Absolutely Positively
Wellington City Council
Me Heke Ki Pōneke

File ref: IRC-5319

19 September 2023

John Doe
fyi-request-23848-47178e0b@requests.fyi.org.nz

Kia ora

Kent Terrace Cycleway

Thank you for your request made under the Local Government Official Information and Meetings Act 1987 (the Act), received 15 August 2023. You requested the following information:

1. Traffic Modelling, Reporting and Calculations (Including SIDRA analysis) as it relates to the newly installed cycleway along Kent Terrace. To understand the predicted level of service decrease/increases for the following intersections:

a) Oriental Parade and Cable Street.
b) Kent Terrace and Courtenay Place
c) Kent Terrace and State Highway 1

2. What validation has been completed by WCC, since the installation of the cycleway including independent road safety audits and verification of the predicted level of service decrease/increases.

Wellington City Council has **granted** your request for information. Please see the below response to your questions.

1. Traffic Modelling, Reporting and Calculations (Including SIDRA analysis) as it relates to the newly installed cycleway along Kent Terrace.

Appendix 1 contains the modelling for intersections Kent Terrace and Courtenay Place and Kent Terrace and State Highway 1. Cable Street and Oriental Parade were not changed significantly enough to warrant the modelling resource.

2. What validation has been completed by WCC, since the installation of the cycleway including independent road safety audits and verification of the predicted level of service decrease/increases.

The transitional approach allows us to implement changes to the roadway quickly and with adaptable materials, so generally minimal modelling is done on these projects as we can respond to issues as needed. On Cambridge Terrace we have already been able to address some congestion issues caused by the initial storage space in the Elizabeth St turn bay.

While we have been preliminarily monitoring queue lengths and any pressing issues, most of the post-installation evaluation will not begin until 6 to 8 weeks after installation as users need this time to adapt to the new layout and flows to normalise. However, we can share that the predicted queues on Cambridge Terrace at Vivian Street are notably shorter than predicted by modelling. Further qualitative feedback will be collected during the feedback phase of the project beginning mid-September. While not completed post installation, we have included the latest independent road safety audits on the 90% designs which may be of interest to you.

Below are the documents that fall in scope of your request and my decision to release the document.

Item	Document name/description	Decision
1	Appendix 1 – Modelling	Released
2	Appendix 2 – Road Safety Audit	Released

Right of review
If you are not satisfied with the Council's response, you may request the Office of the Ombudsman to investigate the Council's decision. Further information is available on the Ombudsman website, www.ombudsman.parliament.nz.

Please note, we may proactively release our response to your request.

Thank you again for your request, if you have any questions, please feel free to contact me.

Ngā mihi nui

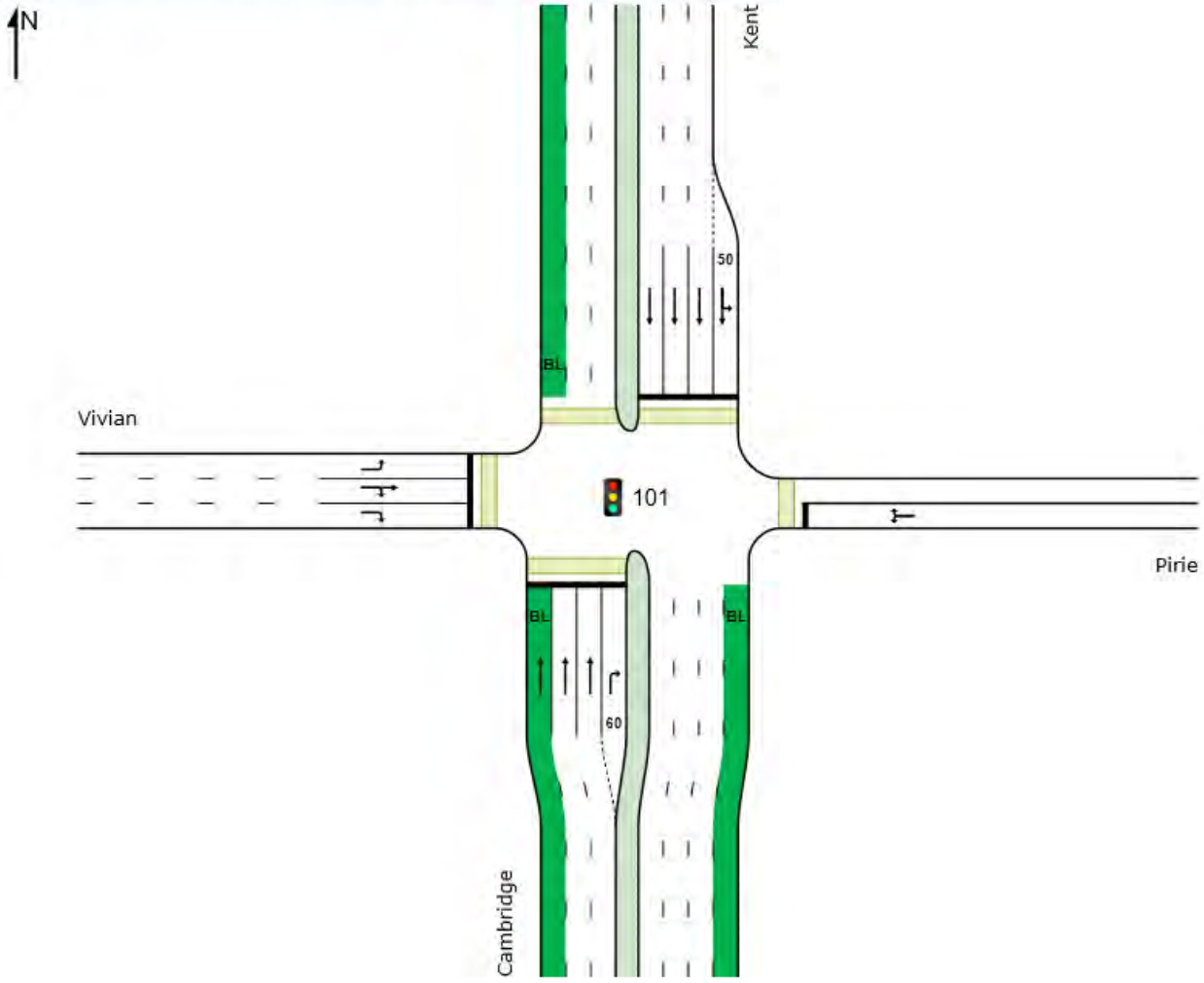
Amber Smith
Senior Advisor Official Information

SITE LAYOUT

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - AM current (Site Folder: AM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - AM current (Site Folder: AM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Cambridge													
Lane 1 (BL)	33	100.0	333	0.100	100	31.7	LOS C	1.3	17.3	Full	500	0.0	0.0
Lane 2	315	4.2	535	0.589	100	36.8	LOS D	14.6	106.2	Full	500	0.0	0.0
Lane 3	315	4.2	535	0.589	100	36.8	LOS D	14.6	106.2	Full	500	0.0	0.0
Lane 4	71	4.0	98	0.716	100	66.7	LOS E	4.1	29.7	Short	60	0.0	NA
Approach	734	8.5		0.716		39.5	LOS D	14.6	106.2				
East: Pirie													
Lane 1	114	4.0	181	0.630	100	59.7	LOS E	6.2	44.9	Full	500	0.0	0.0
Approach	114	4.0		0.630		59.7	LOS E	6.2	44.9				
North: Kent													
Lane 1	92	51.9	283	0.325	100	44.5	LOS D	4.3	43.7	Short	50	0.0	NA
Lane 2	264	4.2	310	0.851	100	55.5	LOS E	15.4	111.4	Full	500	0.0	0.0
Lane 3	279	4.2	328	0.851	100	55.7	LOS E	16.3	118.4	Full	500	0.0	0.0
Lane 4	279	4.2	328	0.851	100	55.7	LOS E	16.3	118.4	Full	500	0.0	0.0
Approach	914	9.0		0.851		54.5	LOS D	16.3	118.4				
West: Vivian													
Lane 1	186	4.0	821	0.227	100	25.0	LOS C	6.0	43.5	Full	500	0.0	0.0
Lane 2	706	8.5	800	0.882	100	44.9	LOS D	40.2	302.1	Full	500	0.0	0.0
Lane 3	700	9.0	793	0.882	100	45.6	LOS D	40.0	301.4	Full	500	0.0	0.0
Approach	1592	8.2		0.882		42.9	LOS D	40.2	302.1				
Intersection	3353	8.3		0.882		45.9	LOS D	40.2	302.1				

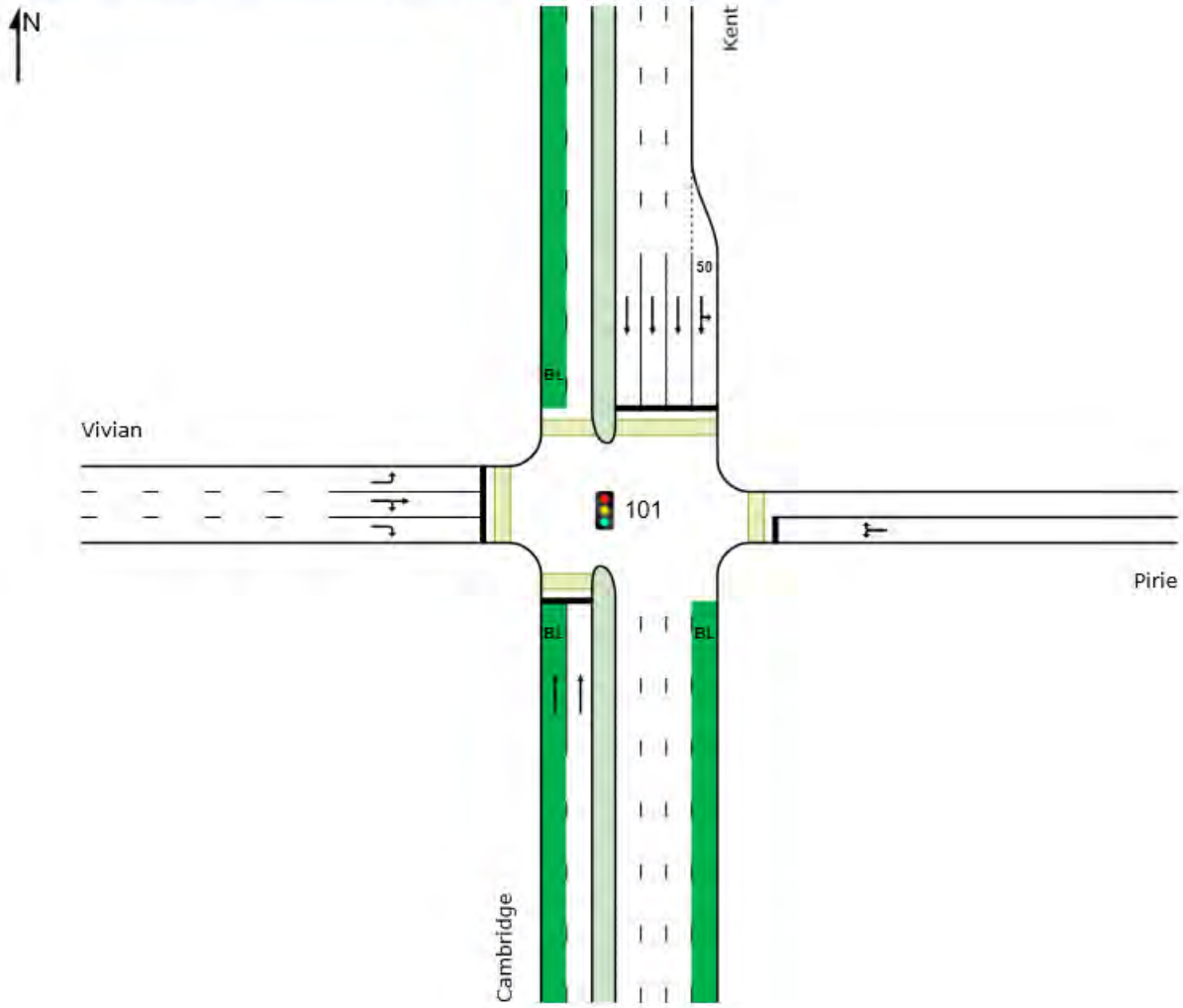
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - AM 1 traffic lane (Site Folder: AM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - AM 1 traffic lane (Site Folder: AM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Cambridge													
Lane 1 (BL)	37	100.0	443	0.083	100	26.0	LOS C	1.4	18.0	Full	500	0.0	0.0
Lane 2	697	4.2	712	0.979	100	78.6	LOS E	56.8	411.8	Full	500	0.0	0.0
Approach	734	9.0		0.979		76.0	LOS E	56.8	411.8				
East: Pirie													
Lane 1	114	4.0	120	0.944	100	86.4	LOS F	8.2	59.0	Full	500	0.0	0.0
Approach	114	4.0		0.944		86.4	LOS F	8.2	59.0				
North: Kent													
Lane 1	92	49.3	542	0.169	100	29.8	LOS C	3.6	35.5	Short	50	0.0	NA
Lane 2	274	4.2	712	0.385	100	29.2	LOS C	11.6	84.3	Full	500	0.0	0.0
Lane 3	274	4.2	712	0.385	100	29.2	LOS C	11.6	84.3	Full	500	0.0	0.0
Lane 4	274	4.2	712	0.385	100	29.2	LOS C	11.6	84.3	Full	500	0.0	0.0
Approach	914	8.7		0.385		29.3	LOS C	11.6	84.3				
West: Vivian													
Lane 1	186	4.0	737	0.253	100	30.5	LOS C	7.1	51.5	Full	500	0.0	0.0
Lane 2	706	8.5	719	0.982	100	84.6	LOS F	58.7	440.7	Full	500	0.0	0.0
Lane 3	700	9.0	713	0.982	100	85.4	LOS F	58.3	439.4	Full	500	0.0	0.0
Approach	1592	8.2		0.982		78.6	LOS E	58.7	440.7				
Intersection	3353	8.4		0.982		64.9	LOS E	58.7	440.7				

