IN THE MATTER   of the Resource Management Act 1991

AND

IN THE MATTER   of an application for a private plan change in Boulcott, Lower Hutt

BETWEEN   Boulcott's Farm Heritage Golf Club

Applicant

AND   Hutt City Council

Respondent

Statement of Evidence of Laura Skilton on Behalf of Boulcott's Farm Heritage Golf Club

Qualifications and Experience

1. My name is Laura Skilton. I am a specialist traffic engineer and transportation planner with over 33 years' experience covering transportation studies, intersection and network analysis, economic analysis and evaluations. My range of experience includes intersection design and analysis, flow analysis, preparation and building strategic transport models, data analysis, safety audits, parking and cycle infrastructure design. I hold the New Zealand Certificate of Engineering.

2. I am familiar with the transport network and traffic conditions within the project area.

3. I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court Practise 2014, and I agree to comply with it. I confirm that the areas addressed in this evidence are within my area of expertise, except where I state that I am relying on the evidence of another person, and I have not omitted to consider material facts known to me that might alter or detract from my evidence.

Background

4. In July 2020 I prepared a Traffic Impact Assessment for Boulcott's Farm Heritage Golf Club to determine the transport effects of a new subdivision using some of the Golf Course land. This assessment was updated in November 2020 as a response to Council Officers questions.

5. This statement of evidence has been prepared based on submissions Council has received, in particular the concern over traffic data used in my Traffic Impact Assessment I prepared. I have also read the statement of evidence prepared by Harriet Fraser on behalf of Council.

6. In preparing this statement of evidence, I am assuming that the Traffic Impact Assessment has been read.

Summary of Traffic Impact Assessment

7. The proposal is to rezone a strip of land on the eastern side of the Golf course from General Recreation to General Residential. The land is 1.6 hectares. Under the 2020 District Plan rules, it would be possible for the site to accommodate 29 single residential lots. Access to the site could be via Allen Street, Kingston Street, or both. Both streets connect to the wider road network via the intersection of Kingston Street and High Street. It is also possible to connect to the wider road network at the intersection of Taita Drive and Fairway Drive via local roads.

8. In order to assess the transport effects of a subdivision, I reviewed available traffic count data, available data on trip generation rates from residential dwellings and reviewed crash data from the Waka Kotahi crash database. I estimated the trips that would be generated from the site for typical household size, which would allow around 28 houses on the site, and for a comprehensive residential development, which would result in around 61 houses on the site.

9. Due to the COVID-19 lockdowns, I was not able to assess the existing "typical" 2020 traffic patterns and estimated existing traffic patterns based on available historic data. The Hutt City traffic count database had a count on High Street adjacent to the site dated December 2015. There were also several counts on High Street opposite Boulcott Street. I used these to estimate a "typical" weekday flow in 2020. I undertook a short survey at the site to assess the distribution of traffic to and from Kingston Street.

10. I estimated the turning flows at the existing intersection and with the proposed development. I then analysed the intersection for the estimated existing and future flows. The analysis showed that vehicles making a right turn from Kingston Street will have increased delays of around 8 to 10 seconds per vehicle. As part of a longer trip, the additional travel time is negligible.

11. I concluded that the re-zoning would not have any adverse traffic effects.

Submissions

12. The plan change was publicly notified, and 16 submissions were received.

13. Some of the submissions were from residents in the adjoining neighbourhood. They questioned the traffic count data used, the trip generation rates used and the delays reported.

14. As a result of these concerns, I have undertaken additional site visits, surveys and gathered more data from the Hutt City Council and the Waka Kotahi traffic count database.

Daily Traffic Counts

15. Hutt City Council had previously provided monthly traffic count data for 2018 for High Street opposite Boulcott Hospital. These are shown in Figure 1.

