for adverse effects on road users.
- (iv) The shorter the display time for a digital billboard, the more likely it is that the billboard will distract road users. Therefore, I agree with the conclusion of the Council Officer that the dwell times for digital billboards in the District should be not less than two minutes during the day and not less than 15 minutes during the night.
- (v) It is generally accepted that transition times between messages on a digital billboard should be short. Therefore, I agree with the Council Officer that the transition time between messages should be 0.5 seconds.
- (vi) Sign design that permits road users to comprehend sign messages requires the content of signs to be appropriately limited. Therefore, I consider that the District Plan should include clear guidance regarding the maximum content for advertising signs. In this statement I have described an objective method for determining the maximum acceptable content.
- (vii) In my opinion, the trip generation thresholds described in the Proposed District Plan (PDP), beyond which

transportation assessment is required, are higher than desirable and create the potential for confusion. Therefore, I consider the thresholds should be reduced and the District Plan provide a clear and simple method for determining the manner in which a combination of light and heavy vehicles can be converted to equivalent car movements. In this statement I have proposed thresholds and described a method for calculating equivalent car movements.

3 Road Safety Overview

3.1 Vision Zero

8. Before considering the implications of the PDP requirements in relation to the matters on which Waka Kotahi has submitted, I consider there needs to be context regarding the basis on which it is important to ensure the requirements of the PDP are aligned with the national Vision Zero approach to road safety.
9. In the Road to Zero strategy document (MOT, 2019), there are various references that are relevant to the Waka Kotahi submission; these include the following:
 - (i) “This strategy provides a [...] vision of a New Zealand where no one is killed or seriously injured on our roads. It charts a path to achieving this through: safe road infrastructure [...] safe road user behaviour; and improved management across the system [...]” (MOT, 2019, page 4).
 - (ii) “Fatigue, distraction and vehicle safety have been seen as priority issues [...]” (MOT, 2019, page 47).

- (iii) “Distraction of two seconds or more can significantly increase the likelihood of a crash.” (MOT, 2019, page 51).
 - (iv) The outcomes framework refers to enabling road users to make safe choices, which includes reducing the number of crashes involving death and serious injury where distraction is a contributing factor (MOT, 2019, page 63).
10. The Waimakariri Road Safety Committee has identified various issues of road safety concern, including intersections (Waimakariri DC, 2023a), for which there is a goal of reducing the number of fatal and serious crashes at Waimakariri intersections.
11. Among the activities that have been identified, Council seeks to “Explore ways to influence road user behaviour at intersections” (Waimakariri DC, 2023b, page 11). Taking into account that Council has an aim of reducing death and serious injury on the road network within the District, I have assumed that Council seeks to positively influence road user behaviour at intersections to reduce the potential for death and serious injury.
12. While the most recent operational Road Safety Action Plan (Waimakariri DC, 2023b) available on Council’s website is for the period 2019-2020, reference is made to education and enforcement regarding distractions. In my opinion, part of the Council’s role in relation to distractions is ensuring that the road network within the District does not permit the introduction of features that have the potential to distract road users.
13. While not specifically related to property access, another aspect of the Action Plan (Waimakariri, 2023b), which is relevant to this statement, is the importance of safety on rural roads. Council
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notes (Waimakariri, 2023b, page 5) that country roads are not motorways. Therefore, when access to and from the District road network is being considered, I consider it important for there to be controls on that access to minimise the potential for adverse road safety effects arising.

3.1.2 Safe System Principles and Pillars

14. “The Safe System is the gold standard in road safety and underpins Road to Zero, New Zealand’s road safety strategy [...] The Safe System principles are:

- We promote good choices but plan for mistakes.
- We design for human vulnerability.
- We strengthen all parts of the road transport system.
- We have a shared responsibility.” (Waka Kotahi, 2023a).

15. “A move to a Safe System way of thinking requires a mind-set shift from historical, outdated views of road safety.” (Waka Kotahi, 2023a). Part of that mind-set shift includes recognising that we should not endeavour to prevent all crashes (because that is impractical), but rather we should focus on preventing deaths and serious injuries from crashes.

16. The Safe System pillars, through which the Road to Zero vision can be achieved are:

- (i) Safe roads and roadsides;
- (ii) Safe speeds;
- (iii) Safe vehicles; and
- (iv) Safe road use.

17. From a Waimakariri District Plan perspective, it is impractical to expect some of these pillars (for example, safe vehicles) to be influenced, however, the safe roads and roadsides pillar is a fundamental aspect of the Safe System through which the District Plan can contribute to the vision of there being no deaths and serious injuries on the road network within the District.

3.1.3 Occurrence of Crashes

18. Notwithstanding that the definition has been around for some time, a crash can be defined as “[...] a rare, random, multifactor event preceded by a situation in which one or more persons failed to cope with their environment.” (Waka Kotahi, 2004).

