BEFORE THE INDEPENDENT COMMISSIONER

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of an application for resource consent for the construction and establishment of a storage and distribution facility, warehouses, ancillary offices and site remediation at 16A Wickham Street, Hamilton

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STATEMENT OF EVIDENCE OF VINISH ANAND PRAKASH
(Traffic)

Dated 15 November 2023

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INTRODUCTION

1. My full name is Vinish Anand Prakash.

2. I am based in Hamilton and have worked for Gray Matter Ltd as a civil designer and transportation engineer since February 2014. I hold a Bachelor of Engineering Technology (Civil, 2014) from the Waikato Institute of Technology (WINTEC). I am a Member of Engineering New Zealand.

3. I am familiar with the transport issues arising in and around the Waikato, having provided advice to Hamilton City Council (**HCC**), Matamata-Piako District Council (**MPDC**) and other local authorities and developers on a range of transport related projects in the area. I have also provided transport advice to Waka Kotahi NZ Transport Agency (**Waka Kotahi**) on a range of projects.

4. I have the following specific experience relevant to the matters within the scope and purpose of this statement of evidence:

    a) Consultant transportation engineer for Road Controlling Authorities assisting in the review of consent applications including industrial, commercial, childcare and residential developments within the wider Waikato region.

    b) Consultant transportation engineer for developers, landowners and local authorities preparing traffic impact assessments for development proposals including schools, industrial, commercial and residential developments.

    c) Consultant transportation engineer for MPDC reviewing the transportation effects of the wider Lockerbie Estate. I reviewed stages 1-3, the Lockerbie Retirement Village and the Lockerbie Neighbourhood Centre (including a cafe and childcare centre), provided evidence and attended the hearing for Plan Change 56 (stages 4-6). I have also reviewed the engineering plans for Stages 1

and 2 and provided safety engineer comments on behalf of MPDC for the Lockerbie Subdivision Stage 1b Post Construction Road Safety Audit.

d) Designer and draughtsperson for Road Controlling Authorities (**RCA**) and Waka Kotahi assisting with design of minor safety improvements and intersection improvements for local roads, and intersection improvements on state highways.

5. I have been engaged by HCC and Waka Kotahi to provide technical evidence on transport matters on their behalf in relation to 16A Wickham Street.

CODE OF CONDUCT

6. I am familiar with the Code of Conduct for Expert Witnesses (Environment Court Practice Note 2023) and although I note this is a Council hearing, I agree to comply with this code. The evidence I will present is within my area of expertise, except where I state that I am relying on information provided by another party. I have not knowingly omitted facts or information that might alter or detract from opinions I express.

SCOPE OF EVIDENCE

7. The purpose of this statement of evidence is to address transportation matters arising relating to the proposed Application to Waipa District Council (**Waipa DC**) for an industrial development at 16A Wickham Street. In my evidence I address:

a) The proposal;

b) Trip generation;

c) Existing crash history at the surrounding intersections;

d) Proposed Travel Management Plan;

e) Safety risk at the surrounding intersections; and

f) Alignment with Safe System and Vision Zero.

EXECUTIVE SUMMARY

8. The applicant proposes to develop an industrial activity at 16A Wickham Street. The site is located within Waipa District, however access to the site is via roads within Hamilton City.

9. I consider that the site could generate 90 veh/hr and 215 veh/day as per Table 6 of Ms Makinson's Statement of Evidence.

10. Based on my assessment of crashes at the SH1c/Kahikatea Drive intersection, the intersection is performing worse than expected based on the current traffic volume. At the Kahikatea Drive/SH1c intersection the actual crash rate of 1 DSi/year is 178% higher than the predicted crash rate of 0.367 DSi/year.

11. The applicant has proposed a Traffic Management Plan (**TMP**) to limit right turns at the Kahikatea Drive/SH1c intersection. I am concerned about the effectiveness of the TMP and I consider that without physical restrictions to limit right turn movements, it will be difficult to ensure that all vehicles from both stages of the development do not right turn out at this intersection.

12. In my opinion, the proposed TMP does not mitigate the safety risk associated with right turns out of the SH1c/Kahikatea Drive intersection. I am concerned that the proposed TMP will not be effective in managing the risk, as the disciplinary/enforcement action associated with non-compliance is outside of the RCA's control, and driver behavior will only be captured during spot checks for a limited duration which do not account for non-compliance outside of spot check times.

13. In my opinion, allowing additional trips at the SH1C/Kahikatea Drive intersection while accepting that there is a crash risk and an inherent level of non-compliance by way of the TMP, does not align with the Safe System or Vision Zero principles and strategies.

THE PROPOSAL

14. The applicant proposes to develop an industrial activity at 16A Wickham Street. The site is located within Waipa District, however access to the site is via roads within Hamilton City. The site is shown as an orange rectangle in Figure 1 below. The red dashed line indicates SH1c, and the yellow lines indicate Wickham Street within HCC (solid line) and the ROW within Waipa DC (dashed line) for access to the site.