Figure 1 Daily Traffic Flow, High Street opposite Boulcott Hospital, 2018
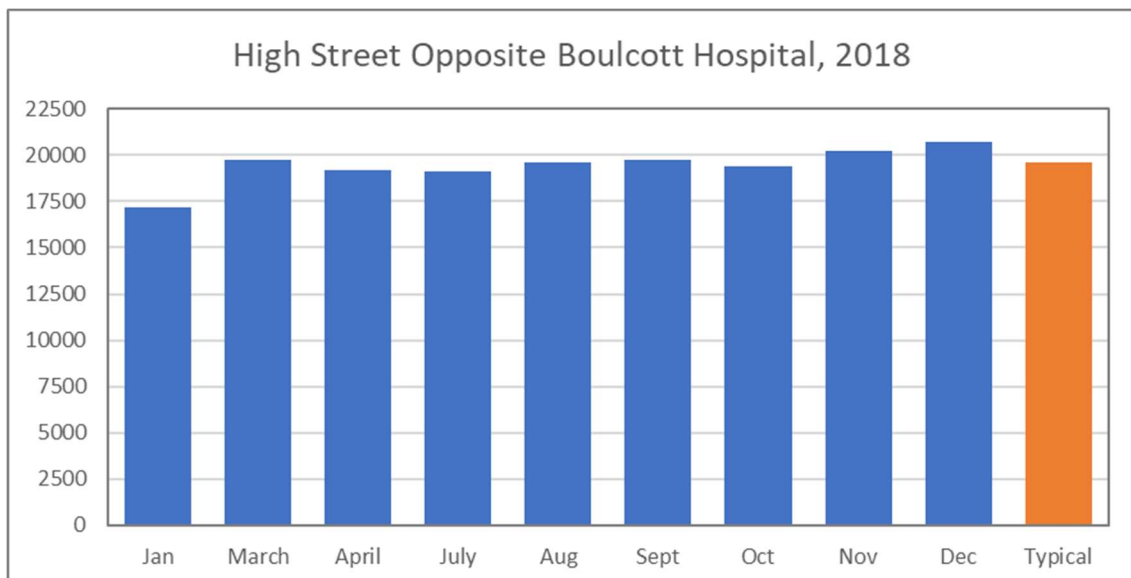
16. Figure 1 shows that generally, the traffic counts are lower in January and higher in December. A "typical" daily flow has been estimated based on the March to November data.

17. Hutt City Council provided additional data for months during 2020 and 2021. The most recent available traffic count was September 2021, however this was affected by the COVID-19 lockdown and has not been used. The daily flows are provided in Figure 2.

Figure 2 Daily Traffic Flow, High Street opposite Boulcott Hospital, 2020 - 2021
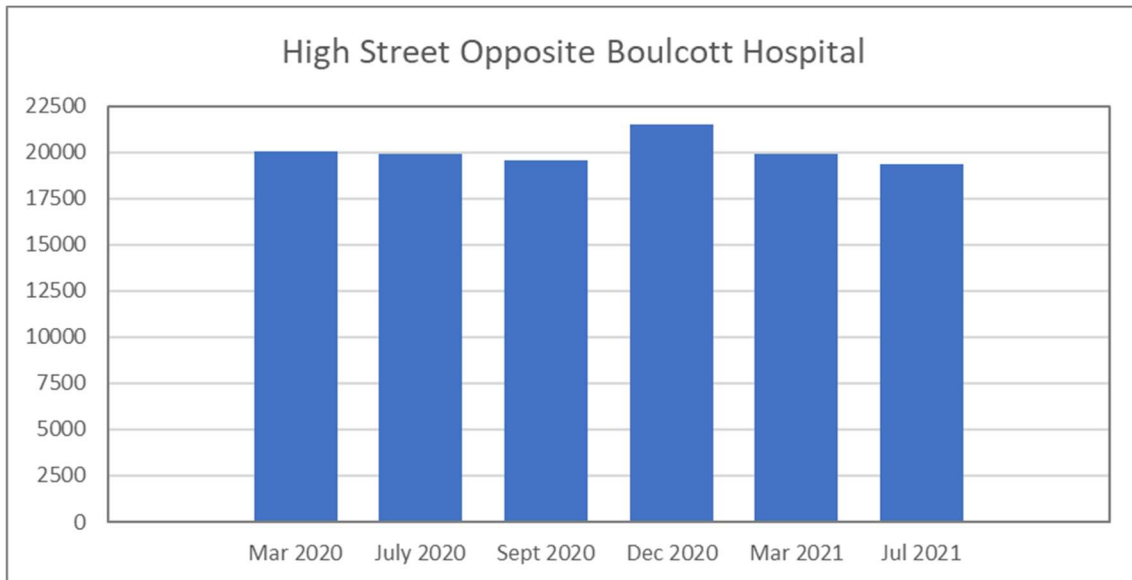
18. Figure 2 shows that December traffic volumes are higher than the other months in 2020 and 2021.

19. A review was made of the Waka Kotahi database for the telemetry site on SH2 at Kelson. Telemetry sites collect traffic volumes on a daily basis and are published within a few days.

20. The daily flows for weekdays, excluding public holidays, for the last two years is provided in Figure 3. It should be noted that the count site has data missing between February and May 2020.

