In the matter of	the Resource Management Act 1991 ("the Act")
and	of submissions by Waka Kotahi NZ Transport Agency (submitter 450 and further submitter 62) on the Proposed Te Tai o Poutini Plan

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

Robert Swears
Technical Principal – Road Safety and Traffic Engineering
NZCE (Civil), BE (Civil)(Hons), MEngSc (Transp), CMEngNZ, CPEng, FEngNZ
WSP, Level 2 / 99 Bryce Street
Hamilton 3204
wsp.com/nz

Private Bag 3057
Waikato Mail Centre
Hamilton 3240
T: +64 7 838 9344
M: +64 21 222 0699
Email: robert.swears@wsp.com

CONTENTS

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 (Civil) 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. 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). I have also provided advice to Waka Kotahi in relation to their submissions

and further submissions regarding the Upper Hutt City, Porirua City, Waimakariri District and Taupō District 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 (2022a) submission and further submission (Waka Kotahi, 2023) on the proposed combined West Coast District Plan; Te Tai o Poutini Plan ("TTPP" or "the Plan") for the West Coast region ("the Region"). 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 witnesses (Environment Court, 2023, Section 9) 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 listed below and reaches the conclusions listed:

   (i) High trip generating activities.

   (ii) Vehicle crossing design.

   (iii) Accessway separation.

8. My conclusions to this statement include the following points:

   (i) Trip generation for land use activities should be determined based on the scale and nature of those activities.

(ii) Equivalent car movements, rather than vehicle movements, should be used as the threshold for determining the transport effects of a land use activity.

(iii) Transport assessments for land use activities that generate greater volumes of traffic should be more comprehensive than for those that generate lower volumes of traffic.

(iv) Greater provision should be made for turning vehicles at accessways on rural roads than for commensurate volumes of turning vehicles on urban roads.

(v) Accessways should be designed and constructed so that surfacing materials do not migrate onto the intersecting road.

(vi) Distances between adjoining accessways and between accessways and intersections should be maximised in order to reduce the adverse safety and efficiency effects of movements to and from those accessways on the road network.

3 High Trip Generating Activities

3.1 Introduction

9. From a transport engineering perspective, different types of land use activities will generate different traffic flow profiles and comprise varying proportions of light and heavy vehicles. However, the impacts on the road network are dependent on the volume and composition of the traffic rather than on the specific land use activity. Therefore, I consider there is merit in defining high trip generating activities based on the actual trip generation for the activity rather than on land use specific development criteria.

10. Additionally, I consider it desirable for the District Plan to define thresholds based on an equivalent car movement (ecm) criterion rather than on generic vehicle movements.

11. From an assessment perspective, the effects of any given equivalent trip generation are likely to vary depending on the nature of the road onto which those generated trips connect with the road network. Therefore, rather than there being a single criterion for transport assessments, I consider there is merit in lower-level assessments being appropriate for some types of road and higher-level assessments for other types of road.

3.2 Trip Generation

12. Table TRN 6 of the Plan (TTPP, 2023a, page 743) refers to a range of land use activities and defines these as "High Trip Generating Activities". However, there will be other unlisted land use activities proposed for the Region that will generate traffic volumes commensurate with and / or greater than those listed in Table TRN 6.

13. In order to determine the overall trip generation potential for a specific activity it is necessary to identify typical trip generation rates for an activity of that nature and factor those rates by the scale of the activity. While I consider there is merit in the Plan defining "high trip generating" based on the volume and composition of traffic generated by the land use activity, I also consider it desirable for users of the Plan to be provided with guidance regarding indicative trip generation rates for various land use activities.

14. In my opinion, users of the Plan should be able to clearly identify the trip generation associated with any given land use activity. For example, at present, Table TRN 6 (TTPP, 2023a, page 743)

refers to residential activity comprising "20 residential sites / units" as being a high trip generating activity. However, depending on whether it is permissible for more than one residential unit to be developed on a site, the criterion does not identify the actual trip generation associated with the threshold. This is because residential trip generation is ordinarily determined based on the number and type of residential units rather than the number of sites on which those units are located. For instance, if two residential units can be established on each of 20 sites the threshold for high trip generating activities would be based on the trip generation from 40 residential units. However, if only one residential unit can be established per site, the trip generation threshold would be based on 20 residential units. The trip generation potential is very different between the two scenarios, however, the Plan regards both as being at the threshold of a high trip generating activity.

15. It appears that Table TRN 6 endeavours to define high trip generating activities but does not in all cases provide users of the Plan with sufficient detail to determine whether their land use activity will be defined as "high trip generating".