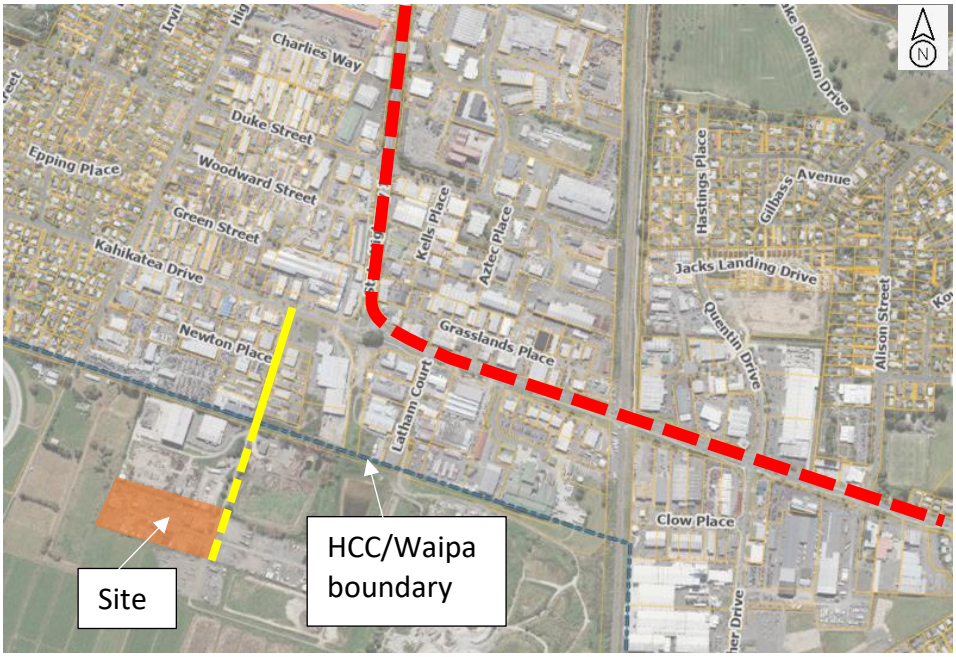

Figure 1: Site locality

15. The proposal, depicted in Figure 2 below is described by the applicant as:

a) Stage 1 Wattyl development which will include 3,640m² warehouse, 300m² office and 1,526m² dangerous goods store, and 19 parking spaces (including 2 accessible spaces).

b) Stage 2 which will include three warehouses that have areas of 626m², 626m² and 1,800m², and 24 parking spaces (including 2 accessible spaces). Each warehouse has an attached 300m² office.

c) Access which will be provided via two two-way vehicle crossings to Wickham Street ROW.

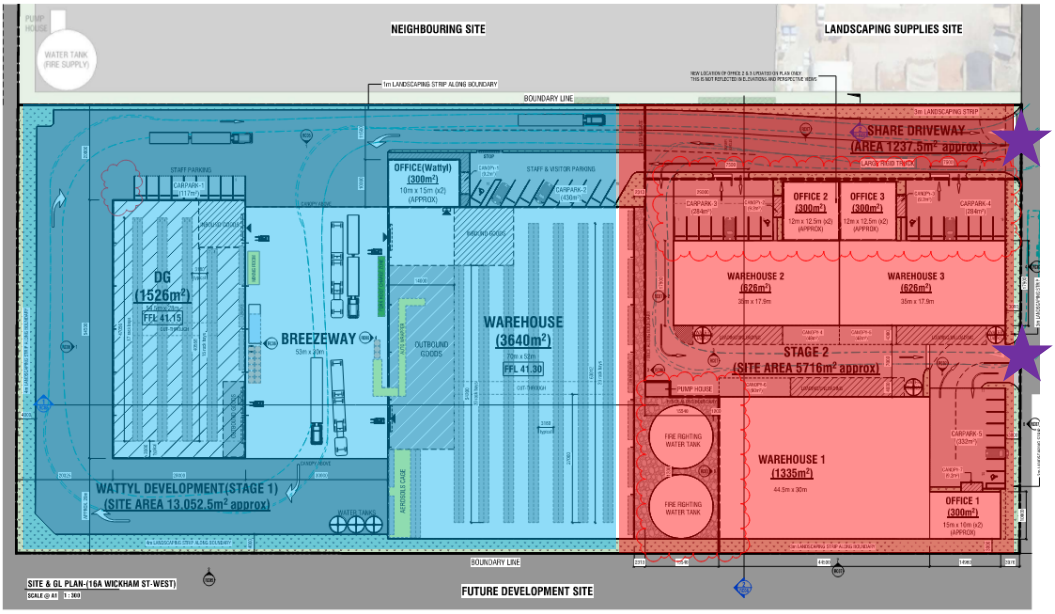

Figure 2:Proposed layout (Stage 1 = blue shading, Stage 2 = red shading, purple stars = vehicle crossings)

16. Access to SH1c from the site, as shown in Figure 3 below, will be via the Kahikatea Drive/SH1c intersection, SH1c/Duke Street intersection or via Killarney Road/SH1c intersection which will require a right turn at the Killarney Road/Higgins Road intersection.

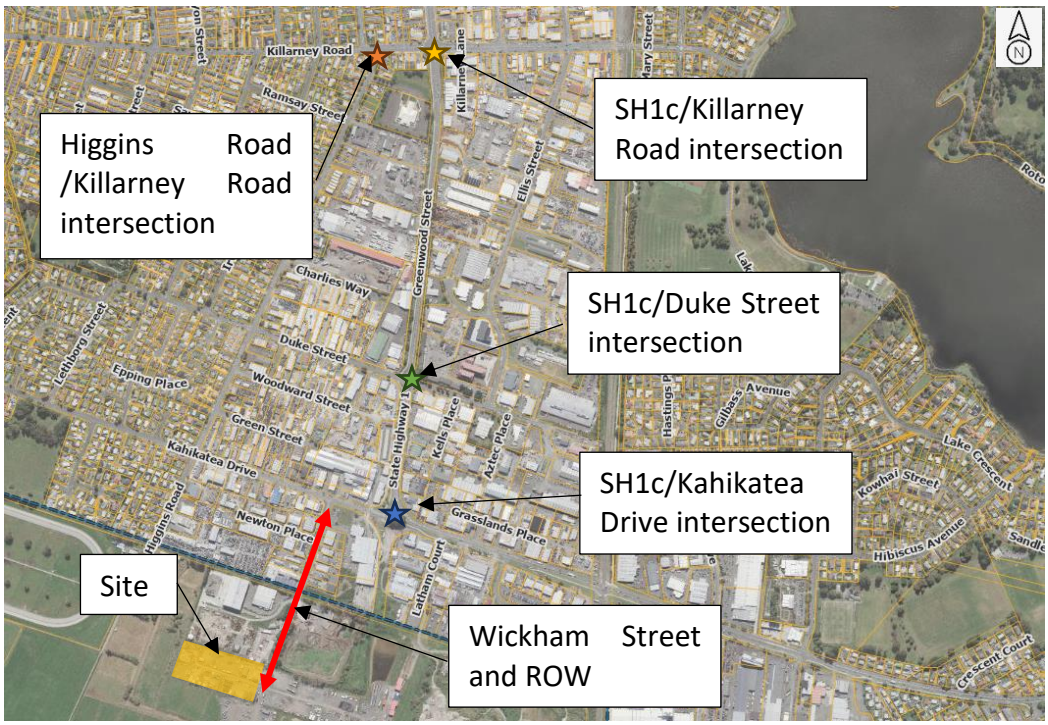

Figure 3:Site locality in relation to SH1c intersections

17. The further information provided by CKL states[1] that in order to address concerns relating to public access the applicant has offered the following condition:

> Any future activities to operate from the buildings established as part of Stage 2 shall be restricted to industrial / warehousing activities until a point in time when the Kahikatea Drive / State Highway 1C intersection has been upgraded. For avoidance of doubt, any ancillary retail activities are not provided for.

18. I support the intent of the condition to limit ancillary retail and public access until such time as the SH1c intersection is upgraded. However, I am concerned that there is no certainty that this will stop people from visiting the site for non-retail purposes such as meetings, deliveries, pickups etc. Therefore, I have reservations relating to the effectiveness of this condition.

19. Overall, I consider that with the proposed TMP conditions in place, there remains a likelihood of a residual adverse transport safety effect which, due to the inherent safety risk at the SH1C/Kahikatea Drive intersection, is unacceptable. The only way this could be properly mitigated would be for physical interventions on the network, which are not able to be imposed as effective conditions without road controlling authority approval, which has not been secured. Accordingly, the proposal will give rise to unmitigated adverse transport effects.

Trip Generation

20. As part of HCC's submission[2], I raised concerns regarding the trip generation assessment and potential underestimation of trips generated by the proposed development.

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[1] 16A Wickham Street, Hamilton – Traffic Submissions, dated 11 October 2023.
[2] Hamilton City Council Submission, Proposed Resource Consent – 16A Wickham Street – Industre Property Rua LU/0038/23, dated 7th August 2023.

21. The applicant's initial trip generation[3] assessment relied on information provided by Wattyl resulting in trip generation of 44veh/day and 11veh/hr.

22. Ms Makinson's evidence[4] described the gross floor area as:

a) Stage 1:

- 3,640 sqm warehouse
- 300sqm office
- 1,526sqm dangerous good store
- Stage 1 total 5,466sqm

b) Stage 2:

- 3 x ancillary office spaces of 300sqm
- 3 x warehouse spaces of totalling 2,587sqm
- Stage 2 total 3,487sqm

c) Development Total 8,953sqm

23. Ms Makinson's evidence[5] includes trip generation assessment based on ITE, RR453 50th%ile and RR453 85th%ile trip generation rates for warehousing activities. The trip generation provided in Ms Makinson's evidence is summarised below.

[3] Integrated Transport Assessment, Stride Property Limited, ITA – 16A Wickham Street, Hamilton, New Zealand, Rev 3.
[4] Statement of evidence of Ms Makinson Para 57-59.
[5] Statement of evidence of Ms Makinson Para Table 4, Table 5 and Table 6.

TABLE 4: ITE TRIP GENERATION VALUES

Development Stage	Peak Hour		Daily	
	Trip Rate (vph)	Trips (vph)	Trip Rate (vpd)	Trips (vpd)
Stage 1 (5,466m²)	0.25 / 100m²	14	1.86 / 100m²	102
Stage 2 (3,487m²)		9		65
Total	-	23	-	167

TABLE 5: RR453 TRIP GENERATION VALUES – AVERAGE

Development Stage	Peak Hour		Daily	
	Trip Rate (vph)	Trips (vph)	Trip Rate (vpd)	Trips (vpd)
Stage 1 (5,466m²)	0.9 / 100m²	49	2.1 / 100m²	115
Stage 2 (3,487m²)		31		73
Total	-	80	-	188

TABLE 6: RR453 TRIP GENERATION VALUES – 85TH PERCENTILE

Development Stage	Peak Hour		Daily	
	Trip Rate (vph)	Trips (vph)	Trip Rate (vpd)	Trips (vpd)
Stage 1 (5,466m²)	1.0 / 100m²	55	2.4 / 100m²	131
Stage 2 (3,487m²)		35		84
Total		90		215

Table 1 ***CKL trip generation assessment***

24. I consider that the trip generation should be based on RR453 85th%ile trip generation rates. I consider that the site could generate 90 veh/hr and 215 veh/day as per Table 6 of Ms Makinson's Statement of Evidence.

Existing Crashes

25. I have completed a search of Waka Kotahi's Crash Analysis System (**CAS**) for crashes over the last five years (2018-2023). The Calculating DSi[6] page on the Waka Kotahi website[7] states that for assessments completed after 31 March each year, that the previous calendar years' data should be included in the analysis. Therefore, crashes for 2018 have been included in the five-year analysis period.

26. I have searched for crashes within a 50m radius of the intersection, the results from the CAS search are summarised in the table below.

[6] Death or serious injury crash.
[7] https://www.nzta.govt.nz/safety/partners/speed-and-infrastructure/speed-and-infrastructure-documents/calculating-dsi-equivalents/

Table 2 ***Existing crash summary***

Intersection	5-year CAS (2018-2023)	
	Total crashes	Comments
Kahikatea Drive/SH1c	38 crashes (10 injury crashes)	- 5 serious injury crashes - 5 minor injury crashes - 30% JA movement crashes - 50% J movements (JA, JC, JO)
Duke Street/SH1c	18 crashes (5 injury crashes)	- 2 serious injury crashes - 3 minor injury crashes
Higgins Road/ Kahikatea Drive	9 crashes (2 injury crashes)	- 2 minor injury crashes
Higgins Road/ Killarney Road	6 crashes (2 injury crashes)	- 1 serious injury crash - 1 minor injury crash

Crash Trends at Kahikatea Drive/SH1C Intersection

27. I have analysed the CAS data for the Kahikatea Drive/SH1c intersection and note the following:

    a) Most of the injury crashes have occurred off-peak;

    b) 50% of injury crashes have been related to crossing (J movements - vehicles turning e.g. JA, JC and JO) movements;

    c) 80% of injury crashes have occurred during the weekday;

    d) 80% of injury crashes have occurred during dry surface conditions;

    e) 80% of injury crashes have occurred during fine weather.