19. While it could be interpreted from this definition of a crash that the road user is always “at fault”, the Safe System approach is that we have a shared responsibility for preventing and reducing the severity of crashes. The key point from the definition is that crashes are multi-factor events. Because there can be numerous factors associated with each crash, not all factors will necessarily be identified by those who report on each crash. Therefore, from a shared responsibility perspective, I consider that if there is uncertainty regarding the potential for an element of the road or roadside environment to contribute to a crash, a conservative approach should be adopted and steps taken to minimise the potential for such factors to contribute to crashes.

20. Diagrammatically, we can consider the multi-factor manner in which a crash occurs (or does not occur) as illustrated below.

Option 1: Crash Occurs	Option 2: No Crash
Intoxicated driver	Intoxicated driver
x Tired driver	x Tired driver
x Busy intersection	x Busy intersection
x Fault with vehicle	x Fault with vehicle
x Distracted by billboard	x Nothing (that is, zero)
x Wet weather	x Wet weather
x Substandard intersection design	x Substandard intersection design
x Low safety rating vehicle	x Low safety rating vehicle
x Power pole on roadside	x Power pole on roadside
x Travel speed faster than speed limit	x Travel speed faster than speed limit
= Crash occurs	= Nothing happens

21. In reality, there is not a mathematical equation that determines whether or not a crash will occur. However, the example above demonstrates that if we remove from the equation one or more of the factors associated with what would otherwise result in a multi-factor crash event, then a mistake is not made² and a crash that might otherwise occur does not occur. Removing a digital billboard (or not permitting one in the first place) from a location where that billboard would otherwise distract a road user and contribute to them making a mistake, eliminates the potential for that crash. Clearly, removing one of the other factors could also eliminate the potential for a crash, however, from a road safety perspective, the owners of the system (that is, all of us) have more control over some factors (for example, the

² Or, if a mistake is made, it does not result in a crash.

presence of a digital billboard) than over other factors (for example, someone driving tired).

4 Signs

4.1 SIGN-S3

4.1.1 Waka Kotahi Submission

22. In its submission, Waka Kotahi (2021) supports the SIGN-S3 provision, however, they propose two additional matters are included relating to transitions and lighting control. The key points of the Waka Kotahi submission in relation to SIGN-S3 are as follows:

- (i) Locations limited to specific zones; and
- (ii) Maximum area per sign; and
- (iii) One sign per site; and
- (iv) Static messages only; and
- (v) No more than two images / messages within a 24-hour period; and
- (vi) 0.5 second maximum transition time; and
- (vii) Minimum display time of one hour per message; and
- (viii) Lighting controls; and
- (ix) Screen blackout in the event of a fault; and
- (x) Not located in natural character area; and
- (xi) Not located in other specific areas; and
- (xii) Minimum setback criteria.

23. Some submitters opposed SIGN-S3 and Waka Kotahi (2022) presented a further submission in that regard. The key points of the Waka Kotahi further submission are that they do not support the submitter's (Go Media, 2021) proposal to remove the maximum area, number of images / messages and display time criteria.

4.1.2 Go Media Submission

24. Go Media (2021) raises various points in relation to digital billboards in its submission. On face value, I agree with some of the basic principles described in the Go Media submission, however, my interpretation of some of the principles described in the submission may be different to the interpretation of the submitter. The Go Media submission includes various points in relation to road safety and transport engineering. I have listed below some of those points and included brief commentary on them.

- (i) Billboards are an accepted part of the urban environment throughout New Zealand (paragraph 4).
 - While I agree that billboards are part of the urban environment, I am not aware of any basis on which they are “accepted” from a road safety perspective. As I have described in this statement, there is sufficient evidence regarding the adverse safety effects of billboards (whether digital or static) that I consider if a Safe System approach is being followed, billboards should not be permitted because of their potential to adversely affect road safety.
 - I have made various comments in this statement regarding measures that may reduce the adverse road

safety effects associated with billboards. Those comments should not be interpreted as my endorsement of billboards, but rather they should be taken as suggestions as to how billboards could be accommodated such that the adverse effects are reduced.

(ii) “The environmental effects of billboard advertising are able to be appropriately managed [...]” (paragraph 4).

- From a road safety perspective, I agree with this statement to an extent. Provided billboards are located where there is limited potential to distract road users and the content itself is unlikely to distract, then, if distraction occurs, the adverse effects of such distractions can be appropriately managed.
- An example of appropriate management with respect to location would be for digital billboards to be located on portions of the road network where there are very low demands on road users and where the consequences of a road user making a mistake are relatively low. For example, a clearly visible solitary digital billboard³ located at the far end of a long flat straight portion of road is unlikely to significantly distract a road user because the billboard would be visible over a long distance on approach to the billboard. If the section of road also has median and

³ For which there is a long display time for each advertising message, the transition between messages is very short and simple, and the messages themselves are clear and simple.

edge of carriageway road safety barriers, then if a road user makes a mistake, the barriers provide protection for that road user and other road users. This does not mean that crashes would not occur, but rather, when they occur there are features of the road and roadside that reduce the potential for death and serious injury.