16. In my opinion, it would be desirable for the Plan to provide users with a guide as to the likely trip generation associated with an activity and to separately define the magnitude of trip generation that constitutes high trip generation.

17. For example, Waka Kotahi (2011, page 98) provides a summary of design trip generation rates for land use activities in New Zealand. However, the activities listed by Waka Kotahi (2011) do not cover all activities likely to occur within the Region, nor does the information provided by Waka Kotahi describe the typical proportion of trip generation associated with any given land use

activity that will comprise heavy vehicles compared with light vehicles.

18. Trip generation can be determined based on the nature and scale of an activity, however, assumptions need to be made regarding the proportions of the trip generation for that activity that are light vehicles and heavy vehicles. Those proportions will vary depending on the nature of the activity.

19. Once trip generation for an activity and the proportions of light and heavy vehicles have been determined, those values can be translated into a passenger car equivalency. This would provide users of the Plan with a relatively simple process for determining whether their activity is a high trip generating activity and the steps to be followed to analyse the effects of that activity.

20. If we consider the nature and magnitude of the activities described in Table TRN 6 of the Plan and apply to these activities the trip generation rates from the Waka Kotahi (2011) report, the daily trip generation for each of the activities is as described in Table 1 below.

Table 1: Trip Generation Associated with High Trip Generating Activities

TTPP Activity (from Table TRN 6)			Waka Kotahi (2011) RR 453 – Daily Trip Rate			Daily trip gen[1]
Name	Qty	Units	Land Use Categories	Rate	per	
Childcare incl. preschool, kindergarten and play centre	25	Children	3.1 Preschool	4.1	Child	102
Education – Schools	30	Students	3.2 Primary	1.6	Pupil	48
Education – Tertiary	150	FTE students	3.4 Tertiary	1.4	Student	210
Industrial	5000	sq.m GFA	4.4 Manufacture	30	100 sq.m GFA	1500
Mining and Quarrying	>30	heavy vehicle mvmt / day	No comparison available			-
Warehousing and distribution	6500	sq.m GFA	4.1 Warehousing	2.4	100 sq.m GFA	156
Healthcare	300	sq.m GFA	No comparison available			-
Office	2000	sq.m GFA	2.1 Office	26.1	100 sq.m GFA	522
Residential	20	sites /units	7.1.2 Dwelling (Suburban)	10.9	Dwelling	218
Retail – Shops and Supermarkets	250	sq.m GFA	*8.5 Supermarket*	129	100 sq.m GFA	322
Retail - Large Format and Bulk Goods	500	sq.m GFA	*8.6 Large format*	45	100 sq.m GFA	225
Service Stations	2	filling pumps	No comparison available			-
Mixed use or other Activities not otherwise listed in this Table	60	vehicle mvmt / day	No comparison available			-

21. The high trip generation thresholds described in Table 1 range from 48 vehicle movements per day to 1500 vehicle movements per day. In my opinion, there will be significant differences in the effects associated with this range of trip generation.

[1] Values are truncated to the closest whole number.

22. As an example of the importance of defining the land use activity, Waka Kotahi (2022a, page 59) refers to trip generation associated with drive-through retail activity and notes that such an activity with a floor area less than 250 m^2 may be a very high trip generating activity. Based on the Waka Kotahi (2011, page 98) report I concur with the submission. For example, a 249 m^2 fast food retail outlet (land use 8.8) would typically generate approximately 900 vehicle movements per day. While this is not higher than the highest value listed in Table 1 above, it does demonstrate the importance of trip generation being linked to the specific land use activity.

3.3 Equivalent Car Movements

23. The Plan (TTPP, 2023a, page 36) defines a heavy vehicle as "[…] a motor vehicle […] having a gross vehicle mass exceeding 3500kg [sic]". However, this definition covers a very wide range of heavy vehicles extending from relatively small single unit heavy vehicles through to multi-unit heavy vehicles that include, but are not limited to, high productivity motor vehicles (HPMV). For example, the transport engineering effects associated with a 4000 kg small truck are significantly different to those associated with a 61,000 kg HPMV (Ministry of Transport, 2016, page 100).

24. In my opinion, the Plan should base trip generation thresholds on equivalent car movements (ecm; sometimes referred to as equivalent car units (ecu)), 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 ecm (or ecu) rather than to trip generation comprising heavy vehicles and / or (subject to clarification by the combined councils) light vehicles.

25. 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).

26. From a transport engineering perspective there is a significant difference between the effects created by light vehicles (cars, utes, vans, etc) and those created by heavy vehicles (trucks, and multi-unit heavy commercial vehicles (HCVs), including HPMV).