28. The majority of crashes have occurred during fine weather and dry surface conditions indicating that factors like poor weather conditions or a slippery surface are not relevant. The intersection is located on the outside of a curve which may make it difficult for drivers to judge gaps or speeds of approaching vehicles, and may result in drivers taking the curve too fast

resulting in loss of control at the intersection. There have been two loss of control injury crashes at the intersection.

29. Based on my review of the CAS data there is evidence of an existing crash issue at the SH1C/Kahikatea Drive intersection.

30. In my view there are potential safety concerns related to the intersection layout and geometric issues which may be contributing to crashes at the intersection. I have summarised these concerns in the table below.

Table 3 ***Potential safety issues at the Intersection***

Intersection Layout	Potential Safety Concern

	• High traffic volumes on SH1c may make it hard to find appropriate gaps to make turns from Kahikatea Drive.
	• Intersection looks and feels wide which may encourage higher speeds along SH1c.
	• Intersection is located on a curve which may:
	  ○ Make it difficult to judge gaps.
	  ○ Make it difficult to judge speeds of approaching vehicles.
	  ○ Lead to loss of control crashes if speeds are high around the curve.
	• No speed management at the intersection.
	• Potential for right turning traffic to obstruct sight distance for left turning vehicles.
	• Right turning vehicles have to travel approximately 13m to enter the southbound traffic lane this may lead to some drivers misjudging gaps.
	• Potential for stand up-angle/ observation angle issues for left turning traffic turning out of Kahikatea Drive.

31. Based on my risk assessment below (high collective and personal risk) the treatment strategy at the Kahikatea Drive/SH1c intersection is a safe

system transformation which would likely include a change in intersection form such as a roundabout or signals.

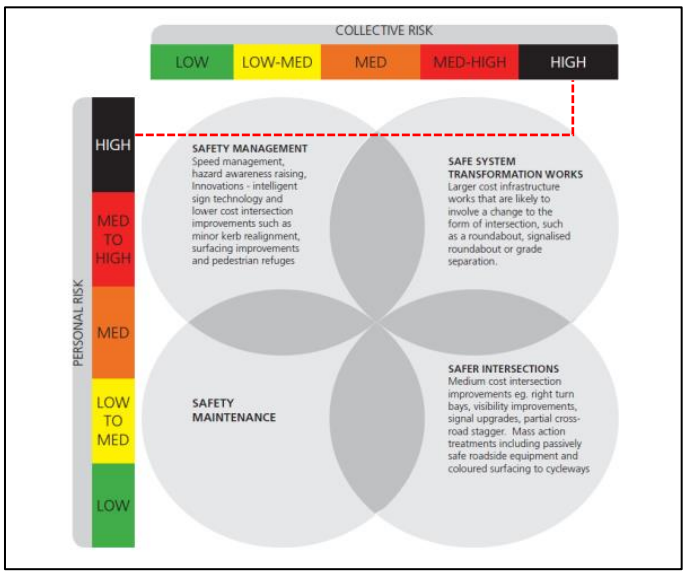

Figure 4:Safe system intersection treatment strategy[8]

32. Neither HCC nor Waka Kotahi have committed plans for safety improvements at the intersection. The Southern Links designation identified a roundabout at this location when a fourth leg is introduced, but there is no funding committed for Southern Links. The draft Southern Links Form and Function Review has proposed a series of business cases to advance specific elements of the designated Southern Links network but commencing these business cases is subject to receiving funding in the National Land Transport Programme (**NTLP**) 2024-2027.

TRAVEL MANAGEMENT PLAN (TMP)

33. The applicant has proposed a TMP to avoid or minimise right turns at the SH1c/Kahikatea Drive intersection prior to the construction of the Southern Links intersection at the Greenwood Street/Kahikatea Drive intersection. I note that there is uncertainty as to when Southern Links will be implemented which means that this arrangement could be in place for a long time.

[8] https://www.nzta.govt.nz/assets/resources/high-risk-intersections-guide/docs/high-risk-intersections-guide.pdf

34. I am concerned about the effectiveness of the proposed TMP. I consider that without physical restrictions to right turn treatments that it will be difficult to ensure that vehicles from both stages of the development do not right turn out at this intersection.

35. The TMP will be required until such time that the Kahikatea Drive/SH1c intersection is upgraded. There are no plans or funding for improvements at the intersection and there is uncertainty as to when Southern Links will be implemented. In my view this means that the current intersection layout could be in place for a long time (potentially more than 10 years).

36. The initial TMP[9] provided with the ITA stated that GPS logs were to be provided. However, this is not included in the most recent version of the TMP. The updated[10] TMP states that spot checks will be undertaken:

    a) Within one month of the site becoming operational;

    b) Monthly thereafter until compliance with the TMP has been confirmed;

    c) Once compliance with the TMP has been demonstrated, spot checks will be continued on an approximately 6-monthly basis unless complaints have been received, until such time that the SH1C / Kahikatea Drive and /or Duke Street SH1C intersection is upgraded;

    d) Upon receipt of any complaint, a spot check will be undertaken within one month of the complaint being received.

37. The TMP states the following disciplinary action will apply (subject to confirmation of Wattyl NZ's disciplinary process and Health and Safety Policy):

[9] 16A Wickham Street, Hamilton, Travel Management Plan 14 March 2023.
[10] 16A Wickham Street, Hamilton, Travel Management Plan 2 November 2023.

a) First and second non-compliance by a driver – reminder of the TMP requirements;

b) Third non-compliance by a driver – verbal warning; and

c) Fourth non-compliance by a driver – written warning.