Figure 3 Daily Traffic Flow, SH2 at Kelson, 2020 - 2021
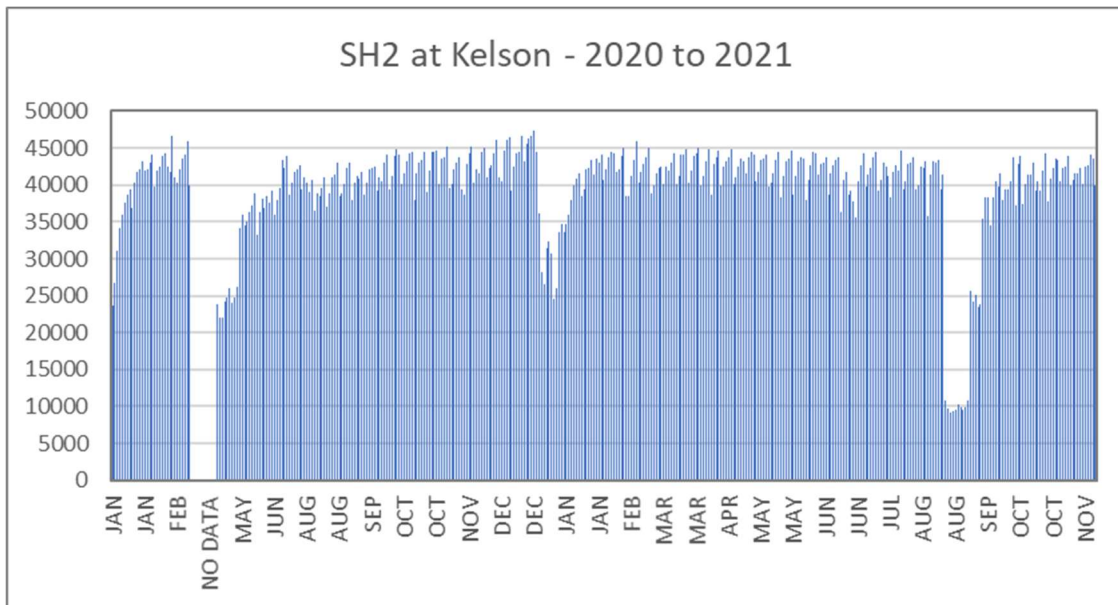
21. Figure 3 shows that the daily traffic volumes are fairly consistent, with the exception of the January holiday period and the COVID-19 lockdowns. Despite still being in Level 2 in November 2021, the daily flows are similar to the rest of 2021.

Hourly Traffic Counts

22. The hourly flow pattern for High Street at Kingston Street is only available for December 2015. However, a comparison to the count site at High Street opposite Boulcott Hospital is provided in Figure 4. I have intentionally altered the X and Y scale to better highlight the differences between the two sets of data.

Figure 4 Hourly Traffic Flow, High Street, December 2015

December 2015 Traffic Counts
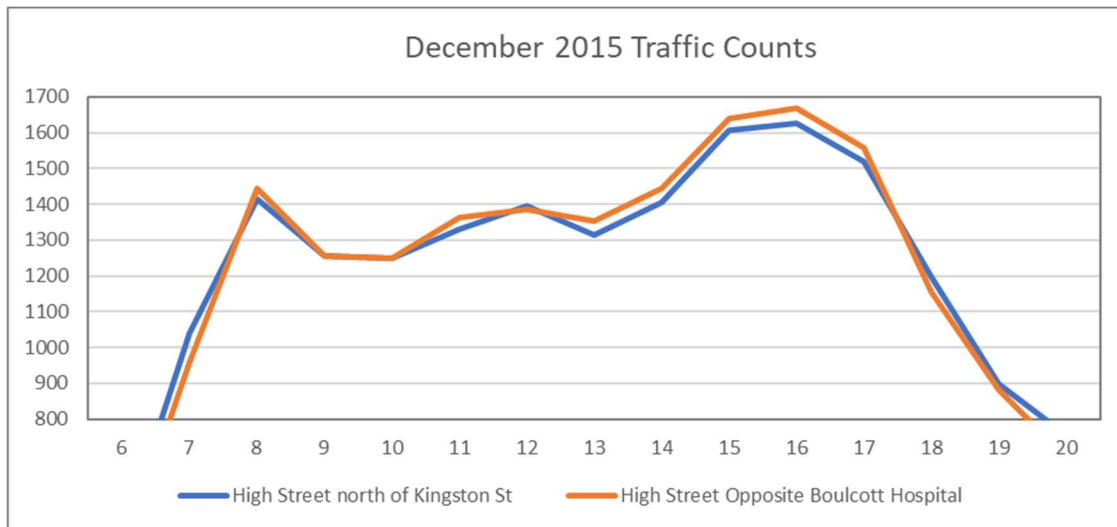
23. Figure 4 shows that the hourly traffic patterns are similar at the two sites on High Street, however the site at Boulcott Hospital generally has a slightly higher flow.

24. The hourly flow pattern for the various more recent counts on High Street at Boulcott Hospital is provided in Figure 5.