27. The Plan does not presently define "equivalent car movement", therefore, a definition such as the following could be suitable for inclusion in the Plan. "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)".

28. Buller District Council (BDC, 2022, page 23) proposes that equivalent car movements are incorporated into the Plan in the manner described in the paragraph above. While the Council Officer (TTPP, 2023b, paragraph 652) makes reference to the BDC proposal, it is unclear whether the Council Officer accepts the proposal.

29. As an example of the ecm approach, GRZ – R5 (TTPP, 2023a, page 378) refers to a home business activity generating "A maximum of 4 heavy vehicle movements per day and whichever is the greater of 20 light vehicle movements per day or 140 light vehicle movements per week;" as being a permitted activity. However, from an effects perspective, this permitted activity does not consider the true nature of the effects. For the options presented by GRZ – R5, a home business generating 4 multi-unit

heavy vehicle movements per day (20 equivalent car movements per day) plus 20 light vehicle movements (20 equivalent car movements) per day (a total of 40 equivalent car movements per day) is at the threshold of being a high trip generating activity. However, a home business that does not generate any heavy vehicle movements, would only be a permitted activity if there were 20 or fewer light vehicle movements per day (20 ecm/day). The difference in effects is significant, however, both are permitted under the Plan.

30. If we apply equivalent car movements to the trip generation described in Table 1 of this statement, the differences in effects are likely to be more pronounced than indicated in the table. For example, I expect the proportion of heavy vehicle movements associated with a manufacturing activity (1500 undefined vehicle movements per day) will be greater than the proportion associated with a primary school (48 undefined vehicle movements per day).

3.4 Transport Assessments

31. Waka Kotahi (2022a, page 59) refers to proposed amendments for TRN S14 (TTPP, 2023a, page 743), however, I consider the criteria for transport assessments should be linked more closely to the trip generation for any given land use activity.

32. Subject to trip generation thresholds being based on equivalent car movements, rather than various combinations of light and heavy vehicle movements, I consider there is scope to have different thresholds for the level of transport assessment required depending on the type of road to which an activity gains its access and the trip generation associated with that activity.

33. 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 Plan. The table from the Environment Court (2019) decision is included below.

Table 2: Trip generation thresholds for transport assessments (source: Environment Court (2019, Appendix A)

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

34. For inclusion in the Plan, I consider it would be desirable to amend the road hierarchy used in Table 2 above so that it is aligned with the hierarchy used in the Region. However, in that regard, I note that the Plan (TTPP, 2023a, page 52) refers to the One Network Road Classification (ONRC) system (REG, 2013), rather than the One Network Framework (ONF) system (Waka Kotahi, 2022b). Therefore, to future proof the Plan, a table similar to the one shown above could be adopted for the Plan, with changes made to the descriptors for road hierarchy and for equivalent car movements rather than equivalent car units to be adopted as the trip generation unit.

3.5 Commentary on Foodstuffs Further Submission

35. In its further submission Foodstuffs (2023) opposes in part the Waka Kotahi submission in relation to trip generation. Foodstuffs proposes that the trip generation requirements of the Plan are amended "[…] as appropriate to fit with Foodstuffs' submissions.

These matters remain more appropriate as assessment criteria in TRN S14 as opposed to a new policy."

36. As noted in this statement, the effects associated with vehicle movements on the road network, as well as the manner in which vehicles enter and exit the road network, are dependent on the volume and composition of the traffic rather than on the specific land use activity. Therefore, I do not consider there should be any differentiation in the assessment required for a supermarket compared with any other land use activity. In addition, I consider that the threshold at which assessment is required for a particular activity should be based on equivalent car movements rather than on a combination of light vehicle movements and heavy vehicle movements.

37. Foodstuffs (2023) also note that supermarkets "[…] have operational and functional needs, and where customers require the use of a vehicle for shopping." This highlights the importance of a transport assessment being conducted because such an assessment will identify opportunities for promoting active mode (walking and cycling) journeys to a land use activity as well as the most appropriate manner for mitigating the effects associated with vehicle movements to and from that activity.

4 Vehicle Crossing Design

4.1 Rural Accessways

38. In response to the matter raised by Waka Kotahi (2022a, page 10) as to "[…] whether there is a need for a Diagram C or a Diagram E crossing. […]" the Council Officer (TTPP, 2023b, paragraph 576) invited Waka Kotahi to present technical detail regarding these design standards. This section of my statement provides that detail.

39. While I fully support the principles described by Waka Kotahi (2022a), I note that the submission does not appear to have taken account of different types of vehicle that would be using the accessways for which Diagram C and Diagram E crossing designs would be required. As noted in the preceding section of this statement, I consider that the Plan should base effects on equivalent car movements rather than on vehicle movements. However, the Waka Kotahi (2022a, pages 47 - 49, and 58) submission refers to "vehicle movements".