38. I note that any disciplinary action will be at the discretion of Wattyl (or other future tenant) and not the RCA's and non-compliance will only be captured during a very small number of spot checks carried out over a limited period.

39. I am concerned that the TMP accepts a level of non-compliance based on the disciplinary action outlined in the TMP. As discussed, there is an underlying safety risk at the SH1C/Kahikatea Drive intersection. Accepting a level of non-compliance by drivers does not mitigate the safety concerns at the intersection. In my view, one bad decision or poor judgement when right turning out of the intersection could result in a crash.

40. The TMP states that HCC, Waipa DC and Waka Kotahi will be provided results from the spot checks for review but given that the subject intersection is a state highway intersection it is unclear who will be responsible for reviewing the monitoring logs e.g., HCC, Waipa DC or Waka Kotahi. However, no matter which RCA is provided the monitoring logs, there is very little the RCA's can do to improve the situation or take action to address any potential safety concerns that may arise from right turns at the SH1c intersection.

41. The spot checks are proposed to be undertaken during AM and PM Peak periods. In my view, this is when compliance is more likely to be achieved as queues and delays at the SH1C/Kahikatea Drive intersection may mean that the intersection is less attractive for right turning out. I consider that there is a potentially higher risk of non-compliance during off peak times and the TMP does not address this.

42. In my opinion, the proposed TMP does not mitigate the safety risk associated with right turns out of the SH1c/Kahikatea Drive intersection. I am concerned that the proposed TMP will not be effective in managing the risk, as the disciplinary/enforcement action associated with non-compliance is outside of the RCA's control, and driver behavior will only be captured during spot checks which do not account for non-compliance outside of spot check times.

43. I note that the proposed TMP conditions in paragraph 109 of Ms Makinson's evidence includes removal of HCC from the TMP condition. I disagree with the suggested condition as HCC are still RCA of the intersecting side road, and I consider that HCC should be retained within the TMP condition.

CRASH RISK ASSESSMENT

44. I have completed an assessment of crash risk for the existing traffic volumes and with the additional development traffic at the intersections. I have used Waka Kotahi's practitioner's spreadsheet[11] to calculate DSi casualty equivalents at the intersection. The following assumptions have been made (all traffic volumes are from Mobileroads.org):

a) SH1c traffic volume at Kahikatea Drive Intersection – average of 29,450 veh/day and 25,833 veh/day = 27,640 veh/day;

b) SH1c traffic volume Duke Street/SH1c intersection = 25,833 veh/day;

c) Kahikatea Drive= 5,020 veh/day;

d) Duke Street - average of 3,525 veh/day and 3,658 veh/day = 3,590 veh/day;

[11] https://www.nzta.govt.nz/safety/partners/speed-and-infrastructure/speed-and-infrastructure-documents/calculating-dsi-equivalents/

e) Posted speed limit – 60 km/h.

45. The actual DSi values at each intersection are summarised in the table below. The CAS data shows that at the Kahikatea Drive/SH1c intersection there is one serious injury/year, with High collective risk at both the Kahikatea Drive/SH1c and Duke Street/SH1c intersections.

Intersection	5 year Actual DSi	Actual Dsi /year	Collective Risk Band based on Actual Crashes
Kahikatea Drive/SH1c	5	1	**High**
Duke Street/SH1c	2	0.4	**High**
Higgins Road/ Kahikatea Drive	0	0	**Low**
Higgins Road/ Killarney Road	0.2	0.04	**Low Medium**

Table 4 ***Actual Dsi at the intersection***

46. The actual crash rates indicate that there is a current crash concern at the Kahikatea Drive/SH1c intersection and the Duke Street/SH1c intersection. Therefore, I have focused my safety assessment on these intersections, in particular the SH1c/Kahikatea Drive intersection.

47. I have completed an assessment of predicted crash risk at the existing intersections based on existing traffic volumes using the Waka Kotahi Practitioners Spreadsheet – DSi casualty equivalents. My assessment is summarised in the table below with spreadsheet outputs attached at Attachment 1.

Intersection	Collective Risk	Personal Risk	5 year DSi Equivalents	DSi Equivalent/year
Kahikatea Drive/SH1c	**High**	**High**	1.836	0.367
Duke Street/SH1c	**Medium**	**Medium High**	0.816`	0.163

Table 5 ***Predicted crash risk***

48. I have compared the actual vs predicted crash rates in the table below. Based on my assessment of crash risk the intersections are currently operating at a level which is far worse than what the predicted crash risk calculations indicate.

Intersection	Actual DSi/year	Predicted DSi Equivalent/year	Difference Predicted vs actual
Kahikatea Drive/SH1c	1.0	0.367	+ 0.633 (178 %)
Duke Street/SH1c	0.4	0.163	+ 0.237 (145 %)

Table 6 ***Comparison of actual vs predicted crash rates***

49. I have completed an assessment of crash risk relating specifically to the JA movement (right turn crossing) at the SH1c/Kahikatea Drive intersection to understand the predicted crash risk associated with an increase in right turn movements out of Kahikatea Drive. I have not completed traffic counts, so for the purpose of this assessment I have assumed that 25% of the existing daily traffic will be right turning out of the intersection (this is equivalent to 50% of exiting traffic turning right out). Bluetooth data[12] supplied by HCC indicates that this right-out movement is 62% of existing turning movements out of Kahikatea Drive onto SH1c. I note that the Bluetooth data does not capture all movements at the intersection, typically 10% of trips area captured.

50. Modelling of the JA movement (crossing – vehicle turning) indicates that the expected injury crash rate for right turns at this intersection is 0.234 JA injury crashes/year. However, the actual crash rate is 0.6 JA injury crashes/year (3 injury crashes over a five-year period) which is worse than what the crash models predict.

51. Adding development traffic (25% of development traffic assumed to turn right-out, equivalent to 57 veh/day) to the crash model does not significantly increase the crash rate (approx. 0.37% increase). However, I

[12] TomTom Origin Destination report – Kahikatea Drive/SH1c – Sample size 12,734 trips. Date range 09/10/23-13/10/23.

am concerned that the crash models do not factor in the existing safety concerns associated with the intersection which I have discussed in paragraphs 26 - 27 above.