- However, in addition to managing the location at which digital billboards are installed, the manner in which messages are displayed to road users and the potential for those messages to distract road users is an important component of appropriately managing the adverse road safety effects of digital billboards.
- Specifically with regard to location, Mollu et al (2018, page 54) states “Avoid installation of digital billboard signs in the vicinity of already attention demanding locations.” This reinforces the approach of billboards being located where there are low levels of demand on drivers. In that regard, intersections are not locations where there are low levels of demand.
- However, the counterargument to this position is identified by Meuleners et al (2020) who notes that in the presence of a digital billboard, the headway (or spacing) between vehicles tends more towards being high risk than when there is not a billboard present (refer to paragraph 36(ii) of this statement). Therefore, even in locations where the presence of a billboard is safer, there are still potentially significant road safety risks.

(iii) The effects of digital billboards are well known (paragraph 6).

- As described in this statement, there is some uncertainty regarding the effects of static and digital billboards. However, the effects are more likely than not to be detrimental from a road safety perspective.
- (iv) Billboards should have a minimum size of 18 m² (Appendix One, page 2).
- Through my work I have been involved with development of national guidance for the content of large road signs, which have some similarities from an effects perspective to advertising billboards. In my opinion, the key criterion to be considered is not the minimum size of a sign, but rather the criteria should be related to the position of the sign relative to road users, content of the sign (including frequency and speed of changes to the message(s), complexity of the message(s), and font type), and the speed at which road users approach the sign.
- (v) While Go Media considers that billboards make an important contribution to the wider district and that the effects of off-site signs are able to be managed, Go Media does not make any reference to road safety. (Appendix One, Policy SIGN –P1 [sic] (Go Media, 2021, page 7/21)).
- (vi) “The effects of digital signs are able to be managed such that effects are comparable to those of non-digital signs.” (Appendix One, Policy SIGNS-P3, page 8/21).
- As noted previously, I agree that the effects of digital signs can be managed. The parameters to consider in relation to that management include (but are not

necessarily limited to) the position of the sign and its content.

(vii) “[...] there is no environmental effects based reason to [limit digital signs ...] the effects of digital signage can be managed, [...]” (Appendix One, Policy SIGN-P4, pages 9-10/21).

- The position of Go Media in this regard is contradictory. On the one hand they propose that there are no environmental effects-based reasons to limit digital signs, but on the other hand they propose that the effects of digital signs can be managed. One of the ways of managing digital signs is to either prohibit or limit digital signs.

4.1.3 Adverse Effects Associated with Digital Billboards

25. Proponents for billboards (whether static or digital) sometimes argue that there is limited evidence to support a view that billboards can adversely affect road safety. However, before considering the adverse effects, it is appropriate to consider why there may be limited evidence in relation to the effects of billboards.

26. Zalesinka, (2018, page 439-440) notes that “Tests aiming to determine the relation between the increase of car [crashes] and the possible presence of LED billboards [...] Due to the complexity of this phenomenon, it is very difficult to determine [...] such a relation. Oftentimes, drivers themselves are not aware of all the factors that played a role in the [crash] or, fearing a fine or having to pay increased insurance premiums, fail to admit, on purpose, that the [crash] was caused because they were distracted by a billboard [...]”.

27. Wallace (2003) describes several pertinent points in relation to the contribution of road user distraction to the occurrence of crashes; these include the following:
- (i) “[...] there is the problem that ‘correlation does not imply causation’. Even if we found a perfect correlation between billboard numbers and [crash] rates, this does **not** prove that billboards cause [crashes]” [emphasis in original] (Wallace, 2003, page 4). However, it is also important to note that a lack of correlation in crash data does not indicate billboards do not contribute to crashes.
 - (ii) “Sometimes however the police merely have a form to fill in, and do not tick the ‘driver distracted’ box unless the driver volunteers the information.” (Wallace, 2003, page 6).
 - (iii) “[...] it does not follow from the fact that billboards are not provided as explanations for crashes in police records that they therefore do not function as such. [...] The fundamental precept of advertising is its impact on the subconscious mind. Therefore if a [... crash] has been directly or indirectly caused by the attention of a motorist being subconsciously attracted away from the highway by an advertising sign, he would not, of course, be in a position to testify that the presence of the sign was even a partial cause for the occurrence of the [... crash] This is yet another reason why the qualitative studies of [... crash causation] should be treated with caution.” (Wallace, 2003, 41).
28. The Waka Kotahi Crash Analysis System (CAS) records all reported crashes and, among the multitude of factor codes, includes Code 356, which relates to attention diverted by advertising signs. For the 2018-2022 five-year period CAS
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records 172,553⁴ crashes for all of New Zealand. Of those crashes, 33 are reported as having factor Code 356. That is not to say only 33 crashes involved a road user being distracted by advertising or signs, but rather only 33 crashes had the factor included in the Traffic Crash Report (TCR).