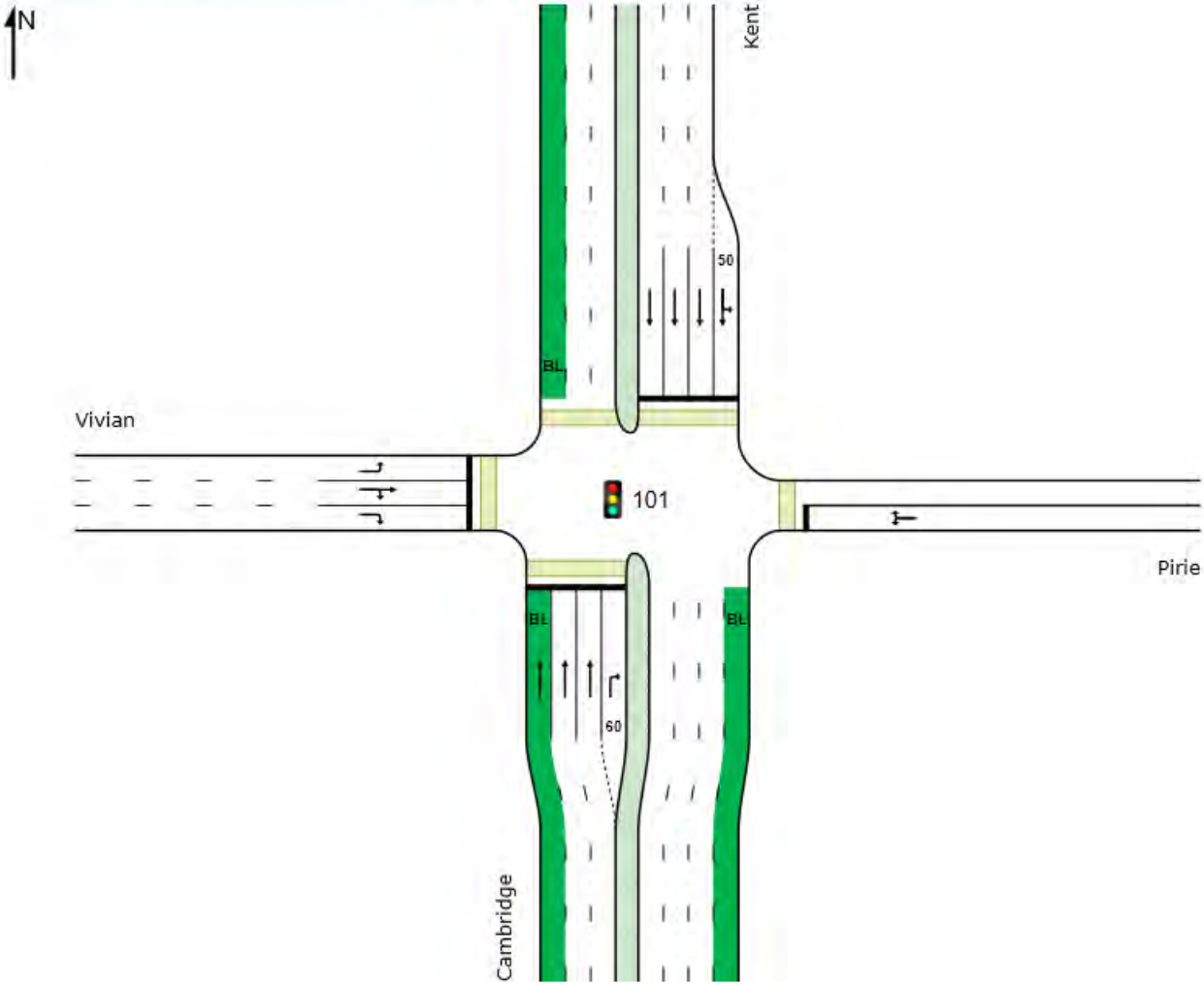
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - PM current (Site Folder: PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - PM current (Site Folder: PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Cambridge													
Lane 1 (BL)	35	100.0	319	0.111	100	30.1	LOS C	1.3	17.2	Full	500	0.0	0.0
Lane 2	337	4.2	512	0.658	100	35.3	LOS D	14.8	107.1	Full	500	0.0	0.0
Lane 3	337	4.2	512	0.658	100	35.3	LOS D	14.8	107.1	Full	500	0.0	0.0
Lane 4	66	4.0	108	0.612	100	59.5	LOS E	3.4	24.9	Short	60	0.0	NA
Approach	776	8.6		0.658		37.1	LOS D	14.8	107.1				
East: Pine													
Lane 1	122	4.0	181	0.676	100	55.9	LOS E	6.2	44.7	Full	500	0.0	0.0
Approach	122	4.0		0.676		55.9	LOS E	6.2	44.7				
North: Kent													
Lane 1	140	34.9	314	0.445	100	42.9	LOS D	6.2	56.0	Short	50	0.0	NA
Lane 2	252	4.2	285	0.886	100	56.4	LOS E	14.2	103.0	Full	500	0.0	0.0
Lane 3	252	4.2	285	0.886	100	56.4	LOS E	14.2	103.0	Full	500	0.0	0.0
Lane 4	252	4.2	285	0.886	100	56.4	LOS E	14.2	103.0	Full	500	0.0	0.0
Approach	897	9.0		0.886		54.3	LOS D	14.2	103.0				
West: Vivian													
Lane 1	189	4.0	813	0.233	100	23.6	LOS C	5.6	40.8	Full	500	0.0	0.0
Lane 2	680	8.5	792	0.858	100	39.2	LOS D	34.0	255.0	Full	500	0.0	0.0
Lane 3	674	9.0	785	0.858	100	39.9	LOS D	33.7	254.3	Full	500	0.0	0.0
Approach	1543	8.2		0.858		37.6	LOS D	34.0	255.0				
Intersection	3338	8.3		0.886		42.6	LOS D	34.0	255.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - PM 1 traffic lane (Site Folder: PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

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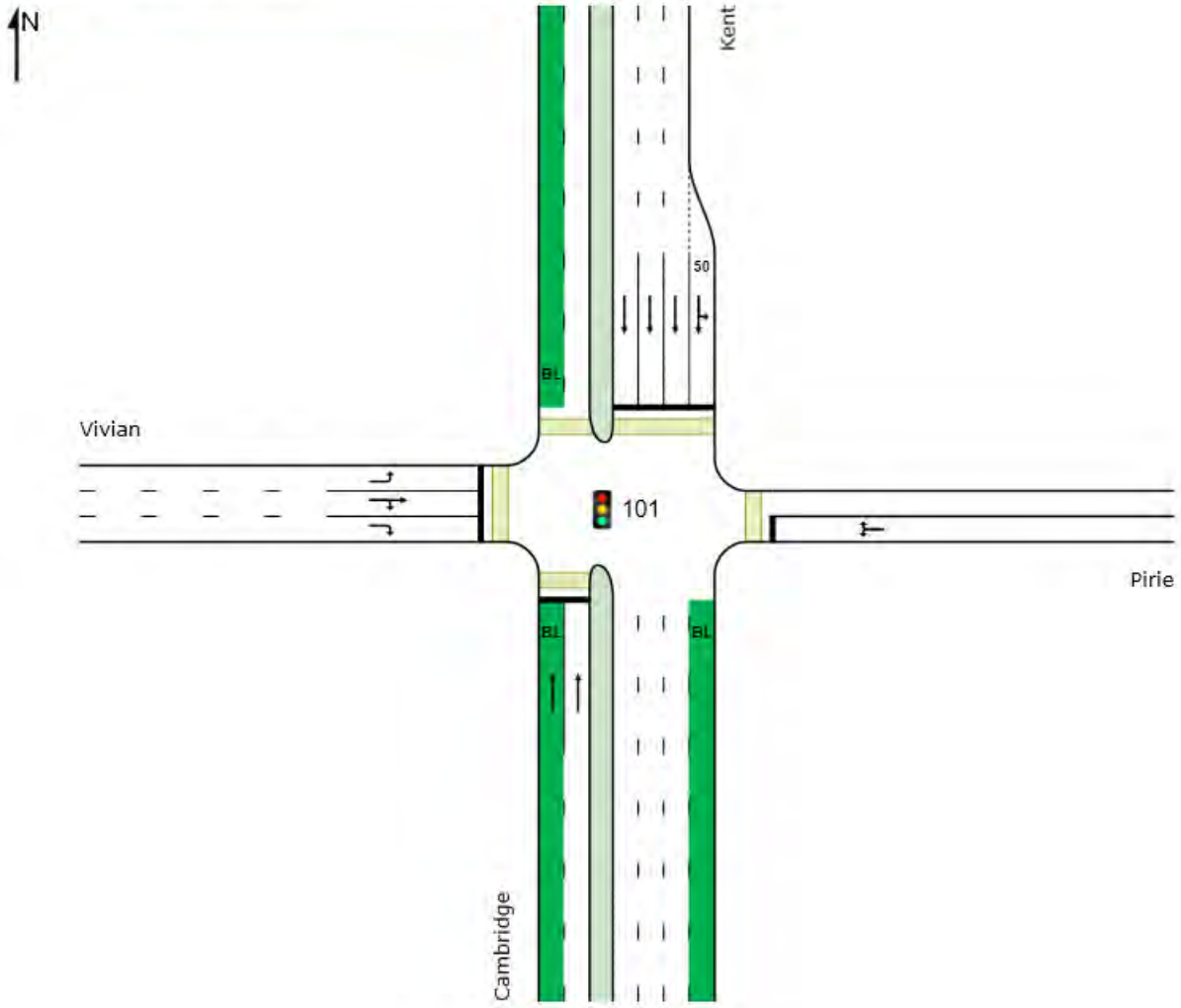


LANE SUMMARY

Site: 101 [Vivian/ Kent/ Cambridge/ Pirie - PM 1 traffic lane (Site Folder: PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Practical Cycle Time)

Lane Use and Performance

	DEMAND FLOWS: Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE: Veh	Dist m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
South: Cambridge													
Lane 1 (BL)	39	100.0	453	0.086	100	25.3	LOS C	1.4	18.8	Full	500	0.0	0.0
Lane 2	737	4.2	728	1.013	100	97.0	LOS F	66.7	483.5	Full	500	0.0	2.0
Approach	776	9.0		1.013		93.4	LOS F	66.7	483.5				
East: Pirie													
Lane 1	122	4.0	135	0.902	100	78.7	LOS E	8.3	60.1	Full	500	0.0	0.0
Approach	122	4.0		0.902		78.7	LOS E	8.3	60.1				
North: Kent													
Lane 1	140	31.4	602	0.232	100	30.6	LOS C	5.5	48.9	Short	50	0.0	NA
Lane 2	252	4.2	728	0.347	100	28.1	LOS C	10.4	75.5	Full	500	0.0	0.0
Lane 3	252	4.2	728	0.347	100	28.1	LOS C	10.4	75.5	Full	500	0.0	0.0
Lane 4	252	4.2	728	0.347	100	28.1	LOS C	10.4	75.5	Full	500	0.0	0.0
Approach	897	8.4		0.347		28.5	LOS C	10.4	75.5				
West: Vivian													
Lane 1	189	4.0	707	0.268	100	32.0	LOS C	7.5	54.1	Full	500	0.0	0.0
Lane 2	680	8.5	689	0.986	100	86.0	LOS F	57.3	430.2	Full	500	0.0	0.0
Lane 3	674	9.0	684	0.986	100	86.7	LOS F	56.9	428.9	Full	500	0.0	0.0
Approach	1543	8.2		0.986		81.4	LOS F	57.3	430.2				
Intersection	3338	8.3		1.013		69.9	LOS E	66.7	483.5				

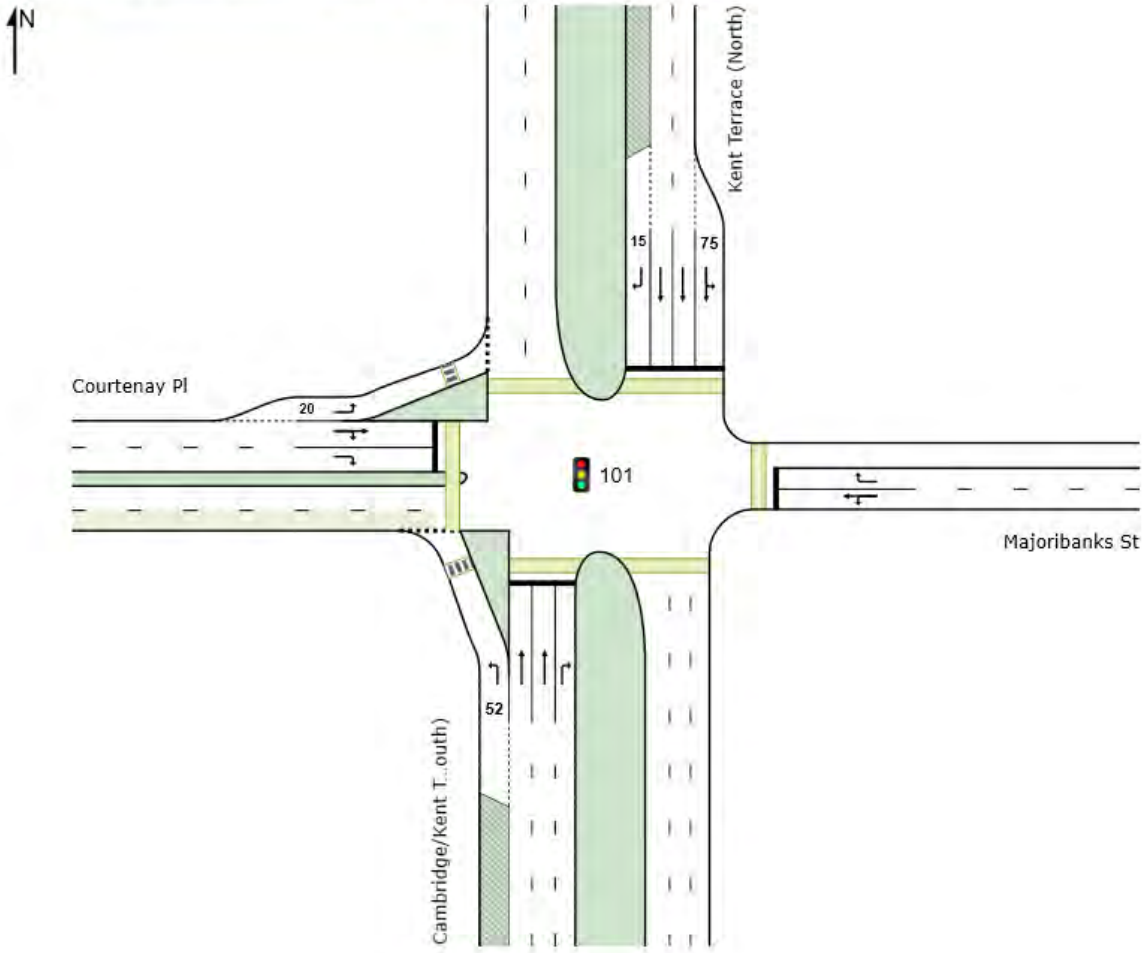
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Cambridge Terr/Courtenay Pl - AM - Base (Site Folder: AM Peak (8-9 am))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Cambridge Terr/Courtenay Pl - AM - Base (Site Folder: AM Peak (8-9 am))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Cambridge/Kent Terrace (South)													
Lane 1	234	23.9	1092	0.215	100	7.1	LOS A	1.8	15.2	Short (P)	52	0.0	NA
Lane 2	337	10.9	765	0.441	100	22.2	LOS C	11.7	89.4	Full	190	0.0	0.0
Lane 3	311	10.9	765	0.407	92[5]	21.8	LOS C	10.6	81.1	Full	190	0.0	0.0
Lane 4	66	11.5	235	0.279	100	47.5	LOS D	3.0	22.8	Full	190	0.0	0.0
Approach	948	14.2		0.441		20.0	LOS C	11.7	89.4				
East: Majoribanks St													
Lane 1	125	6.0	323	0.388	100	42.0	LOS D	5.5	40.4	Full	500	0.0	0.0
Lane 2	248	3.9	320	0.776	100	51.0	LOS D	12.5	90.6	Full	500	0.0	0.0
Approach	373	4.6		0.776		48.0	LOS D	12.5	90.6				
North: Kent Terrace (North)													
Lane 1	170	15.2	663	0.256	33[5]	27.6	LOS C	5.7	44.9	Short	75	0.0	NA
Lane 2	489	15.0	627[1]	0.780	100	31.3	LOS C	21.7	171.1	Full	500	0.0	0.0
Lane 3	335	15.0	553[1]	0.605	78[5]	25.6	LOS C	12.5	98.9	Full	500	0.0	0.0
Lane 4	74	24.6	83[1]	0.899	100	67.8	LOS E	4.2	35.9	Short (P)	15	0.0	NA
Approach	1068	15.7		0.899		31.4	LOS C	21.7	171.1				
West: Courtenay Pl													
Lane 1	45	35.7	681	0.066	100	11.4	LOS B	0.7	6.7	Short	20	0.0	NA
Lane 2	46	20.9	106	0.438	53[5]	52.7	LOS D	2.4	19.4	Full	500	0.0	0.0
Lane 3	74	36.2	89	0.829	100	64.4	LOS E	4.2	38.1	Full	500	0.0	0.0
Approach	166	31.8		0.829		46.7	LOS D	4.2	38.1				
Intersection	2555	14.6		0.899		30.6	LOS C	21.7	171.1				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