40. In its Planning Policy Manual (PPM), Waka Kotahi (2007, page 214) notes "[…] for accessway spacing, accessways that are likely to generate 100 or more ecm/day, or have peak hour flows of 20 or more ecm/hr, will normally be treated as intersections […]".

41. For accesses in the "rural and peri-urban areas" (Waka Kotahi, 2007, page 214) that do not need to be treated as intersections, Waka Kotahi (2007) provides the table and diagrams below to define treatment of accessways.

Table 3: Accessway types (Waka Kotahi, 2007, Table App5B/4)

Type of traffic using accessway (more than one slow, heavy or long vehicle movements per week?)	**Volume of traffic using accessway (ecm/day[37])**	**Volume of traffic using state highway (vpd)**	**Accessway type**
No	1-30	< 10,000	Diagram and Perspective C
		>=10,000	Diagram and Perspective D
	31-100	< 10,000	Diagram and Perspective D
		>=10,000	Diagram and Perspective E
Yes	1-30	All	Diagram and Perspective D
	31-100	All	Diagram and Perspective E

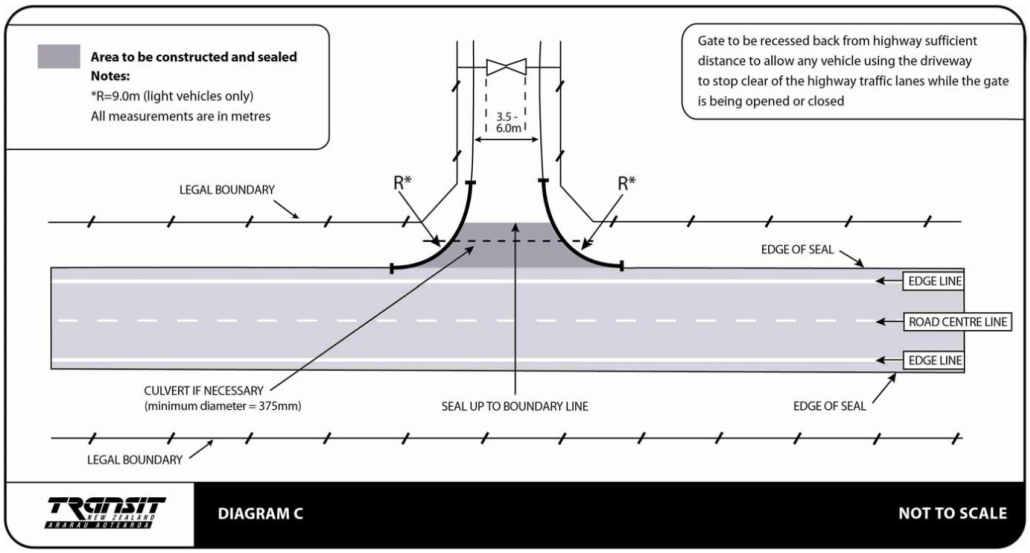

Figure 1: Diagram C (Waka Kotahi, 2007, page 216)

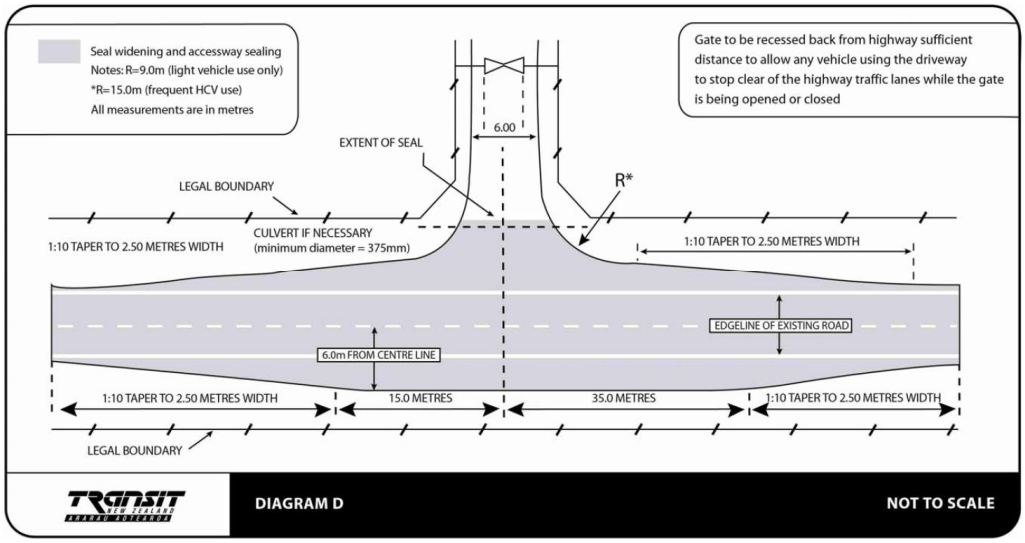

Figure 2: Diagram D (Waka Kotahi, 2007, page 218)