29. It is important to put TCRs in perspective. Unless a road user admits to distraction or the reporting officer (who is usually not a trained crash investigator) completing the TCR enquires as to whether advertising distraction was a factor, it is unlikely that distraction due to advertising signs will be recorded as a factor in the TCR. However, that does not mean only 0.02% of crashes⁵ have advertising distraction as a factor, but rather that the level of reporting is very low.
30. Zalensinka (2018, page 440) notes “The negative impact of LED billboards on the drivers' visual conditions was confirmed by surveys [...] The participants of the survey were asked about their attention being drawn to LED billboards. Ninety respondents, i.e. 80%, answered affirmatively to the question. Another question was: Do LED billboards distract you, as a driver, when you are driving? Most of the respondents, namely 69 people (62%), confirmed the negative impact of LED billboards on the visual conditions. The most commonly cited factor was the excessive brightness of the areas of billboards, followed by excessively bright colours and rapidly changing images.” Therefore, regardless of whether advertising distraction is

⁴ Crash data was retrieved from CAS on the morning of 3 August 2023.

⁵ 33/172,553 expressed as a percentage.

recorded as a factor on a TCR, studies indicate that digital billboards distract the majority of drivers.

31. The simplistic example provided in paragraph 0 of this statement indicates that when preparing a TCR the reporting officer is attempting to identify a multitude of factors for that report. Because there are so many factors to consider when preparing a TCR, there is a distinct possibility that some factors (such as attention distracted due to advertising signs) will either not be reported by road users or not be deduced by the reporting officer. The national crash database describes approximately 340 Factor codes (Waka Kotahi, 2016) that are assigned to the coded listings that are derived from the TCRs. Some of the factors (for example, Code 131 “Lost control when turning”) are likely to be more obvious to the reporting officer than others (for example, Code 354 “Attention diverted by [...] Animal or insect in vehicle”). Therefore, unless a road user involved in a crash volunteers information to the reporting officer or the reporting officer is able identify the contributing factor, the factor will not be in the TCR.
32. I consider that the observations of Zalesinka (2018) and Wallace (2003) are particularly relevant. The intended function of advertising billboards (whether static or digital) is for them to be viewed by the target audience; billboards that are visible from roads are intended to be viewed by road users. Therefore, because billboards (as well as official road signs) are intended to be viewed, they are intended to draw road user attention towards the sign.
33. True Impact Media (2023a) observes that “The possibilities for changeable screens, [...] are endless with digital billboards. Also,

they're more interesting to look at [...] they're better at grabbing people's attention, and their size is more extensive than most traditional billboards. [...] Digital billboards' 8-second intervals on a 64-second loop might be the ideal format for delivering a concise message. It will draw attention **without giving the observer a chance to turn away.**" [emphasis added].

34. That is, the advertiser wants as much content as possible on a digital billboard and they do not want observers to stop looking at the billboard. Advertisers want to maximise road user distraction.
35. While there is not robust data available that provides unequivocal evidence regarding the adverse road safety effects of digital billboards (and / or other sorts of advertising), there is sufficient evidence to indicate that digital billboards distract road users and result in adverse road safety effects. Therefore, on balance, I consider that it is more appropriate to take a conservative approach and recognise the potential for digital billboards to adversely affect road safety.
36. The following sources support my view regarding the appropriateness of a conservative approach:
- (i) "[...] there is now a substantial body of evidence that digital billboards have the potential to be distracting [...]" (Meuleners et al, 2020, page 1).
 - (ii) "A significant main effect for billboard [...] was found for time spent at high risk headway < 2 s [seconds]. More time was spent at high risk headway <2 s when the vehicle was in the vicinity of a billboard [...] compared to no billboard [...]"
A significant main effect for billboard [...] was also found for

time spent at very high risk headway < .250 s. More time was spent at very high risk headway < .250 s when the vehicle was in the vicinity of a billboard [...] compared to no billboard [...]" (Meuleners et al, 2020, page 5-6).

- (iii) "The consistent finding from this study is that the presence of digital billboards (compared to no billboard) adversely affected driving performance across most measures including mean speed, speed variability, high risk headway, variability in lane position and visual fixations." (Meuleners et al, 2020, page 6).
- (iv) "An overall conclusion is that the presence of a digital billboard results in a higher mental workload [...] distraction related to advertising billboards increases crash risk by a factor of 17 [...] a statistically significant increase of crash rate near billboards (before-and-after study). Other studies [...] have suggested that the contribution of roadside advertising to crashes is likely to be relatively small or even non-existent (before-and-after study). On the basis of the results it cannot be concluded that (digital) billboards increase crash risk nor can it be concluded that they have no effect on crash risk at all." (Mollu et al, 2018, page 46).