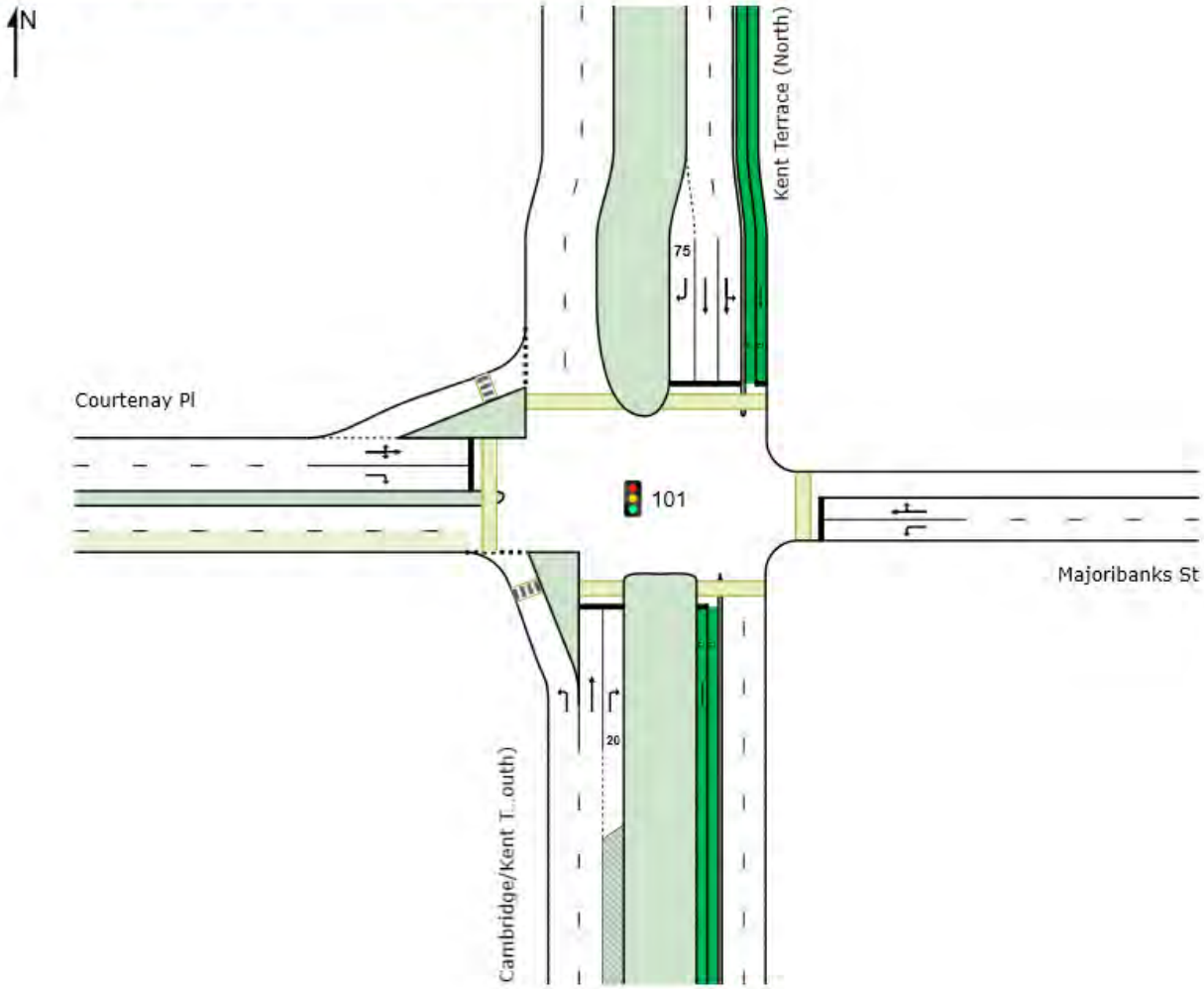
1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
5 Lane under-utilisation found by the program

SITE LAYOUT

Site: 101 [Cambridge Terr/Courtenay Pl - AM - TC 120s - Interim (Site Folder: AM Peak (8-9 am))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Cambridge Terr/Courtenay Pl - AM - TC 120s - Interim (Site Folder: AM Peak (8-9 am))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Cambridge/Kent Terrace (South)													
Lane 1	230	24.1	1090	0.211	100	7.1	LOS A	2.0	17.1	Full	190	0.0	0.0
Lane 2	648	10.9	609[1]	1.064	100	134.1	LOS F	68.3	522.8	Full	190	0.0	100.0
Lane 3	66	11.5	210	0.312	100	57.7	LOS E	3.6	27.7	Short (P)	20	0.0	NA
Lane 4 (CL)	115	0.0	1704	0.068	100	33.3	LOS C	4.8	12.9	Full	190	0.0	0.0
Approach	1059	12.8		1.064		90.9	LOS F	68.3	522.8				
East: Majoribanks St													
Lane 1	58	3.7	281	0.207	100	52.6	LOS D	3.0	21.7	Full	500	0.0	0.0
Lane 2	314	4.8	283	1.108	100	174.9	LOS F	35.4	257.8	Full	500	0.0	0.0
Approach	372	4.6		1.108		155.8	LOS F	35.4	257.8				
North: Kent Terrace (North)													
Lane 1 (CL)	16	0.0	620	0.026	100	51.1	LOS D	0.8	2.2	Full	500	0.0	0.0
Lane 2	508	15.1	505	1.006	100	101.1	LOS F	45.1	356.1	Full	500	0.0	0.0
Lane 3	485	15.0	483[1]	1.006	100	100.3	LOS F	43.2	341.1	Full	500	0.0	0.0
Lane 4	73	24.8	80	0.913	100	82.0	LOS F	5.1	43.1	Short	75	0.0	NA
Approach	1082	15.5		1.006		98.7	LOS F	45.1	356.1				
West: Courtenay Pl													
Lane 1	144	23.5	140	1.033	100	96.8	LOS F	9.2	77.3	Full	500	0.0	0.0
Lane 2	18	100.0	82	0.222	22[2]	65.8	LOS E	1.1	14.1	Full	500	0.0	0.0
Approach	163	32.1		1.033		93.4	LOS F	9.2	77.3				
Intersection	2676	13.9		1.108		103.2	LOS F	68.3	522.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

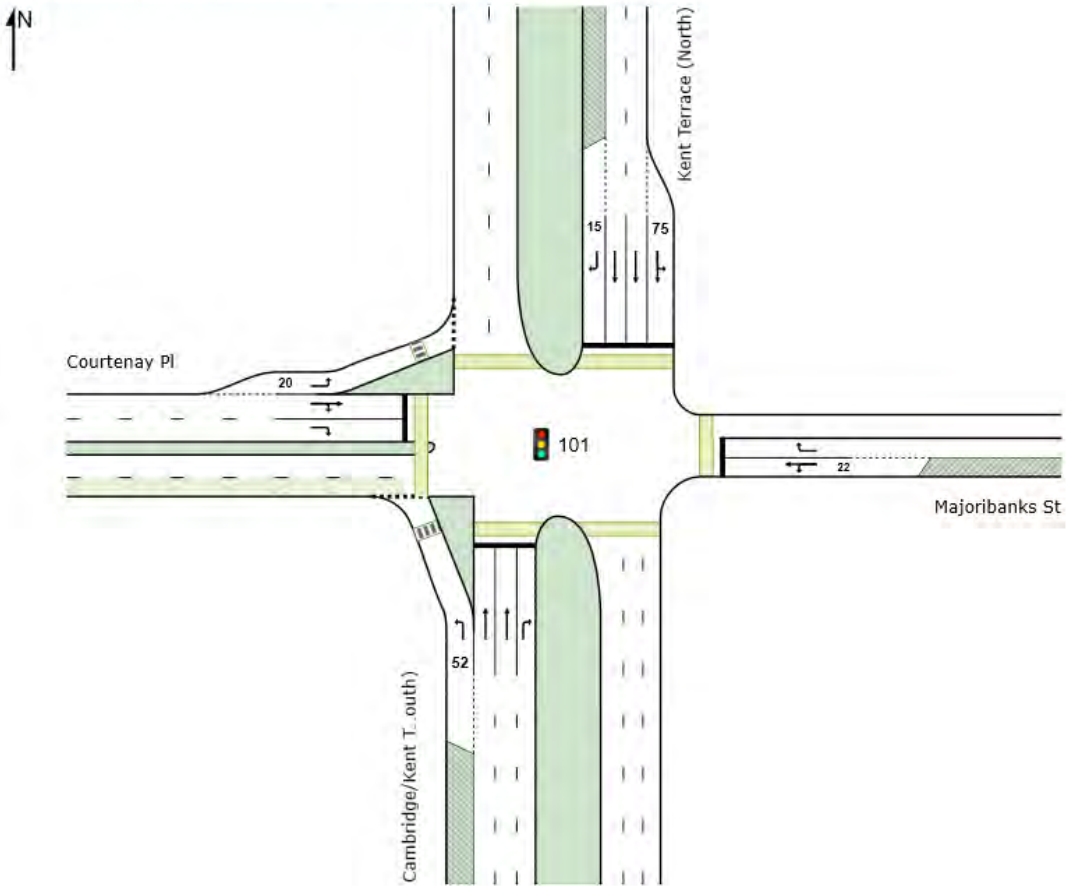
1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
2 Lane under utilisation forced by the program.

SITE LAYOUT

Site: 101 [Cambridge Terr/Courtenay Pl - PM - Base (Site Folder: PM Peak (5-6pm))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Cambridge Terr/Courtenay Pl - PM - Base (Site Folder: PM Peak (5-6pm))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 100 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh.	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Cambridge/Kent Terrace (South)													
Lane 1	278	18.9	1121	0.248	100	7.1	LOS A	2.2	18.0	Short (P)	52	0.0	NA
Lane 2	260	11.1	582	0.481	96 5	29.6	LOS C	11.0	84.6	Full	190	0.0	0.0
Lane 3	291	11.1	582	0.500	100	29.8	LOS C	11.6	88.7	Full	190	0.0	0.0
Lane 4	83	10.4	237	0.349	100	48.0	LOS D	3.8	28.9	Full	190	0.0	0.0
Approach	932	13.4		0.500		24.6	LOS C	11.6	88.7				
East: Majoribanks St													
Lane 1	91	5.9	215	0.426	100	48.3	LOS D	4.3	31.7	Short (P)	22	0.0	NA
Lane 2	145	3.7	188 f	0.773	100	55.3	LOS E	7.5	53.8	Full	500	0.0	0.0
Approach	237	4.5		0.773		52.6	LOS D	7.5	53.8				
North: Kent Terrace (North)													
Lane 1	281	14.9	734	0.382	48 5	26.2	LOS C	9.4	74.5	Short	75	0.0	NA
Lane 2	524	15.0	652 f	0.804	100	29.8	LOS C	22.9	181.2	Full	500	0.0	0.0
Lane 3	358	15.0	601 f	0.595	74 5	22.7	LOS C	12.7	100.1	Full	500	0.0	0.0
Lane 4	97	27.8	191 f	0.508	100	38.4	LOS D	3.9	33.7	Short (P)	15	0.0	NA
Approach	1259	16.0		0.804		27.6	LOS C	22.9	181.2				
West: Courtenay Pl													
Lane 1	40	35.1	846	0.047	100	9.3	LOS A	0.5	4.7	Short	20	0.0	NA
Lane 2	103	25.4	126 f	0.818	100	58.5	LOS E	5.6	47.9	Full	500	0.0	0.0
Lane 3	99	34.4	121	0.818	100	62.0	LOS E	5.4	49.2	Full	500	0.0	0.0
Approach	242	30.7		0.818		51.8	LOS D	5.6	49.2				
Intersection	2670	15.4		0.818		31.0	LOS C	22.9	181.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Intersection and Approach LOS values are based on average delay for all lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

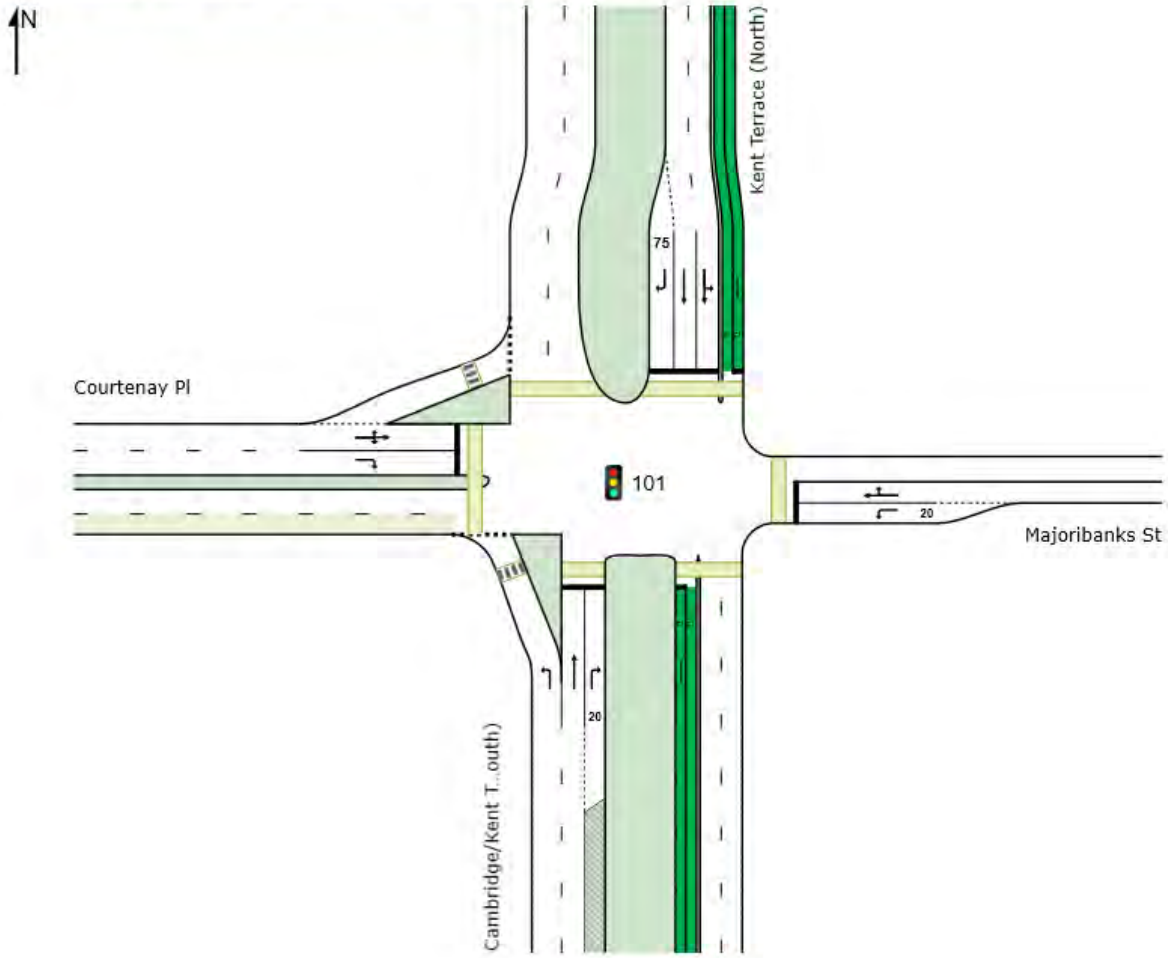
f Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.
5 Lane under-utilisation found by the program

SITE LAYOUT

Site: 101 [Cambridge Terr/Courtenay Pl - PM - TC 120s - Interim (Site Folder: PM Peak (5-6pm))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



LANE SUMMARY

Site: 101 [Cambridge Terr/Courtenay Pl - PM - TC 120s - Interim (Site Folder: PM Peak (5-6pm))]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh.	Dist] m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
South: Cambridge/Kent Terrace (South)													
Lane 1	273	19.1	1120	0.244	100	7.1	LOS A	2.5	20.2	Full	190	0.0	0.0
Lane 2	571	11.1	588[1]	0.972	100	76.5	LOS E	44.4	340.3	Full	190	0.0	58.8
Lane 3	83	10.4	212	0.391	100	58.3	LOS E	4.6	35.1	Short (P)	20	0.0	NA
Lane 4 (CL)	16	0.0	1704	0.009	100	32.5	LOS C	0.7	1.8	Full	190	0.0	0.0
Approach	943	13.2		0.972		54.0	LOS D	44.4	340.3				
East: Majoribanks St													
Lane 1	51	4.3	206	0.245	100	58.0	LOS E	2.8	20.1	Short	20	0.0	NA
Lane 2	185	4.6	181[1]	1.020	100	116.7	LOS F	16.3	118.8	Full	500	0.0	0.0
Approach	236	4.5		1.020		104.1	LOS F	16.3	118.8				
North: Kent Terrace (North)													
Lane 1 (CL)	115	0.0	620	0.186	100	52.4	LOS D	6.1	16.4	Full	500	0.0	0.0
Lane 2	596	15.0	516	1.154	100	207.8	LOS F	76.7	606.0	Full	500	0.0	22.4
Lane 3	567	15.0	491[1]	1.154	100	206.0	LOS F	73.1	577.6	Full	500	0.0	18.1
Lane 4	95	28.0	91	1.041	100	129.8	LOS F	8.7	75.8	Short	75	0.0	NA
Approach	1372	14.6		1.154		188.6	LOS F	76.7	606.0				
West: Courtenay Pl													
Lane 1	206	20.5	190	1.084	100	140.1	LOS F	17.9	147.4	Full	500	0.0	0.0
Lane 2	31	100.0	119	0.263	24[2]	61.3	LOS E	1.8	23.1	Full	500	0.0	0.0
Approach	238	30.9		1.084		129.7	LOS F	17.9	147.4				
Intersection	2789	14.7		1.154		130.9	LOS F	76.7	606.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Intersection and Approach LOS values are based on average delay for all lanes.
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Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
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2 Lane under-utilisation found by the program.