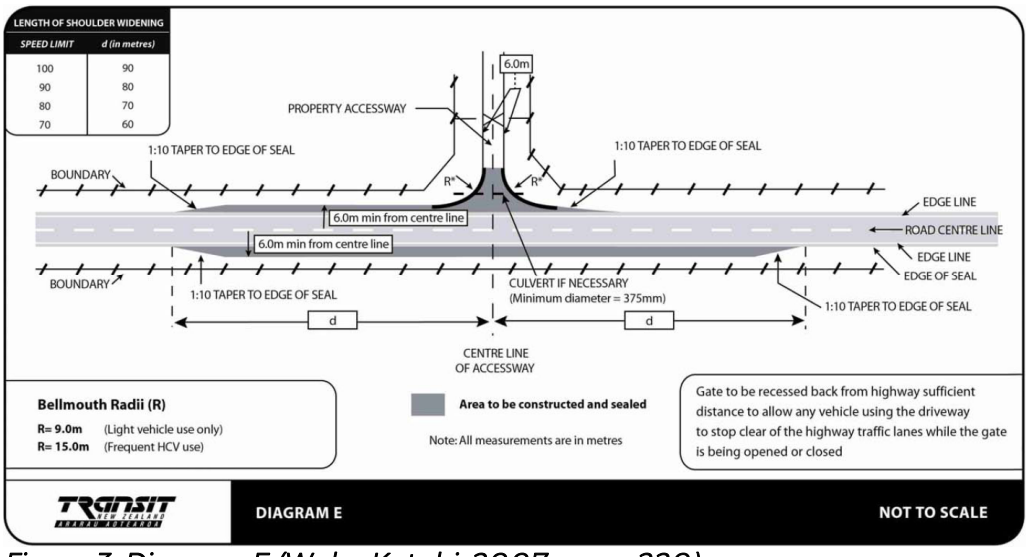

Figure 3: Diagram E (Waka Kotahi, 2007, page 220)

42. There is an important difference between the contents of the PPM and the Waka Kotahi (2022a) submission in that the former refers to Diagram D, while the submission specifically excludes reference to Diagram D. My understanding is that Diagram D is no longer favoured by Waka Kotahi because road users do not appear to have a good understanding of the manner in which a Diagram D treatment should be used.

43. Based on my detailed knowledge of a fatal crash at which a road user did not use a Diagram D treatment in the intended manner, I consider there is merit in the Waka Kotahi approach of proposing to not incorporate the Diagram D treatment in the Plan for locations at which accessways intersect with state highways. However, if Diagram D is not incorporated, the need for a Diagram E treatment at potentially lower turning volumes than described in the PPM becomes more important.

44. Although, based on my experience, there can be issues with the manner in which road users behave at Diagram D access treatment locations, there may be situations on the local road network for which the combined councils consider it appropriate for the Plan to permit the establishment of a Diagram D type access.

45. In my opinion, it would be better to provide some localised widening on a road at the point where an accessway intersects than to provide no widening at all.

46. Notwithstanding the question of the inclusion of Diagram D, the Waka Kotahi criteria for different access treatments consider whether an accessway accommodates "more than one slow, heavy or long vehicle movements per week […]". The table (Table 3 of this statement) also refers to equivalent car movements

using an accessway. However, the Waka Kotahi submission (2022a) refers only to vehicle movements. Therefore, as discussed in Section 3 of this statement, I consider the references in the Plan should be based on equivalent car movements rather than vehicle movements.

47. With specific reference to the submission, Waka Kotahi (2022a) has stated:

(i) GRUZ-R9 (page 47), RLZ-R8 (page 48), and SETZ-R9 (page 49); "[…] Diagram E […] is sufficient for 30-100 vehicle movements per day to the state highway."

(ii) TRN-SX-NEW (page 58) "Waka Kotahi generally requires that within the rural zone with speed limits of 70km/h [sic] or greater than [sic] either the Diagram C or Diagram E vehicle crossings be required, which are sufficient for 0-30 or 30-100 vehicle movements per day, respectively."