4.2 Duration of Sign Message Display

- 37. From a road safety perspective, the longer a message is displayed on a digital billboard the better. Describing the findings of a driving simulation study, Meuleners et al (2020) notes the following points (inter alia) in relation to the distracting aspects of electronic advertising billboards:

- (i) “Billboards with simple (versus complex) content presented at a long dwell time (60 s versus 40 or 20 s) had the least negative impact on driving outcomes. Billboards with complex content had similar negative effects on driving, regardless of dwell time.” (page 1).
 - (ii) “While the presence of digital billboards negatively affected driving performance, simple billboard content and longer dwell times were safer.” (page 1).
 - (iii) “[...] while the outdoor advertising industry prefers shorter dwell times, these shorter dwell times expose the traffic stream to more image changes over time, and is likely that the image change is a critical aspect of the attention capturing effect of a digital billboard [...]” (page 2).
38. Therefore, the shorter the dwell time per message the more likely it is that a road user will observe one message changing to another message, which means they will be distracted by more than one message and by the transition between messages. Depending on the location of the billboard, those distractions have the potential to adversely affect the road user’s ability to safely operate their vehicle.
39. Mollu et al (2018) considered the effects of digital billboards near pedestrian crossings. From a road safety perspective, there is robust logic in this approach given that pedestrians are among the most vulnerable road users. Mollu et al (2018) noted the following in relation to display times on digital billboards:
- (i) “The presence of a digital billboard, especially with short display time, leads to visual distraction, which has a

negative impact on driving behavior and traffic safety.”
(page 45).

- (ii) “[...] a longer display time of the message on the digital billboard was associated with less eye glances on the digital billboard.” (page 49).
- (iii) “Display time influenced the average number of glances on the digital billboard with a shorter display time resulting in more glances. However, the total eye glance duration was not influenced by display time. Furthermore, a road environment with retail stores generated more glances towards a digital billboard.” (page 51). This supports my view that if digital billboards are to be installed, they should be installed in locations where there are few other distractions for drivers (refer to paragraph 24(ii) of this statement).
- (iv) “Avoid too short display times (i.e., the longer the better);”
(page 54).

40. While the content refers specifically to types of advertisement, Ancaies (2023) notes “Considering billboards only, there is consistent evidence of more and longer glances at electronic billboards with movable displays, compared with static ones [...] and some evidence of more glances at electronic billboards with shorter display times [...]. Other studies found no major difference in the effect of static and electronic billboards on glances [... others] found evidence of worse driving performance (e.g. reaction time) in the case of movable displays, [... while others] found no significant effect.”

41. Essentially, there is not absolute certainty that digital billboards result in adverse road safety effects. However, taken on balance, it appears that digital billboards are detrimental to road safety. Therefore, from a Vision Zero perspective, I consider it more appropriate that a conservative approach is taken, and measures are put in place to strictly control the placement, function, and content of digital billboards.
42. Waimakariri (2023d, page 124) recommends “[...] that SIGN-S3 has no limitation on the number of images and includes a minimum 2 minute dwell time during the day and 15 minutes at night.”
43. I am not aware of any research that differentiates between the distraction and / or road safety effects of the display times of digital billboard messages during the day compared with during the night. However, regardless of the display time selected, there will be some road users that observe a message changing. Notwithstanding my opinion that digital billboards should not be located at high-risk locations such as intersections⁶, these are the locations at which there is most likely to be delay to road users. Taking into account typical delays at intersections, I consider it likely that a two-minute dwell time could result in a road user viewing three images. However, the time between image changes would be such that the road user is less likely to focus their attention on the billboard in anticipation of a change.
44. With reference to paragraph 33 of this statement, a two-minute dwell time would provide road users with the opportunity to

⁶ Refer to paragraph 24(ii) of this statement.

turn away from the billboard and focus on the driving task. Therefore, it does not appear to be unreasonable.

4.3 Digital Sign Transition

45. Waimakariri (2021, page 478/955) proposes there would be discretion (SIGN-MD1 and MD2) over transitions for digital billboards.
46. Waka Kotahi (2021, page 53/71) proposed that the only transition between two images on a digital billboard would be a “[...] cross-dissolve of a maximum of 0.5 seconds [...]”.
47. CTC (2012) describes a range of transition times for digital billboards as listed below:
- (i) The United States Federal Highway Administration (FHWA) provided guidance in 2007 that the transition time between messages should be between 1 and 4 seconds. (page 5).
 - (ii) CTC (2012, page 6-7) noted that Queensland had the most comprehensive regulations including a requirement that “The time taken for consecutive displays to change should be within 0.1 seconds.” and that “The complete screen display should change instantly.” These requirements apply regardless of whether the digital billboard predominantly displays graphics or predominantly displays text.
 - (iii) New York State regulations from 2008 required “Message transition time should be instantaneous to minimise distraction.” (page 9).