NEWTOWN TO CITY TRANSITIONAL CYCLEWAY 90% DETAILED DESIGN ROAD SAFETY AUDIT

PREPARED FOR WELLINGTON CITY COUNCIL

March 2022

Stantec

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QUALITY STATEMENT

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APPROVED FOR ISSUE BY

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Refer to Auditors Statement in Section 4

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REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
A	24/2/2022	Draft for SAT review	M Smith	J England	C de Kock	
B	8/3/2022	Final for Client Review	M Smith	J England	C de Kock	C de Kock
c	28/4/2022	Final for Sign off				

Wellington City Council

Newtown to City Transitional Cycleway
90% Detailed Design Road Safety Audit

CONTENTS

1. Introduction 1
1.1 Safety Audit Definition and Purpose 1
1.2 The Project 2
1.3 The Road Safety Audit Team 3
1.4 Previous Road Safety Audits 3
1.5 Scope of this Road Safety Audit 3
1.6 Report Format 3
1.7 Documents Provided 4
1.8 Disclaimer 5
2. Safety Concerns 6
2.1 General 6
2.2 Riddiford Street 12
2.3 Adelaide Road 16
2.4 Cambridge Terrace 24
2.5 Bi-Directional Alternate Route Design 32
3. Comments 40
4. Audit Statement 43
5. Response and Decision Statements 44
5.1 Designer's Responses 44
5.2 Safety Engineer's Comments (if applicable) 44
5.3 Project Manager's Decisions 44
5.4 Designer's Statement 44
5.5 Safety Audit Close Out 45

LIST OF TABLES

Table 1-1: Road Safety Audit Team Members 3
Table 1-2: Crash Frequency Descriptor 4
Table 1-3: Concern Assessment Rating Matrix 4
Table 1-4: Concern Categories 4
Table 1-5: Documents Provided to the SAT 5

LIST OF FIGURES

Figure 2-1: Riddiford Street southbound bus stop 7
Figure 2-2: Example of additional green markings at bus stops 9
Figure 2-3: Riddiford Street Bus Platform and adjacent cycle lane 11
Figure 2-4: Proposed Riddiford Street / Hospital Road intersection design 13
Figure 2-5: Riddiford St / Adelaide Road / Johns Street 15
Figure 2-6: Southbound Adelaide Road approach to intersection with Johns Street and Riddiford Street. 16
Figure 2-7: Current lane configuration and signal aspects 17
Figure 2-8: Adelaide Road / Hospital Road – southbound lanes shifted right 18
Figure 2-9: Lane widths on Adelaide Road and width of separators 20
Figure 2-10: Bus stop south of Broomhedge Street 21
Figure 2-11: Adelaide Road between Alfred St and Girton Tce – parking with adjacent bus lane 22
Figure 2-12: Adelaide Road / Rugby Street Intersection 23
Figure 2-13: Cambridge Terrace southern end of cycle lanes. 25
Figure 2-14: Typical U-Turn closure detail 26
Figure 2-15: Cambridge Tce and Fifeshire Ave intersection 27
Figure 2-16: Cambridge Tce / Vivian Street intersection 29
Figure 2-17: Cambridge Tce turning pockets for cyclists 30
Figure 2-18: Cambridge Tce ASB at Elizabeth St intersection 31
Figure 2-19: Cycle Path transition through Courtenay Place / Majoribanks St intersection to Oriental Parade 32
Figure 2-20: Cycle hook turn box located within intersection 34
Figure 2-21: Proposed Oriental Parade Crossing point 37
Figure 2-22: Existing speed hump and tree 38
Figure 2-23: Note vegetation blocks sight of car stopped at lights 38
Figure 2-24: Vegetation height masks car 38
Figure 2-25: Utility kiosk located at proposed crossing point 38
Figure 2-26: Service covers within proposed crossing point 38
Figure 2-27: Service covers within proposed crossing point 38
Figure 3-1: Alternate cyclist linkage to/from Courtenay Place 41
Figure 3-2: View west from Kent Terrace to Cambridge Tce and Courtenay Place beyond 41
Figure 3-3: View of alternate cyclist connection utilising existing ASBs. 41

APPENDICES

Appendix A Supplied Drawings and reports 1

1. Introduction

1.1 Safety Audit Definition and Purpose

A road safety audit is a term used internationally to describe an independent review of a future road project to identify any safety concerns that may affect the safety performance. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc.), carried out by an independent competent team who identify and document road safety concerns.

A road safety audit is intended to help deliver a safe road system and is not a review of compliance with standards.

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, which is a safe road system increasingly free of death and serious injury. The road safety audit is a safety review used to identify all areas of a project that are inconsistent with a Safe System and bring those concerns to the attention of the client so that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

'to deliver completed projects that contribute towards a safe road system that is free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.'

A road safety audit should desirably be undertaken at project milestones such as:

- concept stage (part of business case);
- scheme or preliminary design stage (part of pre-implementation);
- detail design stage (pre-implementation or implementation); or
- pre-opening or post-construction stage (implementation or post-implementation).

A road safety audit is not intended to be a technical or financial audit and does not substitute for a design check of standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the NZTA Road Safety Audit Procedures for Projects Guidelines - Interim release May 2013 the audit report should be submitted to the client who will instruct the designer to respond. The designer should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

For each audit team recommendation that is accepted, the client will make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations. It is to be completed by the designer, safety engineer, and client for each issue, and should record the designer's response, client's decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the important feedback loop. The road safety audit team leader will disseminate this to team members.

1.2 The Project

The WCC Transitional Cycleways proposes interim transitional cycleways to quickly roll out the WCC Cycleway network over months rather than years. These transitional cycleways will be formed with minimal physical works and temporary materials in an interim fashion.

Two projects are proposed as the initial tranche of work:

- Newtown to City, extending for 2.3km along Riddiford St, Adelaide Rd, Cambridge Terrace, Kent Terrace and Oriental Parade, and
- Botanic Gardens to City, extending for 1.3km along Tinakori Road, Bowen Street, Whitmore Street.

To enable the transitional cycleway approach, these projects are designed to fit within the existing physical road environment as far as possible to reduce the installation works required and demonstrate the temporary approach (i.e. Council are open to adjusting aspects of the cycleway following installation and are not investing heavily in physical works that may only be in place for a short length of time). Where possible kerbs and traffic signal poles are to be left in place and managed through design compromises.

Cycle facilities on these routes are expected to be upgraded to permanent as part of the Let's Get Wellington Moving (LGWM) programme of works (details below).

The 30% design road safety audits are intended to consider the wider implications for road users given this introduction of a new space within the road corridor and potential for conflicts between road users as a result of the changes to the road layout. Additional audits are carried out at 90% design and post construction, and details such as signage and markings are anticipated to be assessed at these later stages.

The Newtown to City Transitional Cycleway extends along Riddiford Street, Adelaide Road, Cambridge Terrace, Kent Terrace and Oriental Parade between Newtown (Mein Street) and the waterfront at Waitangi Park.

There is no current provision for cyclists between Newtown and the city; cyclists are currently required to share traffic lanes with vehicles. It is noted that there are peak period bus lanes on parts of the route (Adelaide Road and Cambridge Terrace) which are utilised by cyclists during peak periods. This suppresses cycling demand that could start to be unlocked with a suitable facility.

LGWM works on this corridor have not yet been confirmed and are not scheduled to occur for several years (maybe up to 10 years). WCC has an opportunity to implement some interim measures until these future works are completed.

This road corridor has limited width and a cycle facility would occupy space currently used for other modes of transport. For past projects this has meant that affected stakeholders are concerned with the impact of the changes and sceptical of the benefits. This interim project will record the outcomes to quantify the benefits and compromises of such a facility for consideration in the LGWM design, as well as providing improved cycling opportunities for people travelling between Newtown and the city.

The project scope includes:

- Connections to Mt Victoria Tunnel (path), Hospital, Memorial Park & Courtenay Place
- Monitoring before and during implementation
- Evaluation
- Signalised intersection upgrades
- Integration with LGWM intersection changes along SH1
- Interim pedestrian facility upgrades
- Interim bus facility improvements
- Considering where the cycle facility is within the road cross-section
- Coordinate with other works on this corridor (e.g. scheduled maintenance)
- Keep a consistent team with Thorndon to City (Bowen Street) transitional cycleway

Newtown to City has been divided into two sub-projects 'south' and 'north' of the Basin respectively to reflect the significant difference in road layout and design between Adelaide Road and Cambridge Terrace.

1.3 The Road Safety Audit Team

This road safety audit has been carried out in accordance with the NZTA Road Safety Audit Procedure for Projects Guidelines – Interim release May 2013, by:

Table 1-1: Road Safety Audit Team Members

Name	Position	Organisation	Element
Mike Smith	Senior Principal Road Safety Engineer	Stantec Christchurch	Complete Streets; SANF; Multi-modal
Jon England	Senior Principal Road Safety Engineer	Stantec Wellington	SANF; Urban RSA; Multi-modal

1.4 Previous Road Safety Audits

The SAT undertook a Road Safety Audit (RSA) of the 30% design in November 2021. As agreed with the client, this RSA combined the conventional process of a Road Safety Audit, along with the narrative of a SANF process.

1.5 Scope of this Road Safety Audit

Wellington City Council has commissioned Stantec to undertake a Road Safety Audit (RSA) of the 90% design, following on from their earlier 30% design RSA of the Newtown to City corridor transitional cycleway.

The initial RSA acknowledged that the 30% design had many high-level thoughts for the facility and that these would be greatly enhanced through the next phases of the design process. Discussions revealed that the project team appreciated comments to guide the way forward, minimising the risk of the need for rework at a later stage.

It was proposed, and accepted by the WCC project team, that while this RSA generally follows the process outlined in the Waka Kotahi Guidelines for Road Safety Auditing of Projects, additional direction that could be gained from this first review would assist the design team. It was presented that the application of the Safety Audit and Network Functionality (SANF) framework would provide the additional guidance required for the project team. This was accepted by the WCC project team.

Accordingly, the Safety Audit Team (SAT) applied narrative around the issues and guidance going forward that applies the SANF framework and makes commentary that would not typically be expected in a conventional RSA.

This RSA follows on from the initial findings, designers' comments and client feedback. The SAT has been supplied a new set of design drawings that incorporate changes following the 30% design RSA, along with additional decision tracking commentary and direction to elements raised in the 30% Design RSA.

The SAT have been requested to consider these changes, utilising the knowledge and photos / videos taken from the previous assessment. It was agreed that this assessment would be undertaken as a desktop assessment, with additional site visits by members of the team where required, if the design had a significant change or impact from the previous assessment.

1.6 Report Format

The potential road safety problems identified have been ranked as follows.

The expected crash frequency is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the concern assessment rating matrix in Table 1-3. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

In ranking specific concerns, the auditors have considered the objectives of the Safe System approach, i.e. to minimise fatal or serious injury crashes.

In undertaking this assessment, the Safety Audit Team have utilised the following descriptor tables to enable a fair and reasonable rating of the risks.

Table 1-2: Crash Frequency Descriptor

Crash Frequency	Indicative Description
Frequent	Multiple crashes (more than 1 per year)
Common	1 every 1-5 years
Occasional	1 every 5-10 years
Infrequent	Less than 1 every 10 years

Crash Severity is determined on the likelihood of a crash resulting in death or serious injury. The reader is advised that the severity of an injury is determined in part by the ability of a person to tolerate the crash forces. An able-bodied adult will have a greater ability to recover from higher trauma injuries, whereas an elderly person may have poor ability to recover from high trauma injuries. The auditors consider the likely user composition, and hence the likely severity of injury to that user.

Table 1-3: Concern Assessment Rating Matrix

Severity (likelihood of death or serious injury)	Frequency (probability of a crash)			
	Frequent	Common	Occasional	Infrequent
Very likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each concern category is given in Table 1-4.

Table 1-4: Concern Categories

Concern	Suggested action
Serious	Major safety concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant safety concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate safety concern that should be addressed to improve safety.
Minor	Minor safety concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues, it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

1.7 Documents Provided

The SAT was provided with the following documents for this audit.

Table 1-5: Documents Provided to the SAT

5-C4623.00(1)_C200-C401(B) (90% design)reduced.pdf	11/02/2022 11:28 a.m.	Adobe Acrobat D...	7,481 KB
DRAFT Transitional Cycleways Newtown to City Design Decisions Report.docm	1/02/2022 2:02 p.m.	Microsoft Word M...	4,244 KB
5-C4623.00_C255-C256(Signal layout) (Adelaide ped signals).pdf	1/02/2022 1:49 p.m.	Adobe Acrobat D...	1,010 KB
5-C4623.00_C253-C254(Signal layout) (Adelaide_Hospital intersection).pdf	1/02/2022 1:49 p.m.	Adobe Acrobat D...	1,080 KB
5-C4623.00(3)_C21(Adelaide ped signals).pdf	1/02/2022 1:49 p.m.	Adobe Acrobat D...	789 KB
5-C4623.00(3)_C11(Adelaide_Hospital intersection).pdf	1/02/2022 1:49 p.m.	Adobe Acrobat D...	786 KB
5-C4623.00(3)_C01(Riddiford_Adelaide intersection).pdf	1/02/2022 1:49 p.m.	Adobe Acrobat D...	826 KB
5-C4623.00(1)_C200-C401(B) (90% design).pdf	1/02/2022 1:49 p.m.	Adobe Acrobat D...	28,321 KB
Newtown to City 30% Design RSA_ Decision tracking completed (1).docx	1/02/2022 1:42 p.m.	Microsoft Word D...	21,227 KB

1.8 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the SAT. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review nor are they an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisation.

2. Safety Concerns

2.1 General

2.1.1 Driveway / Access Warning **Moderate**

Refer also to Section 2.1.2 Driveway / Access Warning of previous 30% Design RSA.

The SAT raised concern regarding the 30% design, that it should consider the individual needs of every access and have suitable design features incorporated to maximise the warning of approaching cyclists, maximising the safety of the cyclist.

The Designers response stated: "Agree with SAT, high risk accesses should be identified and appropriate treatments for exiting vehicles should be implemented".

In reviewing the 90% Detailed design the SAT acknowledge that there has been an addition of green surfacing at conflict points, however, there remain locations where additional surface markings are required.

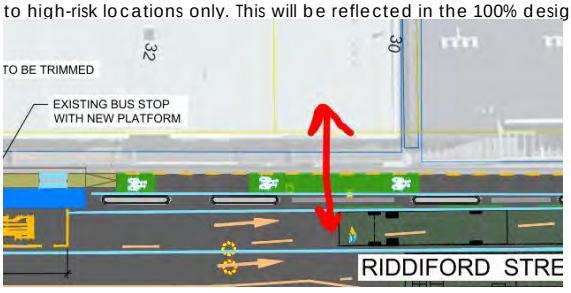
These include (but are not limited to):

1. 32 Riddiford Street - off street parking accessway
2. Girton Tce – green dashed lines over intersection
3. Bus / cycle lane Riddiford Street right turn into Adelaide Road – dashed green line through on bus lane path to highlight special vehicle lane.

In addition to this, the SAT consider that additional green markings at major traffic generator accesses, such as 32 Riddiford Street, car park near 46A Riddiford Street, arrival lane to bus stops at hospital (southbound movement). The SAT consider that the additional green markings in the bus lane will greatly assist with bus lane definition and reduce the risk of illegal use of the bus lane.

Recommendation(s)

1. Install additional green surface markings at all high traffic generating accesses, where they cross over a) cycle facility and b) bus lanes.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	32 Riddiford Street access has green markings on drawings. No change proposed. Should be noted that Council have requested rationalisation of the green surfacing to high-risk locations only. This will be reflected in the 100% designs.  Cycle lane does not start till after Girton Terrace, as the area where cyclists will be travelling is a bus lane rather than a cycle lane there are issues with placing cycle

Recommendation(s)

	warning markings in a bus lane. Sharrow symbols could be marked at high risk locations. Do not think Girton Terrace meets thjs criteria – no change proposed. Do not see safety benefit from marking green dashed continuity line through intersection, proposed signage (to be included with 100% design) and other markings sufficiently convey allowed movements from the left lane on Riddiford Street. No change proposed.
Safety Engineer comment	Agree with Designer.
Client decision	Request from Cycle advocacy group for additional green dashed continuity line through intersection.
Action taken	Update plans to reflect the green dashed continuity lines through John Street, Adelaide, Riddiford Street.

2.1.2 Bus Platform Design

Moderate

In reviewing the supplied drawings, the SAT note that there has been good use of elevated bus platforms where appropriate. This includes around the hospital bus stops. The elevated platforms will greatly assist the mobility and visually impaired accessing the hospital, providing that either a) the bus can kneel to platform height, or b) the platform is at the bus floor height.

In reviewing the design, the SAT noted that the platforms are formed with square end raised ends (circled below). This will result in a vehicle / motorcyclist / cyclist snag point should an errant user impact with the end of the platform. For vehicles, the damage would be predominantly vehicle damage only, however for a motorcyclist and cyclist the injuries could be serious, with a resultant loss of control into the adjacent traffic lane and risk of impact from other traffic.