48. There is nothing particularly special about the threshold values described by Waka Kotahi, however, the values to which the submitter refers are well-established in many district plans and accepted as appropriate treatments for accessways.

49. Taking into account the Waka Kotahi submission that Diagram D is not included in the Plan for accesses intersecting with state highways and the potential that accessways in some rural and peri-urban locations will not service more than one slow, heavy long vehicle movement per week, I propose the following provisions for the Plan that capture the key points from the Waka Kotahi submission, but also address the equivalent car movement criteria described in Section 3 of this statement:

50. For locations on roads within the Region where the speed limit is 70 km/h or more, the minimum accessway design standard should be in accordance with the Waka Kotahi (2007) Diagram C treatment where:

    (i) There will be very few, if any, heavy vehicles (as defined in the Plan) using the accessway. In this regard, "very few" should be taken to mean no more than two heavy vehicle movements per week; and

    (ii) The volume of traffic using the accessway is less than or equal to 30 equivalent car movements per day.

51. In paragraph 50(i) above, the reason I have proposed "no more than two" is because a heavy vehicle needs to be able to enter and depart the accessway, which results in two movements.

52. For locations on roads within the Region where the speed limit is 70 km/h or more, the minimum accessway design standard should be in accordance with the Waka Kotahi (2007) Diagram E treatment where:

    (i) There will be more than two heavy vehicle movements per week; and / or

    (ii) The volume of traffic using the accessway will be in the range from 31 to 100 equivalent car movements per day.

53. Specific design will be required for accessways where the volume of traffic moving to and from the accessway is greater than 100 equivalent car movements per day.

4.2 Urban Accessways

54. The Waka Kotahi (2022a) submission is essentially silent in relation to treatments for urban accessways. However, I note that the Waka Kotahi (2022a, page 10) reference in relation to

TRN - R1 does not include any qualifiers as to whether the criteria should be limited to rural accessways only. The existing draft of the Rule (TTPP, 2023a, TRN - R1, page 103) does not appear to differentiate between urban and rural roads.

55. Two of the key differences between typical urban roads and rural roads are:

(i) The intervals between accessways are usually less in urban areas and, because of the nature of the adjoining land use, road users are more likely to expect there to be turning movements to and from accessways.

(ii) The speed limit (and the associated speed at which vehicles are moving) is ordinarily higher in a rural area. When crashes occur, there is typically a greater impact speed (than in urban areas) and, consequently, a greater potential for death and serious injuries to result.

56. Therefore, I consider it is appropriate for the controls in rural environments to be more restrictive than those in urban environments. However, that does not mean specific treatments are not required for accessways in urban areas.

57. For urban environments, the assessments described under Section 3.4 of this statement would be the process through which the most appropriate treatments for urban accessways would be determined.

4.3 Effects of accessway surfacing materials on adjoining roads

58. Regardless of the assessment process followed, I consider it important for the Plan to clarify that all accessways (urban and rural) should be constructed of materials that will not result in migration of the accessway surfacing on to the carriageway of the adjoining road. Similarly, I consider the Plan should include

requirements to ensure that materials (such as mud) from adjoining land use activities are not tracked onto the intersecting road by vehicles exiting those activities.

59. In relation to transport objectives, the Plan (TRN – O3, TTPP, 2023a, page 101) refers to enabling the "[…] accessibility, safety and connectivity of land transport infrastructure and consider the amenity of all transport users, including pedestrians and cyclists."

60. To enable the TRN – O3 objective to be met, I consider[2] it desirable for the Plan to include provisions requiring the control of accessway materials such that these do not migrate (or are otherwise tracked) onto road user paths (including foot paths, shared paths, cycle paths, cycle lanes, road shoulders and / or traffic lanes).

61. As an example of the effects, Waka Kotahi (2017, page 23) notes that surface debris such as gravel from unsealed accessways can create sudden changes in available friction and can cause loss of traction for (in this case) motorcyclists.

62. While not an extreme case, the image below is a second example that illustrates migration of gravel from an unsealed accessway onto SH6 north of Hokitika. The presence of the gravel on the shoulder is likely to discourage cyclists from continuing to ride along the shoulder and instead move into the live lane, which could place the cyclists in conflict with southbound motor vehicles. However, requiring controls on the surfacing of accessways; particularly those that slope towards a road, reduces the potential for such migration to occur.

[2] The matter described is just one of the variables that have the potential to affect the enablement of the objective.