Figure 5 Traffic Flow, High Street opposite Boulcott Hospital, 2020 - 2021

High Street Opposite Boulcott Hospital
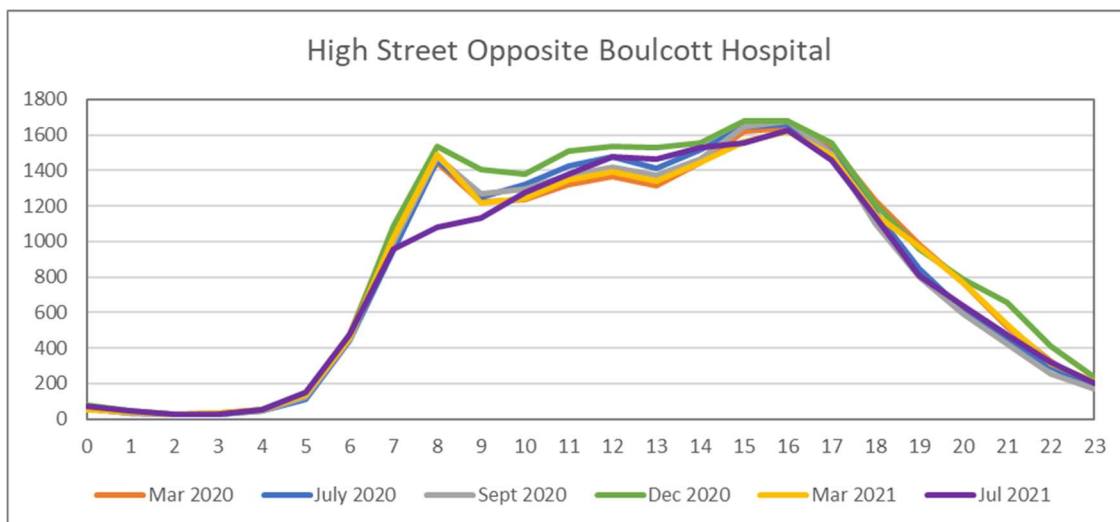
25. Figure 5 shows that there is some variation in the flows and patterns at the count site on High Street at Boulcott Street. The July 2021 count has unusually low data during the morning peak period, and therefore is not considered to be representative of a typical year.

26. The hourly flow pattern for SH2 at Kelson in 2021 is shown in Figure 6.

Figure 6 Hourly Traffic Flow, SH2 at Kelson - 2021
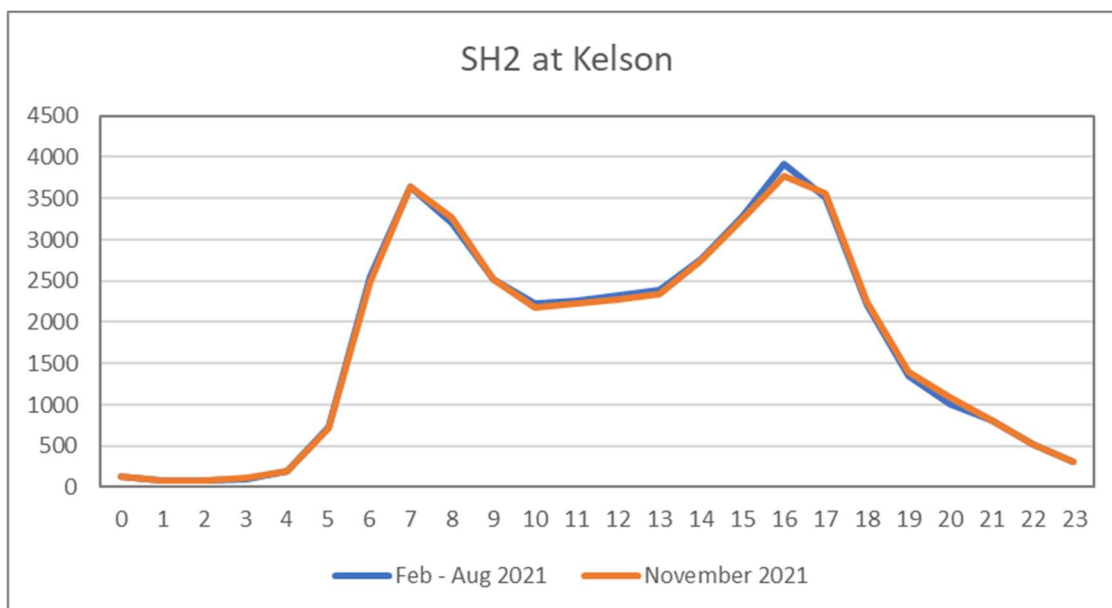
27. Figure 6 shows the hourly flow pattern for a weekday in November 2021 and also the average hourly flow pattern for a weekday between February and August 2021, when Lower Hutt was in COVID-19 restriction Level 1. Public holidays have been removed from the data.

28. Based on the hourly flow data available, I conclude that the March 2021 hourly pattern best represents a typical hourly pattern on High Street, and that November hourly flows are representative of a typical day during the year, excluding public holidays and COVID-19 lockdowns.