CKL Safety Assessment

52. Ms Makinson's safety assessment[13] is presented in the table below. By way of summary, the assessment concludes that the increase in traffic does not significantly change the injury crash rate.

Intersection	Crash Rate from CAS	CEC Existing Expected Crash Rate	Estimate v Actual Factor	Assessment Case (ITE)		Sensitivity Test (RR453 85th Percentile)	
				CEC 'With Development' Expected Crash Rate	Effect (injury crashes per year)	CEC 'With Development' Expected Crash Rate	Effect (injury crashes per year)
Higgins Road / Killarney Road	0.34[3]	0.4081	-	0.4121	0.004 or 1 additional injury crash every 250 years	0.4140	0.0059 or 1 additional injury crash every 169 years
Higgins Road / Kahikatea Drive	0.17[4]	0.1519	1.119	0.1548	0.0029 x 1.119 = 0.0032 or 1 additional injury crash every 312 years	0.1571	0.0052 x 1.119 = 0.0058 or 1 additional injury crash every 172 years
Kahikatea Drive / SH1C	1.72[5]	0.6049	2.843	0.6093	0.0044 x 2.843 = 0.0125 or 1 additional injury crash every 80 years	0.6113	0.0064 x 2.843 = 0.0182 or 1 additional injury crash every 55 years

Table 7 ***CKL crash assessment*** [14]

53. Ms Makinson states[15] that *"Furthermore, where existing observed injury crash rates are higher than the CEC predictive injury crash rate models, I have identified the factor difference between observed and predicted models for the 'existing' case and applied this to the 'with development' CEC models".*

54. The methodology used by Ms Makinson is not specified in Waka Kotahi's Crash Estimation Compendium. My understanding of crash rates is that the relationship is not linear[16] as there are other variables that influence

[13] Para 85.
[14] Ms Makinson's evidence – Table 8.
[15] Ms Makinson's evidence Para 84.
[16] Research Paper - Crash Prediction Modelling at Intersections in New Zealand 1990 to 2009 – Dr Shane Turner and Professor Graham Wood.

crashes. Therefore, simply allowing a linear factor may understate the crash risk at the intersection.

Summary

55. Based on my assessment of crashes at the SH1c intersection, the SH1c intersections with Kahikatea Drive and Duke Street are performing worse than what is expected based on the current traffic volumes. For example, at the Kahikatea Drive/SH1c intersection the actual crash rate of 1 DSi/year is 178% higher than the predicted crash rate of 0.367 DSi/year.

56. Due to the relatively small increase in trips, the conflict models and predicted crash models (JA movement crashes) show a very small change in crash rates. However, the models may not account for other factors which may be contributing to crashes at the intersection, including the specific geometry of the intersection which may make it harder for drivers to judge vehicle speeds and gaps.

57. While the change in traffic volume and crash risk is low, I consider that there is an underlying crash risk in particular, at the Kahikatea Drive/SH1c intersection and this increases the risk of cumulative safety effects not being addressed.

NEW ZEALAND ROAD SAFETY STRATEGY ALIGNMENT

58. In my view, allowing additional traffic at the intersection does not align with Vision Zero, the Safe System approach or appropriate land use planning principles without further intervention. In my opinion, transformation works or physical restriction of specific movements is necessary and would require intervention at other intersections nearby as well.

59. The Road to Zero[17] strategy adopts Vision Zero, and a vision for Aotearoa where no-one is killed or seriously injured in road crashes, and where no death or serious injury while travelling on our roads is acceptable. The strategy sets out road safety targets for the ten year period 2020-2030.

60. Waka Kotahi[18] provides examples of how engineers can apply Safe System Principles which are summarised in the table below. I have provided commentary on how the proposal to introduce additional traffic to an intersection (SH1c/Kahikatea Drive) that has a poor safety record does not align against the Safe System Approach.

Issue	Safe System Approach	Alignment against Safe System Principles
Belief	**Road deaths are preventable** We know road deaths are preventable. It's not acceptable to accept the status quo. By taking a system approach, and choosing Safe System interventions, we can drastically reduce the level of harm on our roads.	The proposal recognises that there is an underlying crash issue at the intersection. However, the Applicant considers that the proposed effect of the proposal is negligible. I am concerned about cumulative safety effects of development at this intersection. The TMP does not physically alter the intersection to prevent the risk of death or serious injury and I am concerned about the effectiveness of the TMP.

[17] https://www.transport.govt.nz/area-of-interest/safety/road-to-zero/
[18] https://www.nzta.govt.nz/safety/partners/road-to-zero-resources/vision-zero-for-engineers/

Issue	Safe System Approach	Alignment against Safe System Principles
Human error	**Plan and design for mistakes, people are fallible and vulnerable** A 'forgiving' transport network is core to the Safe System. Death and serious injury crashes should not occur as a result of driver error. Vehicle and infrastructure/speed improvements should be used to reduce impact forces (should a crash occur) to within human biomechanical tolerances, and therefore reduce the harm.	No physical restriction or speed management measures are proposed. If a driver were to make a mistake, then there is a high risk that a crash at this intersection will result in serious injury or a fatality.
Responsibility	**System designers are also responsible for creating a Safe System** System designers share the responsibility for safe travel outcomes by accommodating people errors.	There is an existing safety risk at the intersection but increasing movements at a high-risk intersection does not align with Safe System Principles. I am concerned about cumulative safety effects of development at this intersection.
Crash severity addressed	**Crashes resulting in death or serious injury** Death and serious injury crashes and/or high-risk crash types should be the starting point in site identification. Minor injury and non-injury crashes may be useful to provide additional information but are not the core focus.	No speed management or physical intervention to restrict high risk turning movements such as right turns. While traffic associated with the development is low, it only requires a small error leading to a crash resulting in a death or serious injury crash. I consider that the risk of this occurring is higher given the poor safety performance of the existing SH1c intersections.
Understanding speed at which deaths and serious injuries (DSI) occur for different crash types	**Biomechanical tolerances core to decision making to eliminate DSI** Biomechanical tolerances are core to the vision of eliminating death and serious injury crashes. We need to understand and be guided by the speed at which DSI occur for different crash types.	No speed management considered at the intersection. Impact speeds are likely to be at 60km/h or greater which results in a higher risk of high severity crashes

Issue	Safe System Approach	Alignment against Safe System Principles
Design requirements	**Must focus on eliminating death and serious injury** It is paramount that new infrastructure assists in eliminating death and serious injuries. This also includes speed management and prioritisation/separation of different transport users travelling in different directions or modes.	The proposal does not eliminate death and serious injuries but adds additional traffic to an existing intersection which is assessed as high risk.