Figure 4: Migration of accessway gravel (circled) on to SH6 on southbound approach to Hokitika (SH6: RP 463 / 4.35; image recorded 7 January 2023. Source: Argonaut, 2023)

63. Notwithstanding the importance of the requirements of TRN – P2 (TTPP, 2023a, page 102) for accommodating vehicle movements to and from sites, I consider it important that the accessways for sites do not adversely affect the ability for road users to have "safe, effective, and efficient movement" along the roads with which those accessways intersect. Therefore, I consider it desirable for the Plan to incorporate provisions requiring accessways to be constructed of materials that will not adversely affect the safety and efficiency of those roads with which the accessways intersect.

5 Separation of Accessways

64. Waka Kotahi (2022a, page 58) has submitted in relation to the separation of accessways relative to intersections and other accessways.

65. While Waka Kotahi correctly identifies that accessway separations in the PPM (Waka Kotahi, 2007, page 213) are based on speed limit criteria rather than land use activity zones, I consider there may be some merit in including reference to

zones as these may act as de-facto indicators of the largest sized vehicles likely to be turning at accessways.

66. Notwithstanding this point, it appears there is scope to reduce the complexity of TRN Table 3 (TTPP, 2023a, page 735). It also appears there is potential to align the requirements of TRN Table 1 with the access spacings described in the PPM (Waka Kotahi, 2007, page 213).

67. However, I understand that the PPM is presently being updated and may include some changes to the parameters described in the 2007 version. I also note that at the time the Waka Kotahi (2022a) submission was prepared the author could not have been aware that Part 4 of the Traffic Control Devices Manual (TCD 4) for Intersections (which is presently being prepared and for which I am the lead author) would incorporate three "bands" of speed limits for a variety of parameters. Those bands are associated with speed limits of 30-50 km/h, 60-80 km/h, and 90-110 km/h.

68. I agree with the point raised by Mr Pearson (paragraph 7.4) that it is undesirable for there to be differentiation of parameters based on a speed limit of 60 km/h and I note that in terms of distances between accessways and intersections, and between accessways, it may be practical to adopt the TCD 4 approach of having three speed limit bands and aligning TRN Table 1 and TRN Table 3 with those bands where practicable.

69. In any case, various research and industry guidance identifies improved road safety outcomes where the separation of accessways from each other and from intersections is maximised. This in turn means that the number of accessways is minimised.

70. That is, the closer the spacing of accessways (whether to each other or to intersections), the greater the incidence of crashes associated with movements to and from those accessways. As speed limits and operating speeds increase, the likelihood of a crash resulting in death or serious injury also increases. Therefore, as speed limits increase the separation of accesses from other accesses and accesses from intersections should increase. In my opinion, the Waka Kotahi (2007, page 213) guidance (replicated below) is a useful starting place for consideration of such separations. However, I consider there is merit in applying the TCD 4 speed limit band approach.

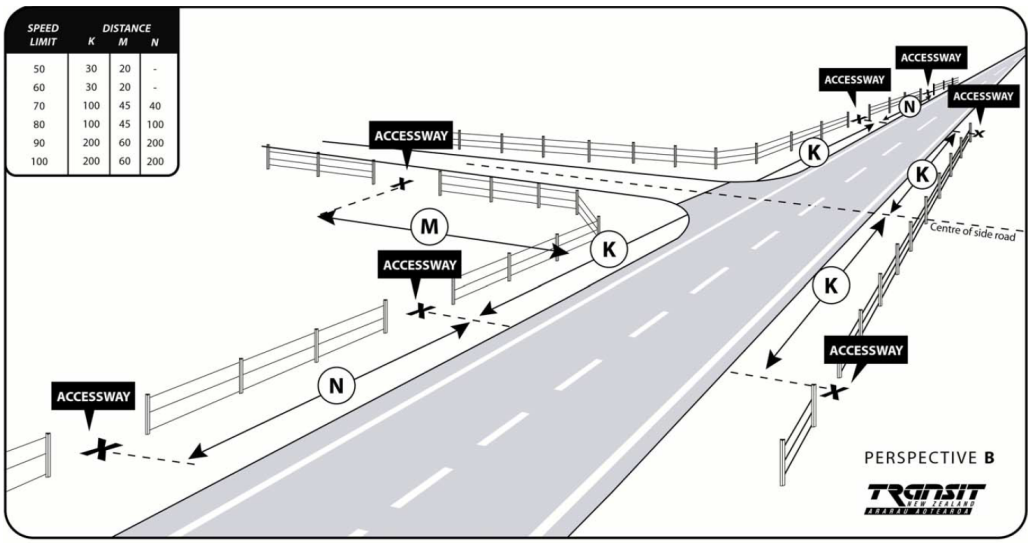

Figure 5: Perspective B (Waka Kotahi, 2007, page 213)

71. In relation to including zones in the Plan to define the minimum separation of an accessway from an intersection, consideration should be given to the types of vehicles likely to be operating within the zone. For example, with reference to Figure 5 above, in a location where the speed limit is 50 km/h, if a 22 m long (MOT, 2016, page 85) multi-unit heavy vehicle is turning from the main road into the side road and then into the first accessway on the side road, there is potential for the vehicle to partially obstruct the intersection as it turns (or is waiting to turn) into the

accessway. Therefore, in zones where there are likely to be multi-unit heavy vehicles, I consider it appropriate for the dimensions identified by Waka Kotahi (2007, page 213) to be increased.