29. The hourly flow pattern for SH2 at Kelson for the first week in November 2021 is shown in Figure 7.

Figure 7 Hourly Traffic Flow, SH2 at Kelson – November 2021
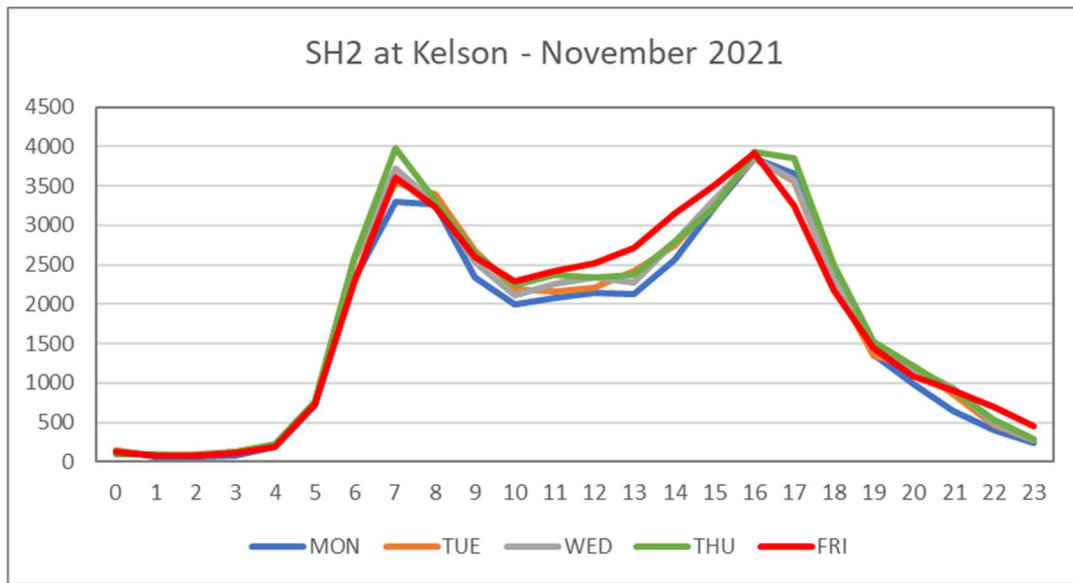
30. Figure 7 shows that during the morning peak, a Friday has the average weekly count (with Wednesday and Thursday being higher and Monday and Tuesday being lower) and in the evening peak a Wednesday has the average weekly count.

Intersection Turning Counts

31. I undertook turning count surveys at the High Street / Kingston intersection between 6:45 and 9:00 on Friday on the 12th November 2021 and between 15:45 and 18:15 on Wednesday 17th November 2021. The 15-minute turning counts are provided in Appendix A and summarised below in Table 1.

Table 1   Intersection Turning Flows – High Street at Kingston Street, Nov 2021

	Southbound	Northbound	Left in	Right out	Left out	Right in
Morning Peak						
7:00-8:00	682	307	7	28	10	3
7:45-8:45	831	443	13	51	7	10
8:00-9:00	863	507	14	50	5	8
Evening Peak						
16:00-17:00	669	816	32	14	17	13
16:15-17:15	666	849	29	14	1	12
17:00-18:00	597	850	36	27	10	11
17:15-18:15	567	798	35	31	9	11

32. The highest hourly two-way volumes on High Street occurred between 8:00 and 9:00 in the morning and 16:15 and 17:15 in the evening. The highest hourly two-way volumes on Kingston Street occurred between 7:45 and 8:45 in the morning and 17:15 and 18:15 in the evening.

33. I note that during the independent surveys undertaken by Harriet Frasier during the morning of 16th November 2021 between 8:00 and 9:00, she recorded less vehicles turning right out of Kingston Street (40 compared to 50) and more vehicles turning left out of Kingston Street (21 compared to 5).

Kingston Street Right Turn Delays

34. I estimated the delays to right turning vehicles during the surveys undertaken on 12th and 17th November 2021. It should be noted that these are approximate and are only stop line delays as they do not include geometric delay. Geometric delay is the amount of time it takes for a vehicle to slow to a stop and speed up from a stop line. Generally, geometric delay for a right turning vehicle is 5.5 seconds[1].

35. Table 2 provides the delay to individual vehicles during the morning peak together for the average for each 15-minute period and the entire two-hour period.

Table 2   Morning Right Turn Delays

Time	Average	Individual vehicles																
7:00-7:15	8.7	15	6	11	6	4	10											
7:15-7:30	14.0	18	27	43	10	11	5	4	4	4								
7:30-7:45	11.8	6	10	22	8	13												
7:45-8:00	6.0	5	5	7	5	7	5	6	8									
8:00-8:15	10.6	5	7	14	23	11	10	12	14	12	5	5	10	6	23	8	7	8
8:15-8:30	9.8	7	17	4	9	6	11	4	12	5	10	17	7	4	11	8	13	21
8:30-8:45	15.9	7	8	11	36	20	25	7	20	9								
8:45-9:00	21.1	29	4	21	6	54	30	4										
7:00-9:00	11.8																	

[1] Value used by the intersection analysis software, Sidra

36. The average right turn delay from Kingston Street between 7:00 and 9:00 is 11.8 seconds per vehicle, excluding geometric delay.