- (iv) Regulations from a community in Georgia required a “Transition time: less than one-tenth of a second, with no animated transitions.” (page 9).
 - (v) The Outdoor Advertising Association of America suggests that digital billboards “Have message transitions of at least one second.” (page 10), however, they also noted that digital billboards should “[...] not include animated, flashing, scrolling, intermittent or video elements.”
 - (vi) For Florida, CTC (2012, page 30) identified a requirement for an instantaneous transition.
48. Aside from the FHWA requirements (1-4 seconds), the transition times identified by CTC (2012) are aligned with what appears to be best practice. That is, from a road controlling authority perspective, the transition time should be effectively instantaneous.
49. Notwithstanding that the Waka Kotahi (2021, page 53/71) submission that “There shall be no transitions between still images apart from cross-dissolve of a maximum of 0.5 seconds [...]” indicates there could be some flexibility in the transition times (from 0 to 0.5 seconds), the submission point is aligned well with the widespread support for the principle of minimising transition times on digital billboards.
50. Waimakariri (2023d, 149) refers to “[...] a 0.5 second transition (not a maximum) should be required to provide a subtler change in image.” As noted above, there are various arguments regarding the most appropriate transition time, however, provided the 0.5 seconds to which the Council Officer refers is a fixed value (that is, the transition time must be 0.5 seconds and nothing else), I
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consider that the solution proposed by the Council Officer is reasonable.

51. Notwithstanding the appropriateness of the transition time, I note (and agree with) the Council Officer's conclusion that the transition "[...] shall be via a cross-dissolve [... and that] There shall be no other transitions between still images [...]" (Waimakariri, 2023d, page 27).

4.4 Sign Content

52. True Impact Media (2023b) provides useful advice regarding the content of digital billboards. Two key parameters with which I agree are:
- (i) "The bigger, the better - don't even think about using a tiny font on your digital billboard [...]".
 - (ii) "Keep it simple - [...] Stick with non-serif fonts and go for bold [...]".
53. SIGN-P3 (Waimakariri, 2021, Page 2 of 19) refers to "managing the [...] content [...] of signs" and SIGN-MD1 (Waimakariri, 2021, Page 54 of 86) describes a matter of discretion in relation to "The extent to which a sign's [...] content [...] and any digital transitions, could adversely affect transport safety, cause confusion, distraction or an obstruction to any road user."
54. Waka Kotahi (2022) refers to the Go Media (2021) submission in relation to SIGN-P3, however, neither the submission nor the further submission nor the PDP appear to provide any guidance regarding the manner in which sign content can or should be measured.

55. I have had (and continue to have) close involvement in the development of the Traffic Control Devices (TCD) Manual suite of documents, which provide guidance for road controlling authorities regarding the mandatory and recommended approaches to be followed in relation to “official” roadsigns. While the work is yet to be completed, the project team has identified objective methods for quantifying sign content. In my opinion, the principles of those methods can be applied to advertising sign content.
56. The Traffic Control Devices Rule (Ministry of Transport, 2022), and the Traffic Control Devices Manual ((Waka Kotahi, 2011a) and (Waka Kotahi, 2011b)) describe limitations on the content of signs that are intended to be visible to road users. However, those documents do not presently quantify the manner in which content should be limited.
57. I do not consider that the designation of a given road is the factor that influences the potential for signs to adversely affect road user behaviour. But rather, it is the content of the sign and the potential for the sign to draw road user attention away from the driving task.
58. Noting that the TCD Manual work is being carried out, there is not presently a final documented methodology of which I am aware that describes a simple method for limiting sign content. However, if Waimakariri District Council adopted a term such as “element”, I consider that the following definitions would be an appropriate starting place for defining what is meant by an element:
- (i) A single word equals one element. The number of elements included in words joined together without spaces

is equal to the number of words. For example, “wordsjoinedtogetherwithoutspaces” equals five elements.

- (ii) An established simple single logo equals one element.
- (iii) An image equals four elements.

59. For interpretation purposes the District Plan could include wording which makes clear that an element refers to each individual item which includes:

- (i) Each word used = 1;
- (ii) An email address = 1;
- (iii) A website URL = 1;
- (iv) A phone number = 1;
- (v) An image = 4; and
- (vi) A logo = 1.

60. However, caution should be applied to ensure that images and logos do not include fonts that are difficult to read. Similarly, logo design that effectively adds text to a sign message should be included in the word count.

61. While I am not advocating that such billboards are displayed (whether in a static or digital form) the examples below explain the application of my proposal for defining elements.

62. Figure 1 comprises four elements; namely a portion of the McDonald’s “M” logo and the words “on your left”.



*Figure 1: Advertising sign containing four elements
(image source: Famous Campaigns, 2023)*

63. Figure 2 comprises at least 12 elements; namely the logo (1 element), the image of the product (4 elements), the words “builds strong teeth” (3 elements, which has a font size that is too small), and the main image (4 elements). Although, it could be argued that the some of the words on the image of the product should be regarded as text with a difficult to read font type.