Figure 2-1: Riddiford Street southbound bus stop

It is noted that the southbound lane leading into the bus stop is a general lane north of the hospital road intersection but is multiple bus stops following. This could cause late lane changes should a bus stop in the bus stop. It is acknowledged that as a general operation, buses will stop in traffic lanes to onboard / disembark passengers. Predominantly this occurs in the marked bus lane and should have little impact on the general user. In and around the hospital the stopping in the general traffic lane will have a greater impact.

Recommendation(s)

1. Review raised bus platform design to eliminate blunt end formation that presents as a frontal impact / snag risk
2. Review lane and facility markings for the left hand south bound lane entering into the bus stop area, ensuring that appropriate warning / guidance is given to road users of bus stopping in lane.

Frequency	Severity	Rating
Crashes are likely to be occasional	Death or serious injury is likely	The safety concern is moderate
Designer response	Markings guide vehicles to avoid end of platform – no change proposed.	

Recommendation(s)

	Acknowledge risk identified by SAT, however, limited opportunity to mitigate in the limited space in advance of the intersection – no change proposed.
Safety Engineer comment	Agree with Designer.
Client decision	Agree with above
Action taken	No action required

2.1.3 Traffic Signal Phasing

Significant

The SAT were provided details of pole and aspect locations only. Signal phase diagrams have not been supplied.

The SAT requested phase and personality diagrams for all intersections to enable them to fully consider the impacts of the design, and the safe movement of all users. The SAT were advised that the phase diagrams were not available.

The assessment of the traffic signal phase diagrams is critical to this design to ensure that conflict does not occur between users under the various signal phases.

Intersections of concern include:

1. Mein Street / Riddiford Street
2. Hospital Road / Riddiford Street
3. Riddiford Street / Adelaide Road / John Street
4. Hospital Road / Adelaide Road
5. Rugby Street / Adelaide Road

As this material was not supplied, we are unable to assess this matter.

The SAT direct that an additional RSA should be undertaken once all phasing and personality diagrams have been supplied as requested.

Recommendation(s)

1. The SAT direct that an additional RSA should be undertaken once all phasing and personality diagrams have been supplied as requested.

Frequency	Severity	Rating
Crashes are likely to be common	Death or serious injury is likely	The safety concern is significant
This has been assessed as significant as a crash between a large vehicle and a cyclist will result in serious to fatal injuries.		
Designer response	Agree information should be provided to inform SAT. Assumptions have been documented in a report and will be incorporated into the 100% design drawings.	
Safety Engineer comment	Agree with SAT and Designer.	
Client decision	Agree with above	
Action taken	Road Safety workshops have been carried out for major intersections	

2.1.4 Surface Markings – Bus stops

Significant

Green markings have been indicated to be installed at the entry / exit to bus stops. Typically, the bus lane is wider than marked bus stop. The SAT are of the opinion that there is opportunity to use a green surface alongside the bus stop to guide cyclists around stationary bus and also highlight to a driver that cycle passing is possible on their right.

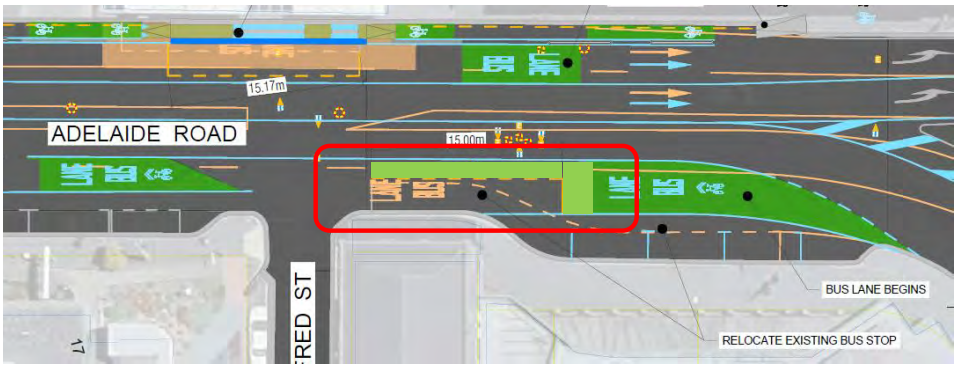


Figure 2-2: Example of additional green markings at bus stops

The SAT disagree with the designers' comment in their design decision report regarding downhill cycle actions (Pg 10 : Bus Stops). This is copied below. While the decision report does not indicate the meaning of the tick mark, the SAT have assumed that this is the preferred solution for the matter discussed.

Bus stops

Bus Stop	Cycle facility	Full bypass	Partial bypass	Shared space	Cyclist required to wait or overtake stopped bus
Stop 4311 Bowen Street (near 38)	Shared bus/cycle lane	Space not sufficient to provide full cycle bypass within existing road corridor	Downhill cycle speeds high (>35km/hr) resulting in unsafe conflict with pedestrians	Downhill cycle speeds high (>35km/hr) resulting in unsafe conflict with pedestrians	✓
Stop 6017 Riddiford Street (Hospital)	Kerbside Cycle Lane	Significant physical works require and insufficient space.	✓		
Stop 6055 Riddiford Street (Hospital)	Kerbside Cycle Lane	Significant physical works require and insufficient space.	✓		
Stop 7017 Riddiford Street (Opposite Hospital)	Kerbside Cycle Lane	Significant physical works require and insufficient space.	✓		
Stop 6015 Adelaide Road at Broomhedge street	Kerbside Cycle Lane	Significant physical works require and insufficient space.	Space not sufficient to provide partial cycle bypass within existing road corridor	✓	
Stop 7015 Adelaide Road (near 80)	Kerbside Cycle Lane	Significant physical works require and insufficient space.	Space not sufficient to provide partial cycle bypass within existing road corridor	✓	
Stop 6014 Adelaide Road at Basin Reserve (near 13)	Shared Bus/ Bike Lane	Significant physical works required and insufficient space.	Non-Linear Shape and limited space make this difficult to implement	Insufficient width. High numbers of waiting pedestrians during peak times, space not sufficient for passage of cyclists	✓
Stop 7014 Adelaide Road at Basin Reserve (near 12)	Kerbside Bike Lane	Significant physical works require and insufficient space.	Space not sufficient to provide partial cycle bypass within existing road corridor	✓	

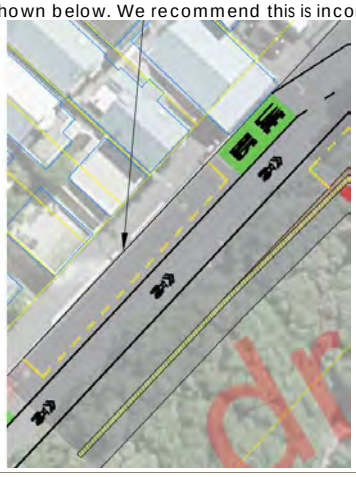
It is the opinion of the SAT that faster moving cyclists will attempt to re-enter the general traffic lane and pass the bus. This is typical observed behaviour on other similar projects around NZ. It is important to note that at present there is no legal obligation for a cyclist (or any driver) to stop behind a bus.

The SAT recommend that the design should apply similar treatments to all bus stops along the project length.

Recommendation(s)

1. Apply additional green markings alongside bus stops to guide cyclists around stationary bus and highlight to driver that a cycle passing is possible on their right.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant

Designer response	The bus lane width of 3.2 m has been chosen based on best practice guidance[1] to minimise the risk of cyclists attempting to pass buses within the lane. It is acknowledged that the guidance notes: 'For bus stops within narrow bus lanes, the option of indenting bus stops should be considered. Indenting the kerb by 1.0 m at the bus stop will achieve enough width so that people on bikes do not have to join the adjacent traffic lane when passing a stopped bus'. Given the transitional nature of the project, identing bus stops is not currently being considered. We agree that cyclists will attempt to bypass stopped buses via the adjacent traffic lane. We do not agree that marking green adjacent to the bus stop is the correct approach as that may apply a level of priority and safety that doesn't exist. An earlier concept on Bowen Street included sharrows adjacent to the bus stop as shown below. We recommend this is incorporated into the design. 
Safety Engineer comment	Agree in part with Designer. Marking a substandard narrow bus stop bypass lane would be unsafe. Sharrows should not be used in the adjacent lane. It is expected that should cyclists wish to overtake, they will enter the general traffic lane gaps permitting.
Client decision	No sharrows to be added. Agree with Safety Engineer
Action taken	No action required

2.1.5 Raised Bus Platforms

Moderate

From the level of detail provided in the plans, it is indicative that the bus platforms have a good level of treatment for bus patrons, enabling easy access to and from the bus. The landing area for the bus platforms has not been dimensioned, and in measuring from the drawings, it is assumed that the platform width (face of kerb to cycle facility) is 1.2 metres (scaled from drawings). The cycle facility is elevated to

[1] https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/between-intersections/bus-lanes/

the same level as the bus platform, with pedestrian crossing bars over cycle path. An example of the treatment is given in Figure 2-3 below.

Figure 2-3: Riddiford Street Bus Platform and adjacent cycle lane

The drawings provided are considered indicative of the design intent and lack clarity of the treatments required for the full consideration of the bus stop use.

The SAT comment that the design includes pedestrian style crossings at multiple locations, assuming that these relate to the door positions of buses. The SAT comment that the bus will operate with both front and rear doors, therefore multiple crossing points will be required to accommodate the movement positions, not just front door. The design lacks clarity around the provision of TGSI for the bus stops and movement positions over the cycle facility. Tactile and lead pavers are required for bus stops.

The drawings do not reflect if there are any coloured pavement surfacing to be applied at the bus stops. Typically, a conflict zone surfacing is applied, enabling all users to be aware of other user movements. This is typically a red surfacing between pedestrian crossing points to highlight high conflict areas for passengers alighting from a bus. The design for this type of facility should be standard across the greater Wellington Network to ensure consistency.

Signs / markings have not been supplied in the drawings provided to the SAT. Pedestrian crossing points will require all legal signs and markings to formalise the pedestrian movement over the cycle facility. Signs and Markings drawings are to be produced and reviewed prior to Tender to ensure that all required elements are incorporated into the design.

A feature of the Hospital bus stop is the formation of a ramp down / up midway between the two bus stop facilities (circled in Figure 2-3 above). This will result in a trip / fall hazard, and is considered a significant risk to the elderly, mobility impaired and visually impaired.

The SAT are aware of crashes involving cyclists impacting with the elderly while the elderly were alighting from the bus. These crashes have resulted in serious injury (greater than one day stay in hospital). It is known that the elderly has poor resilience for recovery from high trauma injuries.

The SAT comment that the design should apply similar treatments to all bus stops along the project length.

Recommendation(s)

1. Install pedestrian crossing features for both the front and rear door positions for the bus patron movement over the cycle facility.
2. Install a red pavement surface at bus stops indicating the conflict zone between bus patrons and cyclists.
3. Develop a Signs & Markings drawing set prior to going to Tender. This drawing set should be reviewed to ensure that all required elements are incorporated into the design.
4. Apply a consistent bus stop treatment to ensure consistency over the greater Wellington cycle network.
5. Eliminate the set-down section between the two bus platforms

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Council have purchased an off the shelf product which includes coloured components to highlight risk areas as shown below. It is acknowledged that conflicts	

Recommendation(s)

	will also exist at the rear bus doors, the intention of the red surface is to highlight the whole area is a potential conflict zone. The intention of the proposed layout shown below is to try and be as consistent as possible with previous treatments around Wellington city including Victoria Street around Kilbirnie e.g. Crawford Road. The 100% designs will include a signs and marking drawing. Signage for cyclists at bus stop conflicts will be provided where passengers will be alighting directly into the cycle path (not relevant for this section).  Risk of ramp down / up midway between the two bus stops noted but disagree that the risk is significant. The likelihood of a crash should be low given most patrons will walk directly from the bus to the footpath – not along the platform. The additional ramp will help slow cycle speeds which supports the SAT's concerns about 'cyclists impacting with the elderly while the elderly were alighting from the bus'. No change to ramp proposed.
Safety Engineer comment	Agree with Designer.
Client decision	Agree with above
Action taken	No action required

2.2 Riddiford Street

The following section relates to site specific issues identified along Riddiford Street. These should be read in conjunction with the general issues outlined in Section 2.1

2.2.1 Riddiford Street / Hospital Road Intersection **Serious**

As previously detailed, the signal phase diagrams have not been supplied for the signalised intersections along the route.

In reviewing the Riddiford Street / Hospital Road intersection the SAT make the following comments in the absence of any phasing information.

Figure 2-4: Proposed Riddiford Street / Hospital Road intersection design

1. Riddiford Street (southbound), left lane is both a through and left movement. Alongside this is the separated cycle facility. The Design Decision Report supplied makes the following assessment:

Intersection	Opposing vehicle movement	Ban vehicle turn movement	Time separate cycle and turn movements	Cycle bypass (Dutch style)	Left turn lane crossing in advance	Cycle Barnes Dance	Highlight and slow conflict points
Riddiford Street & Hospital entrance	LT	Not able to be banned, no alternative entrance to this part of hospital grounds	Shared LT/through traffic lane, separating phases would result in long delays and poor compliance as cyclists choose to travel on the green vehicle light	Road width not sufficient to achieve vehicle tracking without significant civil works beyond the scope of the project	Not applicable – shared LT/through traffic lane due to width constraints and capacity requirements at John Street intersection	Low volume of turning cyclists, separating phases would result in long delays and poor compliance as cyclists choose to travel on the green vehicle light	✓
	RT	Not able to be banned, no alternative entrance to this part of hospital grounds	Single traffic lane, separating phases would result in long delays and poor compliance as cyclists choose to travel on the green vehicle light	Road width not sufficient to achieve vehicle tracking without significant civil works beyond the scope of the project	Not applicable – shared RT/through traffic lane due to width constraints	Low volume of turning cyclists, separating phases would result in long delays and poor compliance as cyclists choose to travel on the green vehicle light	✓

   The SAT are of the opinion that given that the main cycle path is on the southbound movement, and that this creates significant conflicts with the left turn vehicle movement, that phase separation of the two movements is critical. The designer's decision suggests that the solution to be applied includes highlighting the conflict, and slow conflict points. The SAT are of the opinion that the current design does neither.

2. The departure lanes from Hospital Road are proposed to be marked as a left out and a right out. Cycle ASB facilities have been installed at the head of the departure lanes. Cyclists wishing to enter into Riddiford Street and undertake a northbound movement would typically do so from the left-hand lane. The Traffic Regulations stipulate that unless otherwise permitted (by vehicle class) a vehicle must turn in the direction of the lane arrows marked on the pavement. This regulation would technically prohibit a cyclist from turning right from the left-hand lane.
   A cyclist undertaking the turn from the right-hand departure lane could follow the general path of the lane, departing into the bus lane as they turn. However, for this to occur, the cyclist would require direction to the right-hand lane. A practical solution would be to install signs giving exemption to cyclists to turn right from the left hand / left turn lane.

3. The northbound bus movement and the north bound cycle movement occur from two separate facilities south of the intersection. An understanding of the signal phasing is critical to determine if the release of these two classes occurs at the same time, or if one lane is released ahead of the other. A cyclist advancing into the northbound bus lane does so from the left-hand side of the bus and could potentially be within the bus driver's blind zone. This could result in side-swipe / squeeze crashes resulting in moderate to serious injuries.

The separated facility design of the southbound and northbound cycle lanes can lead to an impression by cyclists that under certain conditions (such as the lack of a red signal) that safe through movement is available, when in fact the through movement could be impacted by the adjacent turn / through

movement. Such a crash would result in serious injuries, with the possibility of a fatal injury if a large vehicle was involved.

The SAT are of the opinion that the current option of highlight and slow conflict points has not been demonstrated, and the current design creates a high risk of crashes between cyclists on the through movement and other adjacent vehicle movements.

Recommendation(s)

1. Undertake a complete review of the design of the Riddiford Street / Hospital Road intersection, with full consideration of the restrictions required to safely separate the movements through appropriate phasing of the traffic signals.
2. Install "EXCEPT CYCLE" to the left turn out movement lane from Hospital Road

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	Cycle aspects are proposed to provide partial protection for cyclists (as per pedestrians) in the southbound direction. Signals information should be provided to SAT. Assumptions have been documented in a report and will be incorporated into the 100% design drawings. The project team have agreed to shift the merge between buses and bikes to a mid-block location between the signalised crossing and the hospital access to help mitigate merge risk through the intersection. Agree with SAT that 'except cycle' (or similar) should be provided to left lane out of hospital access and propose removal of ASB in front of right lane.	
Safety Engineer comment	Agree with Designer. Key signalised intersections to be reviewed in *Safety in Design Workshops*.	
Client decision	Agree with above	
Action taken	Safety in design workshops carried out for intersections	

2.2.2 Riddiford Street / Adelaide Road intersection

Significant

As previously detailed, the signal phase diagrams have not been supplied for the signalised intersections along the route.