37. The highest average delay occurred between 8:45 and 9:00 with an average delay of 21.1 seconds per vehicle. This was high due to a single vehicle having a 54 second delay.

38. The average delay between 8:00 to 9:00, when traffic volumes on High Street were the highest, was 12.9 seconds per vehicle.

39. On two occasions during the morning peak period three vehicles arrived at the same time, and therefore the third vehicle had a longer delay. This occurred just after 7:15 and again at 8:00. Long delays were experienced also at 8:30 when a queue of three vehicles formed as each time there was a gap in the traffic for a vehicle to exit, a vehicle would make a right turn into Kingston Street, which the vehicle on Kingston Street was required to give way to.

40. Table 3 provides the delay to individual vehicles during the morning peak together for the average for each 15-minute period and the two hour period.

Table 3   Evening Right Turn Delays

| Time	Average	Individual vehicles														
15:45-16:00	17.8	10	6	6	25	37	7	14	25	16	26	24				
16:00-16:15	28.0	47	7	30												
16:15-16:30	25.0	25														
16:30-16:45	13.8	16	17	7	15											
16:45-17:00	20.8	21	45	16	12	8	23									
17:00-17:15	11.7	12	10	13												
17:15-17:30	32.0	17	13	15	83											
17:30-17:45	8.6	19	6	5	7	6										
17:45-18:00	13.6	31	20	4	19	17	11	12	15	4	13	11	6			
18:00-18:15	6.4	5	9	6	8	6	6	5								
16:00-18:00	16.1															

41. The average right turn delay from Kingston Street between 16:00 and 18:00 is 16.1 seconds per vehicle, excluding geometric delay.

42. The highest average delay occurred between 17:15 and 17:30 with an average delay of 32.1 seconds per vehicle. This was high due to a single vehicle having an 83 second delay. This long delay occurred due to a vehicle making a right turn in every time there was a gap on High Street.

43. The average delay between 16:15 to 17:15, when traffic volumes on High Street were the highest, was 17.3 seconds per vehicle.

44. During the surveys, I observed several right turning vehicles who decided to turn left after a period of time. In the morning peak a single vehicle did this after only 15 seconds, so it could have been someone changing their mind rather than due to frustration. In the evening peak this occurred five times, after waiting 30, 23, 22, 35 and 45 seconds. Ironically in all of these situations, within a few seconds of turning left, a gap appeared in the main flow of traffic.