*Figure 2: Advertising sign containing 12 elements
(image source: HubSpot, 2023)*

64. The image below (Figure 3) is an example of a billboard that has been displayed in New Zealand.



*Figure 3: New Zealand digital billboard example
(image source: Go Media, 2023)*

65. Adopting the elements approach and considering fonts and other aspects of the billboard as presented, I note the following:
- (i) “Go Media” in the top left-hand corner is two words, which is two elements.
 - (ii) “Go Media” in the bottom left-hand corner is at least two words, which is at least two elements. However, the font is of a size that is smaller than appropriate, therefore, the text should not be included on the sign.
 - (iii) The word “Go” as used for the “Go Media” company name, resembles an R2-5.1 Hand-held go sign (MOT, 2022, page 104). Waka Kotahi (2011b, page 6-2) requires that “Advertising signs must not: imitate traffic signs or any traffic control device [...]”, therefore, the word “Go” should not resemble an R2-5.1 traffic control device.
 - (iv) “Will you protect us? Join the Forest & Bird whānau today” is 11 words, which is 11 elements.
 - (v) “forestandbird.org.nz” is a URL, which is one element.
 - (vi) The Forest & Bird logo is a logo, which is one element. However, the text below words “Forest & Bird” is too small and the “Giving Nature a Voice” font is of a type that is difficult to read and should not be used. Therefore, the logo should be limited to the tree and the words “Forest & Bird”.
 - (vii) The image of the birds is an image, which equates to four elements. Arguably, the kōwhaiwhai pattern on the left-hand side should also be counted as an image, however, I have not quantified that content for this example.

66. Notwithstanding the words that should not be included on the sign in any case, the Figure 3 example comprises 21 elements.
67. I consider that all parties associated with displaying advertising signs in the District (whether static or digital) would have certainty regarding acceptable content for signs if an objective approach such as the one described above is adopted for the District Plan.
68. Emphasising that the work is not yet complete, a similar approach is included in the draft version of Part 2 of the TCD Manual with which I am involved. However, the approach described in the draft is that the desirable maximum content for an intersection direction sign (as an example) is equivalent to 12 elements (or sign content that equates to 12 elements). The draft criteria also include limits on lines of text and positioning of words relative to each other. Noting that we are not comparing like with like, a similar approach could be adopted for the Waimakariri District Plan and a maximum content threshold of 12 elements adopted.
69. Considering the example provided as Figure 3 of this statement, the Forest and Bird billboard would not be permitted under the Waimakariri District Plan.
70. In relation to the system described above for determining the maximum content for a digital billboard, I consider it desirable for the District Plan to clarify that the Council Officer's references⁷ to the term "image" relate to a complete message

⁷ For example, Waimakariri (2023d, page 24).

on a single billboard display, which includes any and all images, text, and logos associated with each single static display.

5 Table TRAN-1: High Traffic Generation Thresholds

71. In its further submission, Waka Kotahi (2022) has opposed an increase to traffic generation thresholds as proposed by Woolworths (2021).
72. In paragraph 59, Woolworths (2021) states “[...] the provisions in the transport chapter (TRAN) require basic or full integrated transport assessments and corresponding resource consents for restricted discretionary activities for any activity that exceeds 250vmpd as an average daily traffic generation. This is quite a low threshold that [...] should be increased [...]”.
73. The submitter proposes (Woolworths, 2021, page 25/25) that the Council should “Amend Table TRAN-1 to increase the permitted daily traffic volume thresholds for supermarkets so as to align with the Auckland Unitary Plan threshold of 1,667m² [sic] of new retail GFA, after which an Integrated Transport Assessment is required and a restricted discretionary activity consent. [...] the triggers as notified are too low and therefore onerous in respect of the potential effects to be managed.”
74. However, in my opinion, the thresholds described in Table TRAN-1 are too high and should be reduced, rather than increased as proposed by Woolworths. The other matter that I consider needs to be addressed in relation to Table TRAN-1 is the uncertainty regarding the combinations of traffic generation that constitute high traffic generation.

75. Woolworths (2021) proposes that the thresholds are increased to match the approach and the Auckland Unitary Plan, however, I propose that the thresholds are decreased to match approaches adopted in other locations where existing traffic volumes and congestion are not as extreme as they are in Auckland.
76. In terms of volume, Table TRAN-1 refers to vehicle movements per day (vmpd) and heavy vehicle movements per day (hvmpd). However, it is not clear whether the thresholds listed in the table define thresholds for vehicles AND heavy vehicles or whether they are the thresholds for vmpd OR hvmpd.
77. In my opinion, the PDP should base trip generation thresholds on equivalent car movements (ECMs, sometimes referred to as equivalent car units (ECUs)) which is a theoretical basis by which heavy vehicles are regarded as equivalent to a specified number of light vehicles. Such an approach would make the wording of the Plan simpler because it refers to ECMs (or ECUs) rather than to a traffic generation comprising heavy vehicles and / or (subject to clarification by Council) light vehicles. While there is variation between local authorities, the ECM approach has been adopted by (for example) Palmerston North City Council (2022) and Thames-Coromandel District Council (Environment Court, 2019).
78. From a transport engineering perspective there is a significant difference between the effects created by small vehicles (cars, utes, vans, etc) and those created by larger vehicles (trucks, and multi-unit heavy commercial vehicles (HCVs)).