Table 8 ***Alignment against Safe System Principles***

61. There is no speed management at the intersection and SH1c is posted with a 60km/h speed limit. The figure below demonstrates the probability of death or serious injury crashes based on collision speed. If a side impact crash were to occur at a collision speed of 60km/h or greater, then there is a 40% probability that the crash will result in a death or serious injury.

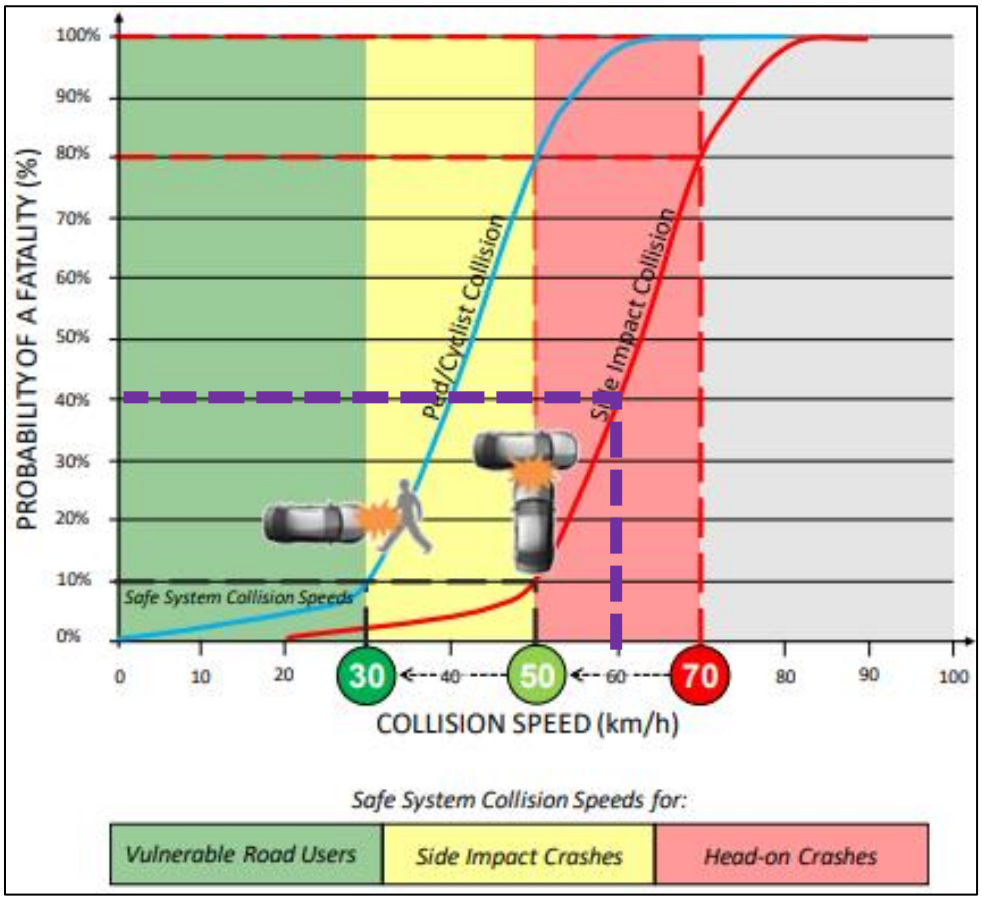

Figure 5:Probability of fatality vs. collision speed[19]

62. The proposal results in additional turning movements at an intersection which has a poor crash history. As discussed above, the crash prediction models indicate that the level of trips associated with the proposed development do not significantly change the predicted crash rate at the intersection. However, I am concerned that the actual crash rate is significantly higher than the predicted crash rate at the SH1c/Kahikatea Drive intersection and adding additional traffic without mitigation to minimise the risk of right turns or address safety concerns does not align with Road to Zero or Safe System principles.

APPLICANT'S TRAFFIC EVIDENCE

63. I have reviewed the evidence of Ms Makinson.

64. Ms Makinson states[20] that *"in the time since the speed reduction, there has been a marked reduction in the crash rates at the SH1C / Kahikatea Drive intersection in the short term and in my opinion, there is no reason to expect a reversal of this positive change."*

65. The period where crashes have reduced is 22 months. In my view there is insufficient data to confirm if the reduction in speed has solely contributed to a reduction in crashes and the sample of data is too small to provide comfort that the trend will continue. Typically, a minimum five year period is used to identify safety risk at an intersection.

66. The Waka Kotahi Safety Intervention Toolkit[21] indicates that typically changes in speed limit can reduce the death and serious injury equivalents by 30%. I note that the crash data in Ms Makinson's evidence indicates that

[19] Vic Roads Raised Safety Platforms Road Design Note RDN 03-07, December 2019, Figure 1.
[20] Ms Makinson's Statement of Evidence Para 37
[21] https://www.nzta.govt.nz/assets/resources/standard-safety-intervention-toolkit/standard-safety-intervention-toolkit.pdf (page 52)

there has been a reduction in death and serious injury crashes by 67%, which is more than what is considered to be typical.

67. While the posted speed limit has reduced, it is unclear if the reduction in crashes is a direct result of the reduced posted speed or if there are other factors which may have contributed to the reduced speed.