Traffic Impact Assessment Comparison

45. A comparison has been made to the assumptions made in the Traffic Impact Assessment dated July 2020.

46. The estimated morning peak turning counts and the actual morning peak turning counts, for the peak hour on High Street, are shown in Figure 8.
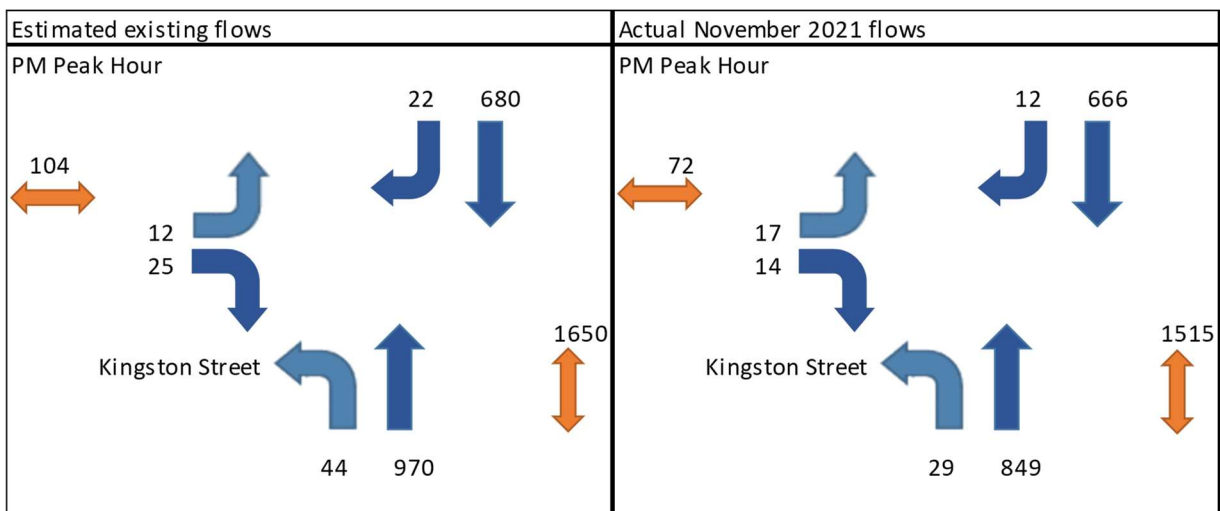
Figure 8 Estimated 2020 and Observed 2021 Turning Volumes - Morning Peak
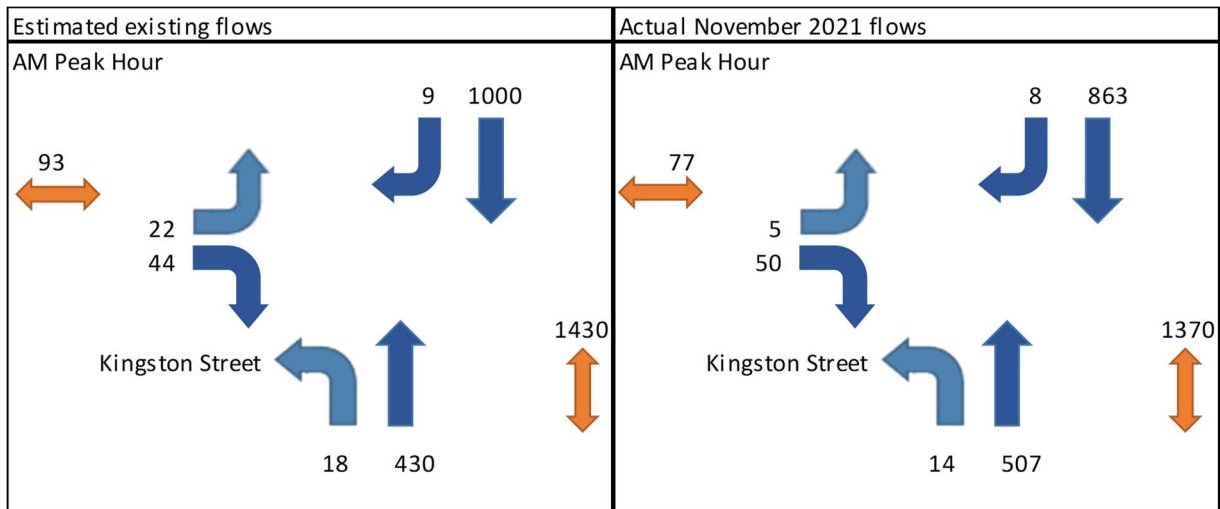
47. The previous analysis was based on a two way flow on High Street of 1430 and a two way flow on Kingston Street of 93 during the morning peak hour. The actual November 2021 survey, which is considered to be representative of a typical day for 2021 based on the review of seasonal traffic count data, has a two way flow on High Street of 1370 and a two way flow on Kingston Street of 77. I therefore consider that my previous analysis is conservative.

48. The estimated evening peak turning counts and the actual evening peak turning counts, for the peak hour on High Street, is shown in Figure 9.

Figure 9 Estimated 2020 and Observed 2021 Turning Volumes - Evening Peak

49. The previous analysis was based on a two way flow on High Street of 1650 and a two way flow on Kingston Street of 104 during the evening peak hour. The actual November 2021 survey has a two way flow on High Street of 1515 and a two way flow on Kingston Street of 72. I therefore consider that my previous analysis is conservative.

50. The delays for right turning vehicles exiting Kingston Street are provided in Table 4.

51. The first column shows the modelled delays based on the estimated turning flows at the intersection. The second column shows the average observed delays during the surveys with an additional 5.5 seconds added to incorporate geometric delays and make them comparative to the modelled delays. The third column shows the modelled delays based on observed turning flows during the November 2021 surveys.

Table 4   Right Turn Delays on Kingston Street at High Street (seconds per vehicle)

	Modelled 2020 delays based on estimated flows	Observed delays, including geometric delay	Modelled 2021 delays based on actual flows
Morning Peak Hour	28.7	18.4	20.9
Evening Peak Hour	37.7	22.8	23.9

52. As expected, the modelled 2021 delays are less than the modelled 2020 delays due to the lower traffic volumes. However, the modelled 2021 delays are slightly higher than the observed 2021 delays which means that the gap acceptance parameters used in the model are greater than actual and again shows that my previous analysis was conservative.

53. The estimated trip generations used in the previous analysis and the actual trip generations for the 100 houses that use the intersection are provided in Table 5.

Table 5   Estimated 2020 and Actual 2021 Household Trip Generation Rates

	Trip Generation Rate used in Traffic Impact Assessment	Actual Trip Generation Rate
Morning Peak Hour	0.90 trips per household	0.81 trips per household
Evening Peak Hour	1.00 trips per household	0.86 trips per household

54. The trip generation rate used in my previous analysis was higher than the actual observed trip generation rate. It is considered that this is possibly due to the wide spread of the trips being generated. For example, in the morning peak, residents employed in Wellington will leave earlier than residents employed in Lower Hutt. Again, this shows that my previous analysis was conservative.

55. Overall, I am satisfied that the previous analysis was conservative and that the actual impacts of the proposed development will therefore be less than shown in the Traffic Impact Assessment.