79. The PDP does not presently define “equivalent car movement”, therefore, a definition such as the following could be suitable for inclusion in the PDP. “One equivalent car movement (ECM) = 1 car / light vehicle movement, 3 ECM = 1 heavy commercial vehicle movement, 5 ECM = 1 combination heavy commercial vehicle movement (for example, truck and trailer, tractor unit and semitrailer, B-train, et cetera)”.
80. On the assumption that the traffic generation described in Table TRAN-1 is based on vmpd AND hvmpd the ECM volumes presently included in the PDP would be as described in the table below.

	Residential Zones et cetera	Commercial Zones et cetera	Rural Zones
Traffic generation as in PDP	> 200 vmpd > 50 hvmpd	> 250 vmpd > 50 hvmpd	> 200 vmpd > 50 hvmpd
PDP traffic generation (ecm) with all heavy vehicles being single unit	> 350 ⁸ ecm	> 400 ecm	> 350 ecm
PDP traffic generation (ecm) with all heavy vehicles being multi-unit	> 450 ⁹ ecm	> 500 ecm	> 450 ecm

81. The actual impacts will depend on the types of heavy vehicles associated with an activity; if the heavy vehicles are all single unit heavy vehicles there will be three ECM per heavy vehicle, however, if they are multi-unit heavy vehicles there will be five ECM per heavy vehicle. From an effects perspective, this is a significant difference that is not captured in Table TRAN-1 in its present form.

⁸ 200 + 3 x 50 = 350 ecm

⁹ 200 + 5 x 50 = 450 ecm

82. I consider it preferable that there is consistent terminology throughout the PDP in relation to vehicle movements. While the terminology is generally consistent and I anticipate that most transport engineering professionals would understand that one vehicle movement is the same as one vehicle trip, it would be beneficial to provide clarity so that other users of the District Plan do not conclude that one trip is equivalent to two movements.
83. There is nothing special about a threshold value of 100 equivalent car movements per day. The effects of a land use development that generates fewer than 100 equivalent car movements per day may be more than minor, however, I recognise that there needs to be some sort of threshold below which detailed analysis is not required for a land use activity to be considered acceptable.
84. In my opinion, the thresholds presently described in the PDP (notwithstanding the uncertainty as to what the values actually represent) create significant potential for the effects associated with an activity to be more than minor. The values to which I refer are the ones that Woolworths (2021) proposes are increased.
85. Waka Kotahi (2022, page 18 - 19) has opposed (and I agree with them) the proposal by some submitters that the trip generation thresholds in Table TRAN-1 should be increased and / or ignored for some activities. In my opinion, the values notified in the PDP are relatively high and are likely to result in more than minor adverse effects arising from some developments whose scale falls below the thresholds described in the table.

86. The Waka Kotahi (2022) further submission does not propose alternative values, however, based on thresholds adopted for other district plans, I consider there is merit in Waimakariri District Council adopting a threshold of 100 equivalent car movements, below which assessment is not required.
87. On a similar basis to Table TRAN-1 in the PDP (Waimakariri, 2021, page 240/955), I consider there is scope to have different thresholds depending on the type of road to which an activity gains its access, however, I consider those values should be lower than the ones described in the PDP. I also consider that the relaxation in trip generation values described by some submitters should not be accepted.
88. In my opinion, an approach such as the one adopted by Thames-Coromandel District Council (TCDC), as described by the Environment Court (2019), should be considered for adoption for the Waimakariri PDP. The table from the Environment Court decision, which I have included below, has parallels with Table TRAN-1 in the Waimakariri PDP.

Table 5-1: Trip generation thresholds for transport assessments (source: Environment Court (2019, Appendix A)

Table 8: Type of Assessment of Effects on the Transport Network				
<u>Vehicle Trip Generation</u>	<u>Road Hierarchy</u>			
	<u>Local</u>	<u>Collector</u>	<u>Arterial</u>	<u>Regional</u>
<u>Low (51-100 ECU per day)</u>	<u>n/a</u>	<u>n/a</u>	<u>Traffic Impact Assessment</u>	<u>Traffic Impact Assessment</u>
<u>Medium (101-250 ECU per day)</u>	<u>n/a</u>	<u>Traffic Impact Assessment</u>	<u>Traffic Impact Assessment</u>	<u>Integrated Transport Assessment</u>
<u>High (>250 ECU per day)</u>	<u>Integrated Transport Assessment</u>	<u>Integrated Transport Assessment</u>	<u>Integrated Transport Assessment</u>	<u>Integrated Transport Assessment</u>

89. Regardless of whether Waimakariri District Council adopts an approach such as the one described above, I agree with Waka Kotahi that the thresholds presently in the PDP should not be increased. From a transport engineering perspective, I consider the thresholds should be reduced significantly and clarity provided regarding the meaning of the trip generation thresholds.

Robert Swears

4 August 2023

6 Appendix A: References

90. I have referred to the following sources while preparing my evidence:

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