Cyclists northbound on Riddiford Street and continuing onward along Adelaide Road to the city will do so from the left-hand bus lane / cycle lane. The design incorporates an advance stop box to assist the cyclist as detailed in Figure 2-5 below.

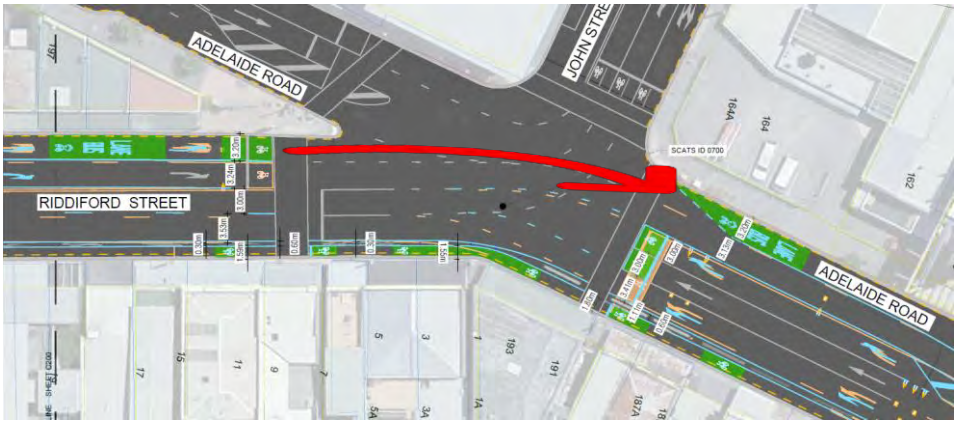


Figure 2-5: Riddiford St / Adelaide Road / Johns Street

The bus / cycle lane is marked in accordance with the two user classes; however, the lane markings (left turn arrow) would prohibit a through movement of both a bus and a cyclist unless an exemption is enabled. This has not been detailed.

The traffic regulations also state that a driver may occupy a bus lane within 50 metres in advance of an intersection. The design as it stands would have the cycle / bus through movement occurring over a wide expanse of intersection (arrowed). The SAT consider that additional dashed green markings are required to highlight the bus / cycle path on the through movement.

The SAT are of the opinion that the design, as presented, fails to address significant conflicts between movements. The lack of signal phasing details does not enable the SAT to undertake a full assessment of the impacts of the design.

Recommendation(s)

1. Apply additional treatments to clearly define the bus / cycle movement in the left lane (northbound)
2. Undertake a full review of the intersection movements, once signal phase diagrams are produced, to assess risks of conflicts between all users. Undertake a Road Safety Audit of the intersection once the signal phase and personality diagrams are determined.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	As noted in response to 2.1.1 proposed signage (to be included with 100% design) and other markings sufficiently convey allowed movements from the left lane on Riddiford Street. No change proposed. Agree with SAT – signal information should be provided.	
Safety Engineer comment	Agree with Designer. Key signalised intersections to be reviewed in *Safety in Design Workshops*.	
Client decision	Road markings updated to include green continuity lines across intersection. Safety in design workshop for signals.	
Action taken	Safety in design workshop for signals. Plans updated.	

2.3 Adelaide Road

The following matters relate to the consideration of the Adelaide Road segment of the route. These should be read in conjunction with the matters raised in the General section to ensure that a holistic solution is applied. Matters raised in the Adelaide Road section cannot be read in isolation.

2.3.1 Cycle Right Turn / ASB access **Significant**

The Adelaide Road / Riddiford Street / John Street intersection has a complicated layout, and complex traffic movements associated with the permitted travel lanes.

In reviewing this intersection, the SAT have identified a number of issues that while on face value seem suitable, closer inspection reveals some complexities that the SAT consider having been unanswered. The lack of signal phasing details for the intersection eliminates the assessment of the permitted travel under each phase, and the impact that this would have on other user movement.

Matters include.

Cycle Right Turn into John Street / through to Adelaide Road (south)

The design has provisions of ASB at the head of the through and right turn lanes (southbound on Adelaide Road), as shown in Figure 2-6 below. Separators are formed up to the limit lines for the signalised intersection.

Figure 2-6: Southbound Adelaide Road approach to intersection with Johns Street and Riddiford Street

In considering the cycle movement from Adelaide Road, the SAT have identified three possible mechanisms to access the movements required.

1. Cyclist uses the separated cycle lane, then waits in the cycle lane until the signals stop all traffic, then they traverse over to the ASB. This raises the following issues:
    a. The cyclist blocks all southbound movement in the separated cycle lane (1.8 m width)
    b. The cyclist is unable to have clear view to primary aspect as they are in advance of the pole. Potentially unable to identify a separated through / right turn phase before they access the ASB
2. Cyclist follows as for 1) but pulls over onto footpath to use crossing at signals.
    a. The design has no provision for a cyclist to depart onto the footpath
    b. Late departure by a cyclist onto a confined space due to veranda supports, street furniture and shop front advertising.
    c. Risk of impact with pedestrians on footpath, especially risk to elderly / mobility impaired / people of low vision

3. Cyclist departs from the separated facility in advance of the intersection to join general traffic lanes.
    a. Crossing at complex locations where traffic is diverging into the respective movement lanes
    b. High volume of traffic provides small and difficult gaps in traffic
    c. Signal phasing may potentially release lanes while cyclist is trying to weave through traffic queues.

The SAT acknowledge that the cycle movement for the through / right turn may be low, but during the site inspection there was a noticeable volume of cyclists undertaking this movement.

The SAT are of the opinion that additional design mitigation and treatments / thought is required to ensure that access to all ASB is safe and does not conflict with any other movement, including footpath movement.

Through movement (southbound) / left veer movement (southbound)

The current road layout has two southbound veer left lanes at the intersection. The revised design, with the formation of the separated cycle lane removes the kerbside left veer lane, leaving a single lane for this movement. It is noted that the proposed design has a single left veer single straight through movement lanes north of the intersection (southbound), yet it has two departure lanes into Riddiford Street.

Figure 2-7: Current lane configuration and signal aspects

The SAT acknowledge that the right hand of these two receiving lanes is to accommodate the right turn movement (southbound) from John Street.

The SAT have concerns that the through movement lane (southbound) may be used as an additional left veer lane by motorists to avoid the increased queues formed through the lane reduction for the left veer.

While the signal phasing diagrams were not provided, it is assumed that the through movement will occur as a concurrent movement with the left veer, as it is presently. This increases the risk that motorists would use the lane as a left veer.

Recommendation(s)

1. Additional design mitigation and treatments / thought is required to ensure that access to all ASB is safe and does not conflict with any other movement, including footpath movement.
2. Undertake a complete review of movement and signal phases, amend the design to eliminate all conflicts of movement / enabled turn movement inappropriate from lanes, and present for a further RSA assessment prior to finalising the design.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree that there are challenges with cyclists accessing the ASB's as noted by SAT. The current design assumes the third 'mechanism' described by SAT is used by confident cyclists. Less confident cyclists can dismount and use the pedestrian crossing facilities.	

Recommendation(s)

	Disagree with veer left concerns identified by SAT, as previously identified by SAT: 'Traffic Regulations stipulate that unless otherwise permitted (by vehicle class) a vehicle must turn in the direction of the lane arrows marked on the pavement'. In addition, consideration is being given in 100% designs to directing the southbound lane from Adelaide Road into the right lane on Riddiford Street Agree with SAT – signal information should be provided.
Safety Engineer comment	Agree with Designer. Key signalised intersections to be reviewed in *Safety in Design Workshops*.
Client decision	Agree with above
Action taken	Safety in design workshop for intersection complete

2.3.2 Adelaide Road / Hospital Road Intersection

Moderate

The SAT noted in the design that the continuation of the lanes through the Adelaide Road / Hospital Road intersection has a noticeable shift to the right (southbound), caused in part due to the differing offset of the kerb line on the west side of the road.

The SAT acknowledged that the proposed cycleway is transitional, however it is noted that this involves shifting of lanes for the new facility.

The SAT make the following comments for the designer's inclusion.

Figure 2-8: Adelaide Road / Hospital Road – southbound lanes shifted right

1. Given the lane shift, install lane continuity lines through the intersection to direct drivers into the correct road position,
2. Paint the initial separator formation (currently two lines) with a solid chevron style, providing visual significance to the commencement of the separated facility south of the intersection,

Recommendation(s)

1. Install lane continuity lines through the Adelaide Road / Hospital Road intersection to provide clear direction of the lane position shift.

Recommendation(s)

2. Paint the initial separator formation (currently two lines) with a solid chevron style, providing visual significance to the commencement of the separated facility south of the intersection

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree that continuity line should be included. Insufficient width to include chevron markings between lines, and cycle continuity lines included – no change proposed.	
Safety Engineer comment	Agree with Designer.	
Client decision	Agree with above	
Action taken	No action required	

2.3.3 Bus Lane Ends – Adelaide Road

Minor

The southbound bus lane marking is installed up to the southbound approach to Hospital Road. The last marking is some 75 metres prior to the side road intersection, and fits with the location where a driver can legally traverse into a bus lane for Hospital Road. Additional "BUS LANE ENDS" are installed immediately upon departure of the Hospital Road intersection. South of this there is no restriction of lane use, therefore it is logical that the Bus Lane ends prior to Hospital Road.

Recommendation(s)

1. Investigate the legality and necessity of the BUS LANE ENDS markings and signs south of the Hospital Road intersection.

Frequency Crashes are likely to be infrequent	Severity Death or serious injury is unlikely	Rating The safety concern is minor
Designer response	No safety concern identified – no change proposed.	
Safety Engineer comment	Agree with SAT. If the BUS LANE ENDS markings and signs south of the Hospital Road intersection are not required, they should be removed from the design.	
Client decision	Agree with SAT and Safety engineer BUS LANE ENDs markings to be removed	
Action taken	Plans updated	

2.3.4 Separator Style / Form

Moderate

The supplied design drawings indicate that the separator style to be applied along Adelaide Road comprises of a physical buffer, where possible when considering the accesses from adjacent properties.

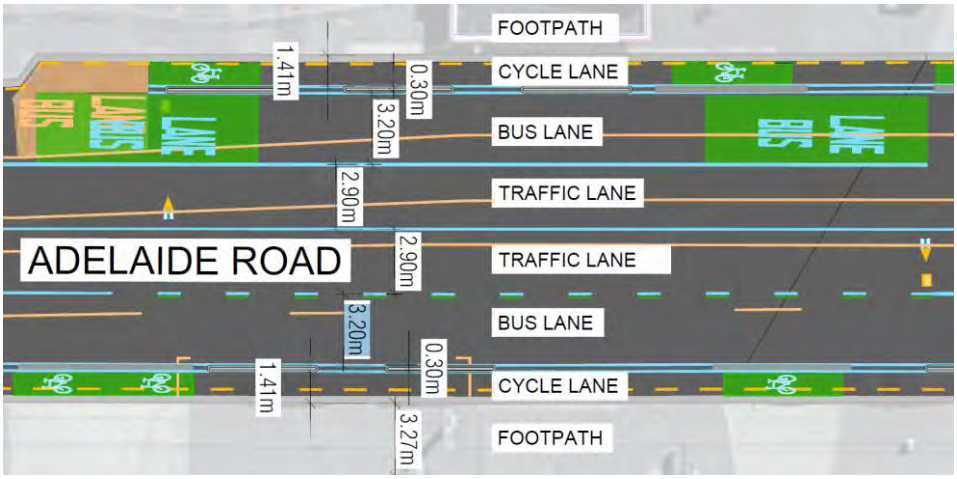


Figure 2-9: Lane widths on Adelaide Road and width of separators

The road layout dimensions indicate that the physical separator is some 300 mm wide, with a 1.4 metre cycle facility alongside.

The SAT question the viability of a physical separator, especially of a temporary design for this width. It is acknowledged that some "stick-on" type separators closely match this width but would generally eliminate the capacity to install the detailed linework. The preferred separator should be of a size that deters people from driving over them.

A lack of deterrence could result in drivers traversing into the parking lane, and obstructing cyclists, or isolated parking in the facility while doing drop-off / pick-up's. This would force a cyclist to traverse out into the adjacent traffic lane.

Recommendation(s)

1. Detail the specific separator type, and characteristics to ensure that sufficient deterrence is provided alongside the facility.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Not a concern has physical separators are proposed.	
Safety Engineer comment	It is expected that the physical separators selected are fit for purpose and will deter vehicles driving over them. Performance will be monitored and modified if necessary.	
Client decision	Agree with above	
Action taken	No action required	

2.3.5 Bus Stop - 101 Adelaide Road

Significant

The existing bus stop near Broomhedge Street is detailed to have a new bus platform installed. In reviewing this platform, and the platform opposite outside 110 Adelaide Road, the SAT note that the

landing space provided is very narrow. No dimensions have been provided on the width of the bus platform, however when compared to the adjacent facility dimensions on the drawing set, it is assumed that the landing space is approximately 500 – 600 mm in width.

Refer also to comments in Section 2.1.2 on the bus platform design.

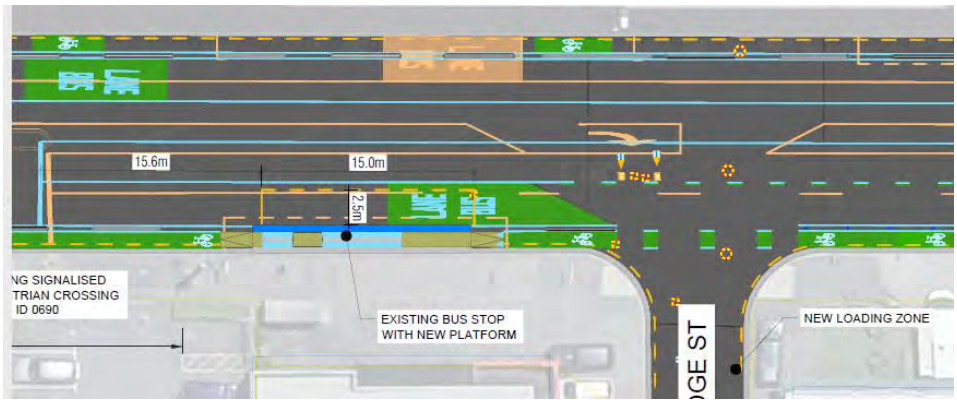


Figure 2-10: Bus stop south of Broomhedge Street

The narrow landing space would result in a passenger stepping from the bus directly into the path of a cyclists, with a risk of being clipped by passing cyclists.

The SAT note that the proposed bus platform is at the same level as the adjacent footpath. A sump is located at a position directly in front of the platform development and could affect the provision of a suitable ramp for the cyclist to access the raised table.

Roadside furniture and utility poles restrict the ability for a cyclist to undertake an evasive movement should they encounter a passenger alighting from the bus. The resulting impact could range in severity from minor, to serious if it involved a vulnerable person such as the elderly.

It is critical to note that Blind Low Vision NZ is located at these bus stops, and would be a user of these bus stops. Low vision or blind users will not be able to easily identify cyclists traversing along the cycle facility in this location.

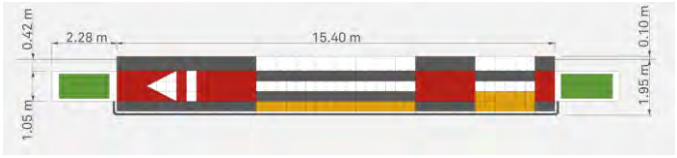
The bus stop design at these locations indicates pedestrian crossing bars as detailed in the typical layout discussed in Section 2.1.2. This will require signs and pavement markings to support the pedestrian priority crossing.

Recommendation(s)

1. Undertake a review of the bus platform design for the bus stops located at 101 and 110 Adelaide Road to provide a safe and appropriate landing zone for passengers alighting from the bus.
2. Provide a signs and markings drawing set for the controls required for cycle movement over the pedestrian facilities at bus stops
3. Install red pavement surface to all conflict zones as detailed in Section 2.1.2
4. Implement additional warning treatments into the design to assist Blind Low Vision users at these bus stops

Frequency	Severity	Rating
Crashes are likely to be occasional	Death or serious injury is very likely	The safety concern is significant
Designer response	Council have purchased an off the shelf product which includes coloured components to highlight risk areas as shown below. The intention of the proposed layout shown below is to try and be as consistent as possible with previous treatments around Wellington city including Victoria Street. The 100% designs will include a signs and marking drawing. Signage for cyclists at bus stop conflicts will be provided where passengers will be alighting directly into the cycle path as per below.	