Reply to Evidence of Harriet Fraser

56. I have reviewed the statement of evidence prepared by Harriet Fraser. I note that we are in agreement with most matters. I have commented on the matters where she disagrees with my Traffic Impact Assessment (TIA).

57. In the TIA I stated that the kerb width of Kingston Street was 7.0 m. Ms Fraser has stated that the width varies between 6.7 m and 6.9 m. The difference in width does not alter the effect of a vehicle parked on Kingston Street. At both 6.7 m and 7.0 m, a car can park on one side and still enable two cars to pass each other.

58. In the TIA I stated that the flush median on High Street enables vehicles to make a right turn out of Kingston Street in two movements. Ms Fraser did not observe this being undertaken, however that does not mean that this can not be undertaken by vehicles. I should note that during my two surveys, I also do not recall seeing a vehicle do this.

59. In the TIA I compared the Stopping Sight Distance (SSD) to the available sight distance. Ms Fraser considers that the Safe Intersection Sight Distance (SISD) or the Minimum Gap Sight Distance (MGSD) should be used. The SSD is the distance required for

vehicle on the main road to react to a potential hazard and stop prior to a collision. The SISD is the SSD plus the distance a vehicle would travel in three seconds. The three seconds is the time allowed for a vehicle to observe a potential conflict developing. The MGSD is based on the critical gap acceptances that drivers are prepared to accept. Ms Fraser has recommended that the no stopping lines on the High Street frontage on the south are extended to provide 69 m of clear visibility. As I measured the sight distance to the south as being 65 m, the extension does not need to be excessive and should not affect on street parking.

60. In the TIA I concluded that there will be no adverse effects of the rezoning. Ms Fraser considers that "*the increase in forecast delays for vehicles turning right out of Kingston Street and onto High Street at peak times is likely to result in driver frustration and increased risk taking*". I have already demonstrated that my previous analysis of the intersection was conservative, and therefore the additional delays is also conservative. As such, I have updated the intersection analysis based on the observed flows and estimated trip generations reported in the TIA. As the previous analysis was conservative, the analysis using the updated data shows that the effect of the re-zoning will be less than previously considered. The updated analysis is summarised in Table 6.

Table 6   Average Right Turn Delays on Kingston Street at High Street (seconds per vehicle)

	Observed delays, including geometric delay	Modelled delays 100 houses (existing)	Modelled delays 129 houses (likely future)	Modelled delays 163 houses (possible future)
Morning Peak Hour	18.4	20.9	22.0	25.2
Evening Peak Hour	22.8	23.9	24.6	27.3

61. Ms Fraser has recommended that the flush median at the intersection is widened to at least 3.3 m such that a vehicle turning right out of Kingston Street can comfortably and safely make the turn in two stages. The existing width is 2.5 m and as such is wide

enough for a 90th percentile car to comfortably be within it, as a 90th percentile car is 1.88 m wide. I know that Hutt City Council Officers have been concerned in the past due to delivery vehicles parking in flush medians in commercial areas, and Waka Kotahi considers that wide flush medians encourage overtaking in unsuitable locations, I therefore consider that the existing flush median is acceptable in its current form.

Summary

62. As a response to submitters concerns regarding the use of factored historic traffic count data, I have undertaken additional surveys. I am satisfied that, based on all the data I have access to, my previous analysis was conservative and that the actual impacts of the proposed rezoning are likely to be less than my previous analysis.

63. The Council's traffic engineer disagrees with some of my findings and I have responded accordingly. In particular, it was recommended that the no stopping lines on High Street south of Kingston Street is increased. I agree that this will improve safety and will improve access. It was also recommended that the flush median be widened to 3.3 m. I disagree that this is required.

64. The new traffic data confirms my previous analysis and conclusion that the proposed re-zoning can take effect with no adverse traffic effects.

Appendix A – Intersection Survey Results

	Southbound	Northbound	Left in	Right out	Left out	Right in
Friday 12 November 2021						
6:45-7:00	113	60	0	7	1	1
7:00-7:15	126	67	2	6	2	0
7:15-7:30	146	80	0	9	2	0
7:30-7:45	208	82	1	5	4	0
7:45-8:00	202	78	4	8	2	3
8:00-8:15	196	103	1	17	0	0
8:15-8:30	216	123	6	17	5	1
8:30-8:45	217	139	2	9	0	6
8:45-9:00	234	142	5	7	0	1
Wednesday 17 November 2021						
15:45-16:00	156	190	6	11	3	5
16:00-16:15	164	199	10	3	3	4
16:15-16:30	168	206	6	1	3	1
16:30-16:45	166	202	9	4	6	4
16:45-17:00	171	209	7	6	5	4
17:00-17:15	161	232	7	3	3	3
17:15-17:30	146	210	8	7	3	2
17:30-17:45	151	216	12	5	1	3
17:45-18:00	138	193	9	12	3	3
18:00-18:15	132	179	6	7	2	3