72. Notwithstanding that, I prefer the approach illustrated by Figure 1 of Mr Pearson's statement in relation to the separation along a side road of an accessway from an intersection over that illustrated by Figure 5 of this statement. The minimum side road distance described by Mr Pearson is to the nearest edge of the accessway, rather than to the centre of the accessway (as illustrated by my Figure 5), therefore, Mr Pearson's approach includes a measure of conservatism. However, Mr Pearson's Figure 1 does not illustrate the separation of accessways from intersections along the "main road", nor the separation of accessways from accessways. Therefore, I consider it desirable for a diagram such as Figure 5 of this statement to be included in the Plan to provide clarity for users of the Plan. However, as noted, I have some concerns regarding the adequacy of some of the lengths described in the inset table of Figure 5.

73. I am not aware of research or guidance that describes optimal spacing for accessways; therefore, it is not practicable for me to make a definitive recommendation in this regard. However, researchers such as Schultz et al. (2010) have identified that adherence to appropriate separations between accessways and intersections "[…] improve safety and increases efficiency of the transportation network […]". Therefore, given its established place in the transport planning "environment" in New Zealand, I consider there is merit in adopting the Waka Kotahi (2007, page 213, Perspective B) approach as a reasonable starting place for determining appropriate separations to be included in the Plan.

6 Conclusions

74. My conclusions to this statement are listed below.

75. Trip generation for land use activities should be determined based on the scale and nature of those activities rather than being limited to specific land use activities that result in potentially significantly varying daily trip generation.

76. Trip generation should be based on equivalent car movements (ecm) rather than on vehicle movements so that the effects of heavy vehicles can be adequately considered when determining the effective magnitude of trip generation associated with an activity.

77. Transport assessments for land use activities that generate greater volumes of ecm traffic than specified levels should be required. However, the nature of the assessment should vary based on the ecm trip generation and the road with which the access to the activity intersects.

78. For the same ecm trip generation, greater provision should be made for turning vehicles at accessways on rural roads than on urban roads. In addition, the greater the trip generation the more significant the provision that should be made at the access.

79. While Waka Kotahi does not favour the Diagram D treatment illustrated in the PPM (Waka Kotahi, 2007), that should not necessarily preclude the use of the treatment on local roads within the Region.

80. Irrespective of the nature of the intersecting road and the volume of traffic using the accessway, accessways should be designed and constructed so that surfacing materials do not migrate onto the intersecting road.

81. Distances between adjoining accessways and between accessways and intersections should be maximised in order to reduce the adverse safety and efficiency effects of movements to and from those accessways on the road network. While there is not definitive guidance available regarding the "best" separation distances to adopt, I consider there is merit in the Plan incorporating separations no less than the Waka Kotahi (2007, page 213) parameters.

Robert Swears

3 November 2023

7 Appendix A: References

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

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- Environment Court, 2023, *Practice Note 2023*, Environment Court of New Zealand, Wellington.
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[Accessed 20 January 2022].
- Road Efficiency Group (REG), 2013, *Applying the One Network Road Classification, Guidelines*, Published December 2013, NZ Transport Agency, Wellington.
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https://ttpp.nz/wp-content/uploads/2023/02/ProposedTTPP_2023.pdf, accessed on 24 October 2023.

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- Waka Kotahi, 2011, *Trips and Parking Related to Land Use, NZ Transport Agency Research Report 453,* Waka Kotahi, Wellington.

- Waka Kotahi, 2022a, *Form 5, Waka Kotahi NZ Transport Agency submission on the notified Proposed Te Tai o Poutini - Combined West Coast District Plan under Clause 6 of Schedule 1 of the Resource Management Act 1991,* 2 November 2022, Waka Kotahi, Christchurch.

- Waka Kotahi, 2022b, *One Network Framework (ONF), Classification Guidance*, Waka Kotahi NZ Transport Agency, Wellington.

- Waka Kotahi, 2023, *Form 6, Further submission on the proposed Te Tai o Poutini Plan,* 26 May 2023, Waka Kotahi, Christchurch.