Recommendation(s)

	 
Safety Engineer comment	Agree with Designer. The bus platform/cycle product and layout must be monitored and modified if necessary.
Client decision	Agree with above
Action taken	No action required

2.3.6 Adelaide Road / Girton Terrace – Cycle Lane markings **Significant**

The design proposed has kerbside parking alongside the road shoulder between Alfred Street and Girton Terrace. Alongside this is an unmarked buffer, then the bus lane, as shown in Figure 2-11 below.

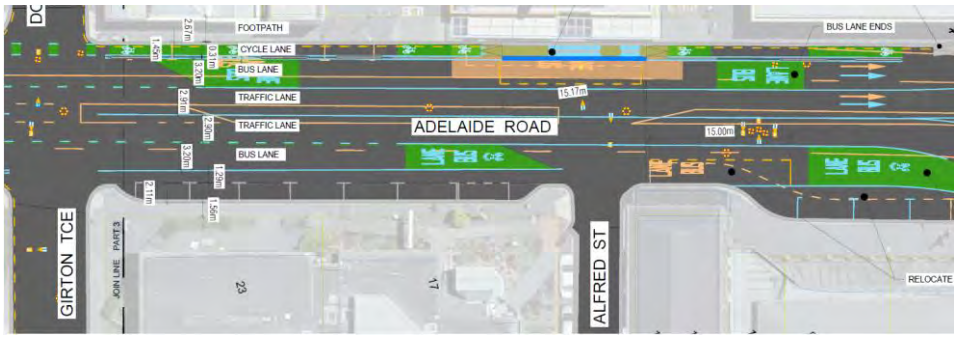


Figure 2-11: Adelaide Road between Alfred St and Girton Tce – parking with adjacent bus lane

The supplied design drawings indicate that there are no side road control markings to define the hold point for Girton Tce. A review of previous site photos, and the aerial plans indicate that there is a current Give Way control. The SAT have assumed that the lack of side road control details is a draughting error, and that the current control will remain.

Cyclists travelling southbound along this section from Rugby Street will initially be within the bus lane, then traversing into a separated facility south of Girton Tce. At this location, an exiting driver's visibility will be partially restricted due to the kerbside parking (right side view on exit), resulting in drivers pulling further forward to gain a view. This brings them into the path of a cyclist traversing along the southbound route.

Cycle guidance markings are generally installed over all other intersections along the route. The SAT are of the opinion that dashed green markings are required over the Girton Tce intersection to highlight to exiting drivers that cyclists will be advancing towards their path of travel to enable them to access the separated facility.

Recommendation(s)

1. Update the drawings to reflect the current or proposed side road controls, including all signs and markings.
2. Install dashed green cycle warning pavement markings over Girton Tce intersection

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Agree – drawings should reflect current give-way controls remain. Dashed green markings concern previously identified in section 2.1.1 – refer previous response.	
Safety Engineer comment	Agree with Designer.	
Client decision	Agree with above	
Action taken	No action required	

2.3.7 Adelaide Road / Rugby Street – Island Design **Moderate**

The SAT acknowledge the changes to the lane entry from Rugby Street into Adelaide Road and the inclusion of enlarged advance flush median chevrons, as detailed in Figure 2-12 below.

Figure 2-12: Adelaide Road / Rugby Street Intersection

The tracking path for the bus has been supplied and demonstrates that the bus left turn can be accommodated within the provided lane. The SAT commend the solution provided.

In considering the turn, and the reduction to a single lane for the left turn, the SAT make the following comments:

1. There are no details to the configuration of the central splitter island. The SAT have assumed that there is no change to this arrangement. The SAT comment that the improved cycle facility along this route may result in the general increase in number of cyclists, resulting in a congested wait area.
2. The designers are to ensure that all appropriate signs and markings are in place within the central splitter island to support the full shared space of the island.
3. There are no details on the lane development further east. It is critical that all lane markings approaching the Adelaide Road intersection are adjusted to meet the new configuration.
4. Advance directional signage has not been detailed. The current two lane left turn will be reduced to a single lane. Advance guidance signs are considered necessary to ensure that drivers depart into the left turn lane early. This early drop also corresponds to the location of an exit lane from the school drop off / Government House area.
5. A flush median is shown on the plans at the location of the splitter island. The SAT comment that this could be supported through the use of vertical bollards to reinforce the slow nature of the turn, provide additional stack space and shorten the crossing distance. This further reduces the risk of a driver undertaking a late turn / passing movement using the flush median.

Recommendation(s)

1. The designers are to ensure that all appropriate signs and markings are in place within the central splitter island to support the full shared space of the island
2. The design is to incorporate all signs, markings and guidance to ensure that a driver wanting to turn into Adelaide Road departs early into the new left turn lane.
3. Incorporate additional vertical bollards in the proposed flush median around the central island

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	No change to function central splitter island – no change proposed. Agree that as demand increases the current facilities may become congested this should be considered as part of permanent changes along this corridor. Agree with SAT. Agree with SAT – vertical delineators should be included in the flush median.	
Safety Engineer comment	Agree with SAT and Designer.	
Client decision	Agree with above	
Action taken	Update designs to include additional vertical bollards around median.	

Commented [RC1]: @chris can you please clarify

2.4 Cambridge Terrace

The following matters relate to the consideration of the Cambridge Terrace segment of the route. These should be read in conjunction with the matters raised in the General section to ensure that a holistic solution is applied. Matters raised in the Cambridge Terrace section cannot be read in isolation.

2.4.1 Southbound Cycle Movement – Direction and Guidance

Moderate

The SAT note the intended start position of the new facilities on Cambridge Terrace, exiting from the Basin Reserve area. Refer to Figure 2-13 below.

It is understood that the general intent for this transition is for the northbound cyclist to continue to utilise the on-road cycle lane then accessing the shared path system.

The SAT note that for the southbound movement (towards Basin Reserve), there is no guidance into a suitable facility, which could lead to cyclists in conflict with other footpath users either on the central path, or on the footpath on the Kent Terrace side.

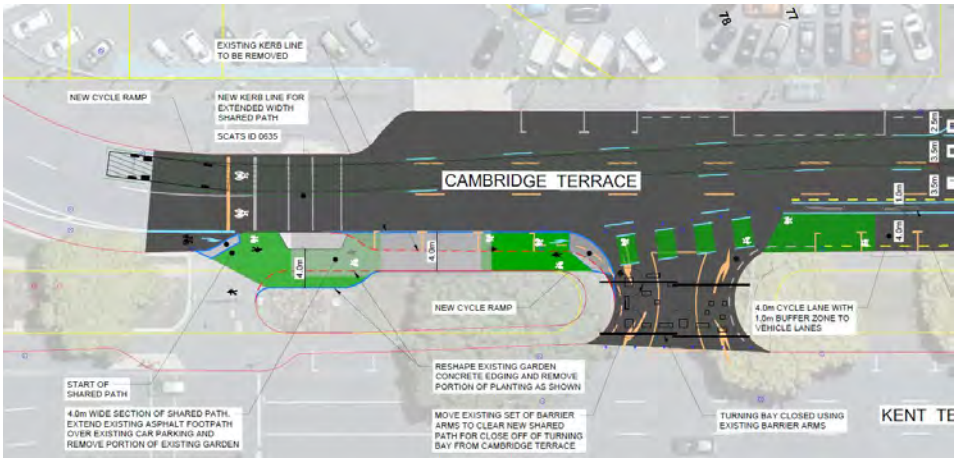


Figure 2-13: Cambridge Terrace southern end of cycle lanes.

The impact of a cyclist with vulnerable users such as the elderly and blind low vision people could result in higher severity injuries. As detailed, the elderly generally has a lower capacity to recover from high trauma injuries, with the resulting injury severity being serious.

Recommendation(s)

1. Include within the design clear and effective guidance to, and warning along the intended southbound route for the facility.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree with SAT	
Safety Engineer comment	Agree with SAT. Detail on cycle lane continuity through or around the Basin has not been provided. Although there have been general discussions on way-finding through the Basin, or around the Basin during an event, the absence of acceptable plans and detail continue to pose a moderate to significant risk. These should be included in the final package for overall approval of this cycleway.	
Client decision	Agree with above	
Action taken	No action required	

2.4.2 U-Turn Facility Closure

Moderate

The SAT recognise the design has sought to temporarily close the current U-Turn pockets along Cambridge Tce / Kent Tce. A typical closure detail is shown in Figure 2-14 below.

The temporary closure will be achieved by the inclusion of vertical bollards across the opening, and the inclusion of green dashed cycle lane markings. In support of this, the existing barrier gates will be permanently closed. The design drawings refer to the use of temporary traffic management movement should they be required to be opened as part of wider area traffic management.

The use of vertical bollards will initially be effective due to their clean and new visible nature, however over time they will typically degrade and become ineffective. The vehicle movement alongside the bollards will result in wheel splash and covering in road grime. The SAT comment that a high level of maintenance intervention will be required to ensure that the bollards are fit for purpose and remain effective.

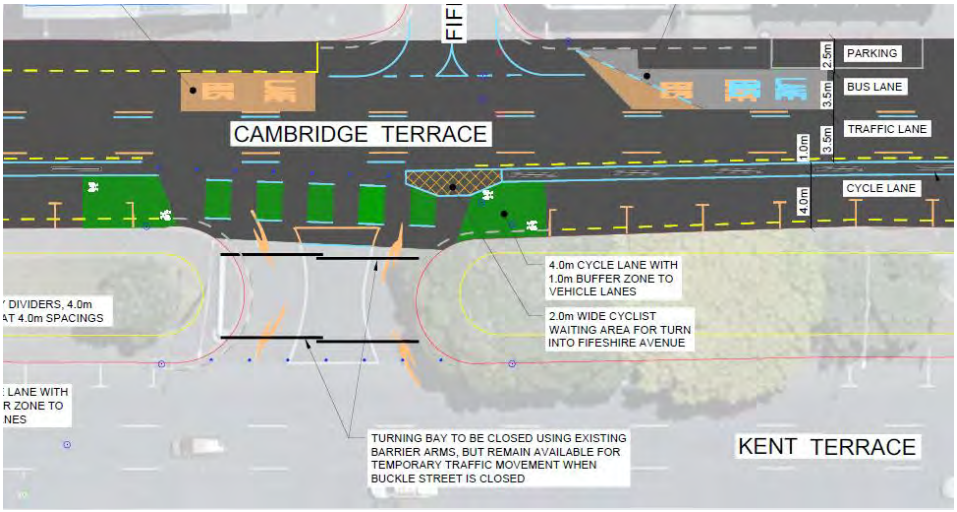


Figure 2-14: Typical U-Turn closure detail

The SAT consider that the following elements require addressing at this stage to ensure that proposed use, and temporary traffic management use is undertaken in a safe manner.

1. The design does not detail the effects on the greater network with the closure of the U-Turn pockets in place. The SAT comment that the removal of all U-Turn pockets south of Elizabeth Street may result in adverse turn movements at Vivian Street. The SAT recognise that the closure of the U-Turn pockets will require drivers to traverse around the Basin Reserve or Elizabeth Street to access business / streets on the opposite side of the central median.
2. That ROAD CLOSED / NO ENTRY / NO RIGHT TURN signs are installed on both sides of the central median, highlighting to drivers that the facility is closed.
3. That the bollards on the Kent Tce side are positioned such that safe pedestrian movement via kerb ramps is maintained when crossing over the U-Turn pocket.
4. That a high level of maintenance intervention of the closure bollards is applied on both a reactive and proactive manner.
5. That full retro-reflective material is applied to the barrier arms.
6. A detailed traffic management plan is developed early, that includes all actions, equipment and guidance required to address the change in priority for the U-Turn pocket.

Recommendation(s)

1. That ROAD CLOSED / NO ENTRY / NO RIGHT TURN signs are installed on both sides of the central median, highlighting to drivers that the facility is closed.
2. That the bollards on the Kent Tce side are positioned such that safe pedestrian movement via kerb ramps is maintained when crossing over the U-Turn pocket.
3. That a high level of maintenance intervention of the closure bollards is applied on both a reactive and proactive manner.
4. That full retro-reflective material is applied to the barrier arms.
5. A detailed traffic management plan is developed early, that includes all actions, equipment and guidance required to address the change in priority for the U-Turn pocket.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree with SAT – noting that some of these recommendations are already included in the design (e.g. item #2)/ and or currently exist (e.g. item #4).	
Safety Engineer comment	Agree with SAT and Designer.	
Client decision	Agree with above	
Action taken	No action required	

2.4.3 Cambridge Tce / Fifeshire Ave Intersection

Significant

The SAT have identified a number of issues as a result of the proposed intersection and cycle facility layout relating to Fifeshire Ave.

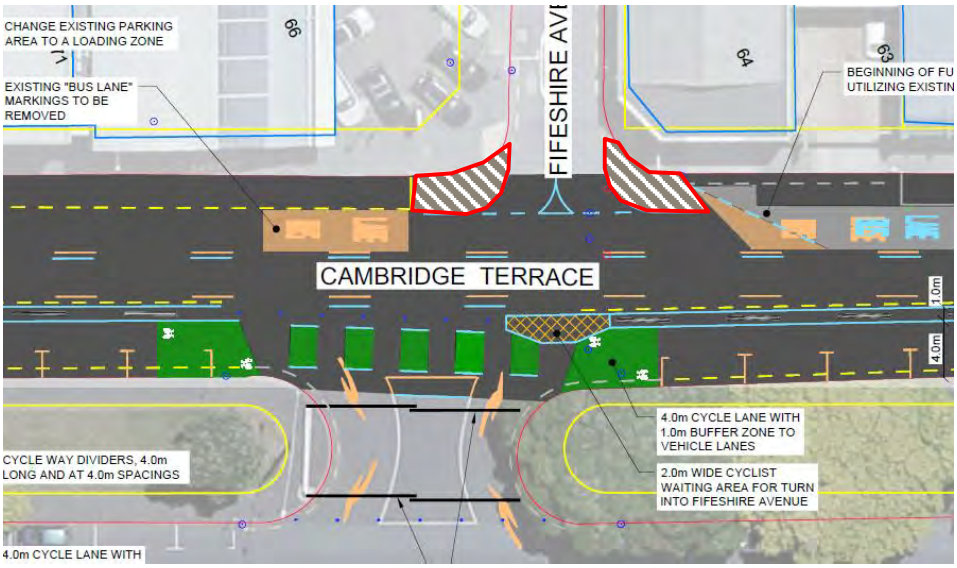


Figure 2-15: Cambridge Tce and Fifeshire Ave intersection

It is noted that the existing parking on the west shoulder is to be converted to a loading zone. The SAT commend this move as it may, in part, reduce the observed effect of car delivery vehicle parking in the traffic lanes unsafely as previously noted in the 30% design RSA. This is to be commended.

The SAT however do note that the design provides edge lines that commence on the traffic lane side of the loading zone, and turn into Fifeshire Ave, both sides. The current markings could be identified as a parking area. The SAT recommend that shoulder chevrons and no-stopping lines are installed to maintain the intervisibility sight line at the intersection (marked on Figure 2-15 above).

The design details a hatched zone for the provision of the turn movement into, and out of Fifeshire Ave. This design narrows the cycle markings for the through movement at this location. The hatched zone will be required to accommodate cyclists who not only turn in, but also turn out of Fifeshire Ave. The SAT are of the opinion that the marked space is insufficient to allow cyclists to safely depart from the through movement, or wait safely to join the through movement, without their wheel being exposed to passing traffic.

The SAT consider that there is suitable available space to mark the cycle lane further towards the central median, and form an enlarged standard hook turn facility, with all associated turn markings.

The revised design as presented in the 90% design drawings indicates that the kerb line (southbound, west side) has been adjusted to enable the passing of the bi-directional facility past the hook turn for Fifeshire Ave. The design fails to detail the provisions for pedestrians along the north / south route. The SAT note that with the closure of the U-Turn facilities, the central median route could become more attractive for pedestrian movement north and south as it eliminates the need to cross minor side roads.