68. For example, the traffic volumes[22] from the Telemetry Site north of the Duke Street/SH1C intersection from 2018-2021 varied from 27,265-25,517 veh/day while the recorded ADT for 2022 was 25,833 veh/day. The State Highway Traffic Monitoring website[23] indicates that traffic volumes[24] east of the SH1C/Kahikatea Drive intersection ranged from 31,177-29,079 veh/day during the period 2018-2021 and 27,562 veh/day in 2022. The data indicates that there has been a reduction in traffic volumes which may also be contributing to the reduction in crashes.

69. Ms Makinson[25] disagrees with the use of CEC conflicting flow models to assess expected crash rates. Ms Makinson has quoted the following statement from the CEC[26]: *"The predictions from these models should be treated with caution until further research explores in more detail the new design variables introduced in the design index".*

70. The CEC[27] states that *"For more detailed analysis of intersections conflicting flow models should be applied"* which is the methodology that I have used to determine the crash risk for right turn out movements. I am concerned about the risk of right turn crashes at the intersection and I am not aware of any other industry standard methods of assessing crash risk relating to right turns.

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[22] State highway traffic monitoring – annual average daily traffic -Telemetry Site 97. Located north of Duke Street/SH1C intersection
[23] https://maphub.nzta.govt.nz/public/?appid=31305d4c1c794c1188a87da0d3e85d04
[24] State highway traffic monitoring – annual average daily traffic regional non-continuous site. 145m west of railway crossing Kahikatea Drive.
[25] Statement of evidence Ms Makinson para 95.
[26] Statement of evidence Ms Makinson para 82.
[27] CEC Section 2.1.2.3.

71. In my opinion, I consider that all models should be treated with caution as these are models subject to a number of assumptions or limitations, and may not always be reflective of the real-world scenarios.

72. I used the conflicting flow model to demonstrate that there is a difference in the safety risk associated with right turns out of the intersection when compared to the predicted crash rate calculated using conflicting flow models. Both models indicated that the intersection is operating worse than what the predicted models indicate.

73. In relation to the existing safety issues at the existing intersection, Ms Makinson[28] has stated *"I note that this is an existing issue and in my opinion is a matter that is the responsibility of the RCA to address."*

74. My understanding is that there is no funding or programme for works at this intersection. In my opinion, while the change in traffic volume and crash risk is low, I consider that there is an underlying crash risk in particular, at the Kahikatea Drive/SH1c intersection and this proposal increases the risk of cumulative safety effects not being addressed.

75. In my view, allowing additional trips at the SH1C/Kahikatea Drive intersection while accepting that there is a crash risk and an inherent level of non-compliance by way of the TMP, does not align with the Safe System or Vision Zero principles and strategies.

CONCLUSION

76. In my assessment the existing SH1c/Kahikatea Drive intersection is performing poorly in terms of safety. I am concerned that cumulative increases in trips and crash risk at this intersection are not being addressed due to the scale of this application and other individual consent applications.

[28] Statement of Evidence Ms Makinson para 95.

77. The applicant has proposed a TMP to limit right turns at the Kahikatea Drive/SH1c intersection. I am concerned about the effectiveness of the TMP and I consider that without physical restrictions limiting right turn movements, it will be difficult to ensure that all vehicles from both stages of the development do not right turn out at this intersection. An inherent level of likely non-compliance exists.

78. In my opinion, any additional traffic at an intersection which has a poor crash history without any mitigation like physical interventions is a poor outcome for the network and does not align with Vision Zero or Safe System Principles.

Vinish Anand Prakash

15 November 2023

Attachment 1: DSI Equivalent Calculations

Project Name	SH1c-Duke Street Intersection							**Assessment Date**	14/11/2023	
Model Type	Standard Model (designed for an input of coded crash data and provides a more accurate risk score)									
Corridor or Intersection	intersection									
Speed Limit	60	*(km/h)*								
Speed Environment	Urban									
Major Road AADT	25833	*Average of the two major intersection approaches*								
Minor Road AADT	3590									
Product of Flow (PoF)	1538	*Only populated for intersections*								
Crash Analysis Period	5	*Number of years in crash analysis period*								
Start Year	2018									
End Year	2022									

Crash History

									Number of Injury Crashes	
	Generic			Intersections			Pedestrian crashes			
Movement crash code	Generic	Midblock	Intersection	Signalised	Roundabout	Priority	Generic	Midblock	Intersection	
All										
A										
B						1				
C										
D										
E										
F						1				
G										
H										
J						2				
K										
L						1				
M										
Q										
Total Injury crashes	0	0	0	0	0	5	0	0	0	

DSi Equivalents	**0.816**	
Collective Risk	**0.16**	**MEDIUM**
Personal Risk	**17.10**	**MEDIUM HIGH**
Infrastructure Risk Rating	**1.23**	**MEDIUM**

Project Name	SH1c-Kahikatea Drive Intersection							**Assessment Date**	14/11/2023	
Model Type	Standard Model (designed for an input of coded crash data and provides a more accurate risk score)									
Corridor or Intersection	intersection									
Speed Limit	60	*(km/h)*								
Speed Environment	Urban									
Major Road AADT	27640	*Average of the two major intersection approaches*								
Minor Road AADT	5020									
Product of Flow (PoF)	1807	*Only populated for intersections*								
Crash Analysis Period	5	*Number of years in crash analysis period*								
Start Year	2018									
End Year	2023									

Crash History

									Number of Injury	
	Generic			Intersections			Pedestrian crashes			
Movement crash code	Generic	Midblock	Intersection	Signalised	Roundabout	Priority	Generic	Midblock	I	
All										
A						1				
B						1				
C										
D						2				
E										
F										
G										
H										
J						5				
K										
L						1				
M										
Q										
Total Injury crashes	0	0	0	0	0	10	0	0		

DSi Equivalents	**1.836**	
Collective Risk	**0.37**	**HIGH**
Personal Risk	**32.75**	**HIGH**
Infrastructure Risk Rating	**1.23**	**MEDIUM**