Recommendation(s)

1. That shoulder chevrons and no-stopping lines are installed at the Fifeshire Ave intersection to maintain the intervisibility sight lines at the intersection.
2. Change the hatched zone for the turn into / out of Fifeshire Ave to a standard hook turn facility with all markings and signs associated for the expected movements.
3. Confirm that full pedestrian movement is maintained on the west side of the central median.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant

Designer response	Existing no stopping lines remain – no change proposed. This issue has been identified and alternate markings will be developed for 100% designs. Care will need to be taken to not mix the markings up with hook turn markings which are appropriate for a certain function at an intersection. Pedestrian movement will be able to occur, although the closed barrier arms may partially restrict desire lines. No drop-kebs are currently provided for this pedestrian movement. This has been identified as a potential future enhancement along the corridor.
Safety Engineer comment	Agree with Designer.
Client decision	Agree with above
Action taken	No action required

2.4.4 Vivian Street Intersection

Significant

As detailed in Section 2.4.2 above, the proposed design removes the capacity of day-to-day use of the existing U-Turn facilities along Cambridge Tce / Kent Tce. The lack of facilities will induce a high demand for motorists to find a location where they can turn to gain access to business / side streets on the opposite side of the central median.

The SAT have concerns that while marked as a through lane only, the right-hand lane approaching Vivian Street (northbound) will be utilised as a U-Turn facility, despite this being an illegal movement. The concern is amplified if the cycle through movement is permitted concurrently with the traffic through movement (northbound). As stated previously, traffic signal phase diagrams were not supplied for this project, so the SAT are unable to assess the risks to all users for the various movement phases. This should be subject to a further RSA once all signal phases and personalities are known, and prior to finalisation of the detailed design.

The proposed facility is bi-directional, and as such will require the provision of limit lines for both directions of travel. At present this control is only on the south side, covering the northbound movement.

The cycle facility crosses over the pedestrian movement north of the Vivian Street intersection. This crossing does not indicate who has priority – pedestrian or cyclists. The pedestrian will be waiting at the edge of the crossing on the Cambridge Tce side, and depending on user and numbers, would result in pedestrians straying across the cycle path. The SAT recommend that pedestrian crossing bars, with all signs and markings being installed. This crossing requires tactile pavers for the pedestrian movement over the cycle facility.

The SAT consider that given the risk of the pedestrian / cycle conflicts, it is imperative that red pavement markings are installed at the conflict zone.

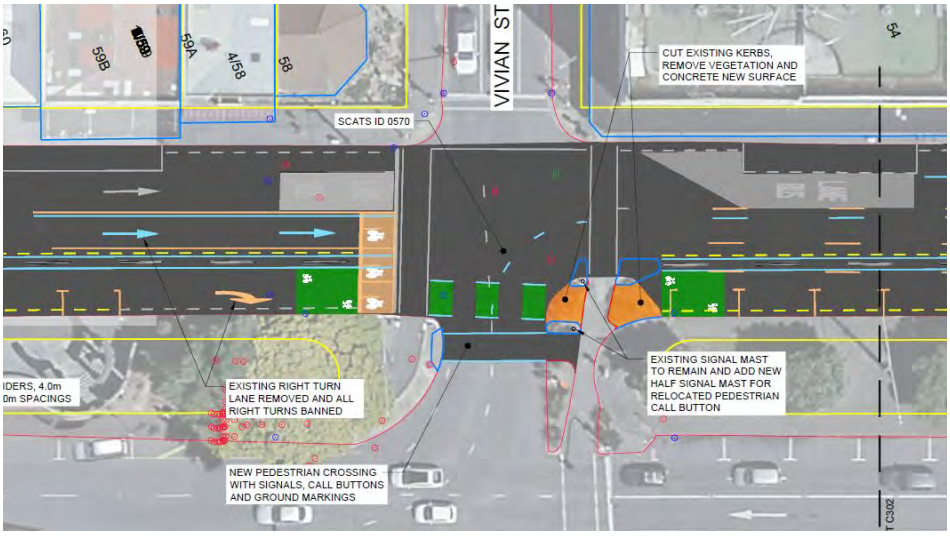


Figure 2-16: Cambridge Tce / Vivian Street intersection

Recommendation(s)

1. As stated previously, traffic signal phase diagrams were not supplied for this project, so the SAT are unable to assess the risks to all users for the various movement phases. This should be subject to a further RSA once all signal phases and personalities are known, and prior to finalisation of the detailed design.
2. Install all limit lines, signal controls and signal aspects for the southbound cycle movement, providing control for cyclists when the Vivian Street / Pirie St movement phase is operative.
3. The design should include pedestrian crossing bars, with all signs and markings being installed.
4. The Vivian Street crossing requires tactile pavers for the pedestrian movement over the cycle facility.
5. Given the risk of the pedestrian / cycle conflicts, it is imperative that red pavement markings are installed at the conflict zone.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with SAT – signal information should be provided. Agree with SAT – items 2-4 – additional information to be included in 100% designs.	
Safety Engineer comment	Agree with SAT and Designer. Key signalised intersections to be reviewed in *Safety in Design Workshops*.	

Recommendation(s)

Client decision	Agree with above
Action taken	Safety in design workshop

2.4.5 Lorne Street / Tennyson Street Intersections – Cycle Hook Turn

Moderate

The design details a hatched zone for the provision of the turn movement into, and out of Lorne Street. This design narrows the cycle markings for the through movement at this location and occurs at the development of the right turn lane.

A similar feature is provided at the Tennyson Street intersection, as detailed in Figure 2-17 below.

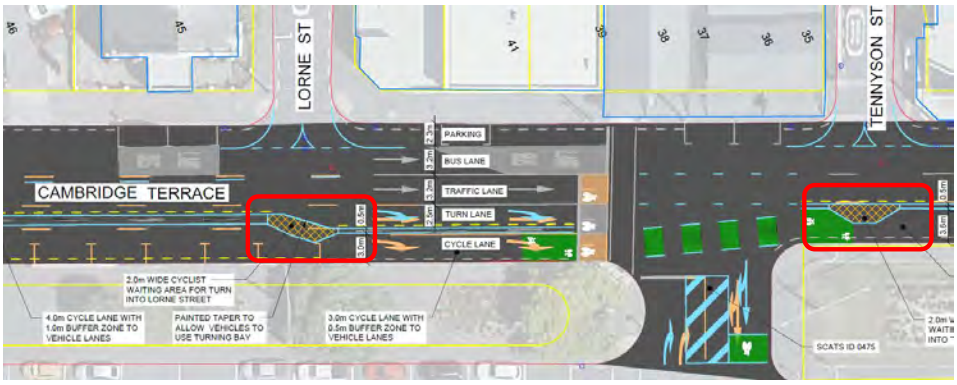


Figure 2-17: Cambridge Tce turning pockets for cyclists

The hatched zone will be required to accommodate cyclists who not only turn in, but also turn out of Loren Street and Tennyson Street. The SAT are of the opinion that the marked space is insufficient to allow cyclists to safely depart from the through movement, or wait safely to join the through movement, without their wheel being exposed to passing traffic. This waiting space impedes on the safe movement of cyclists along the bi-directional facility. The SAT acknowledge that the cycle turn volume at these locations may be low, however the risk remains.

The SAT consider that an enlarged standard hook turn facility, with all associated turn markings should be installed. Consideration should be given to the use of red dashed bands across the cycle facility to highlight the conflict zone where space is constrained due to the adjacent lanes. This will emphasise the conflict zone to all cycle movements.

While the cycle / cycle crash may be non-injury to minor injury, as a result of the impact forces, the result of a crash has the potential for a cyclist to fall into the adjacent traffic lane, with higher severity injuries as a result of impact by a passing vehicle.

Recommendation(s)

1. Form an enlarged standard hook turn facility, with all associated turn markings should be installed. Consideration should be given to the use of red dashed bands across the cycle facility to highlight the conflict zone where space is constrained due to the adjacent lanes. This will emphasise the conflict zone to all cycle movements.

Frequency	Severity	Rating
Crashes are likely to be occasional	Death or serious injury is likely	The safety concern is moderate

Recommendation(s)

Designer response	As per response to 2.4.3 this issue has been identified and alternate markings will be developed for 100% designs. Care will need to be taken to not mix the markings up with hook turn markings which are appropriate for a certain function at an intersection.
Safety Engineer comment	Agree with Designer.
Client decision	Agree with above
Action taken	No action required

2.4.6 Elizabeth Street Intersection

Significant

The proposed design incorporates an ASB at the Elizabeth Street Intersection, as detailed in Figure 2-18 below. It is understood that this layout would have a cyclist undertaking a right turn (in conjunction with the cycle through movement and separated from the right turn movement) traversing into the ASB while the southbound movement on Kent Terrace is occurring.

Figure 2-18: Cambridge Tce ASB at Elizabeth St intersection

The current signal layout does not have any aspect that would control the movement proposed for motorists or cyclists in this location. The absence of signal location and phase diagrams result in the SAT being unable to comment on the impacts that the various movements would have.

Recommendation(s)

1. As stated previously, traffic signal phase diagrams were not supplied for this project, so the SAT are unable to assess the risks to all users for the various movement phases. This should be subject to a further RSA once all signal phases and personalities are known, and prior to finalisation of the detailed design.

Frequency	Severity	Rating
Crashes are likely to be occasional	Death or serious injury is very likely	The safety concern is significant
Designer response	Agree with SAT – signal information should be provided.	
Safety Engineer comment	Agree with SAT and Designer. Key signalised intersections to be reviewed in *Safety in Design Workshops*.	

Recommendation(s)

Client decision	Agree with above
Action taken	Safety in design workshop

2.5 Bi-Directional Alternate Route Design

The SAT commend the innovative solution provided for the alignment section from Cambridge Terrace, Courtenay Place, through to the waterfront. This solution provides a considered and pragmatic treatment for a difficult area.

2.5.1 Cycle Facility – Chicane Movement

Significant

The commencement of the movement to the new route on the east side of Oriental Parade is characterised by a chicane movement from the west side of the central median, through to a cross-over facility over the Courtenay Place intersection, then along the east side of Oriental Parade.

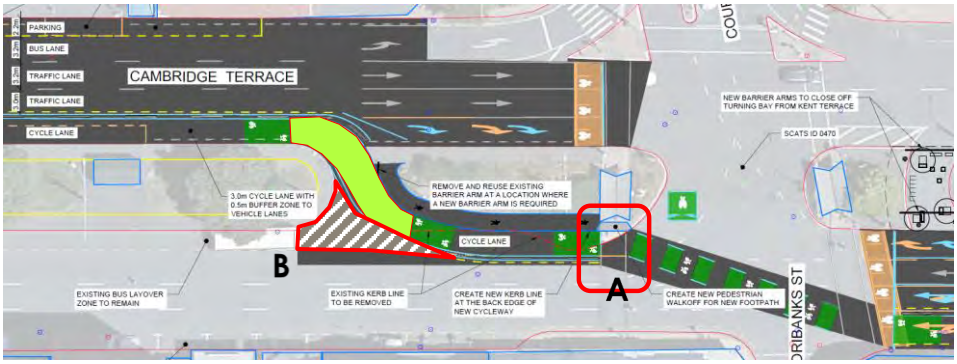


Figure 2-19: Cycle Path transition through Courtenay Place / Majoribanks St intersection to Oriental Parade

In reviewing this new design, the SAT have considered the interaction between bi-directional cyclists, and pedestrian movements at the chicane. The design currently has minimal green marking on the new cycle lane surface, especially in the path of the pedestrian movement.

The SAT consider that the full chicane movement should be green, with a high friction surface that prevents slipping in wet conditions. This will achieve the following:

1. High friction prevents loss of control in the wet.
2. Full green surface highlights to pedestrians that they are crossing a cycle path.
3. The use of vertical bollards on the east side of the chicane to provide a visual "fence" to the cycle path. The current low separators proposed are considered to be ineffective at the definition of the facility edge under normal traffic use.
4. Tactile pavers and associated lead pavers to highlight crossing to blind / low vision users.

In addition to the green markings, it is noted that there appears to be no detail on the required hold lines and signal aspects for the north / south movement. Refer to position A on Figure 2-19 above.

The current design creates an area alongside the cycle facility where a driver could consider that there is a parking space (despite the markings) and artificially creates a wider road aspect. Refer to position B on Figure 2-19 above.

The SAT consider that additional chevron markings would visually reduce the road space and be more in line with through movement travel definition. Refer to

Recommendation(s)

1. The SAT consider that the full chicane movement should be green, with a high friction surface that prevents slipping in wet conditions. This will achieve the following:
   I. High friction prevents loss of control in the wet.
   II. Full green surface highlights to pedestrians that they are crossing a cycle path.
   III. The use of vertical bollards on the east side of the chicane to provide a visual "fence" to the cycle path. The current low separators proposed are considered to be ineffective at the definition of the facility edge under normal traffic use.
   IV. Tactile pavers and associated lead pavers to highlight crossing to blind / low vision users.
2. Include in the design all hold lines, signal aspect design and phase diagrams
3. Install chevron markings to visually restrict road space alongside the new cycleway.
4. As stated previously, traffic signal phase diagrams were not supplied for this project, so the SAT are unable to assess the risks to all users for the various movement phases. This should be subject to a further RSA once all signal phases and personalities are known, and prior to finalisation of the detailed design.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	1. Disagree that high-friction surfacing is required, there is nothing to suggest that the current asphalt surface will become slippery in wet conditions when traversed at an appropriate speed. Pedestrian demand across this path is very low and cycle speeds should be low. The cycle separators include vertical delineators at either end which will provide a visual screen especially given the approach angle of vehicles. Current crossing facility has no tactiles or drop-kerbs, layout of this area is likely to change multiple times over the coming few years (including as part of the Golden Mile project) suggest improved pedestrian facilities are provided as part of a more permanent design. 2. Agree with SAT 3. Agree with SAT 4. Agree with SAT – signal information should be provided.	
Safety Engineer comment	1. Agree with Designer. Behaviour at this location to be monitored and site modified if necessary. 2. Agree with SAT and Designer. 3. Agree with SAT and Designer. 4. Agree with SAT and Designer.	
Client decision	Agree with above	
Action taken	No action required	

2.5.2 Hook Turn Box – Courtenay Place

Significant

The design has a hook turn box positioned in the departure lane from Courtenay Place, as indicated in Figure 2-20 below.

Figure 2-20: Cycle hook turn box located within intersection

Arrows within the box (see insert above) indicates that the hook turn box is to accommodate the right turn in / left turn in for cyclists into Courtenay Place.

The SAT have significant concerns that this hook turn movement appears to occur in the right hand out bound lane from Courtenay Place and is in direct conflict with this movement. As stated previously, traffic signal phase diagrams were not supplied for this project. The SAT consider that the hook turn box is not in a safe position given the complex movements observed at the intersection.

When considering the cycle access to Courtenay Place, the SAT make the following comments:

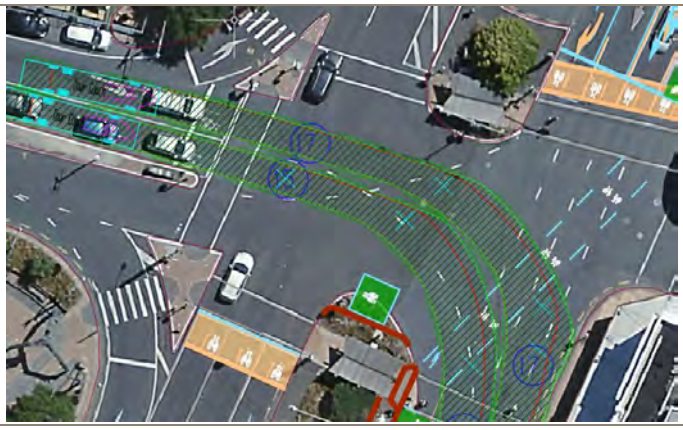
- Cyclists could potentially use the existing footpath crossing (signalised) over Cambridge Terrace, however the shelter in the central median would significantly impact on safe movement and would cause conflicts between cyclist / pedestrians. This risk is present for both the north bound and southbound cycle movements wishing to access Courtenay Place.
- Southbound cyclists wishing to access Courtenay Place would be required to cross the northbound through cycle movement. There are presently no design features to allow this to occur safely, avoiding head-to-head conflicts, of rear end type crashes if they pull left to wait and are exposed to traffic from behind.
- Southbound cyclists do not appear to have a signal aspect and hold position identified in the design for the movement. This includes all markings and signs for guidance.
- It would be unsafe for a cyclist to drop from the separated cycle facility and cross multiple lanes to access Courtenay Place

Recommendation(s)

1. Undertake a significant redesign of the facility, considering the safe movement of cyclists to and from Courtenay Place.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with concern raised by SAT with 90% design. Design to be updated to relocate hook turn and redefine turning paths from Courtenay Place. Working sketch below:	

Recommendation(s)

	
Safety Engineer comment	Agree with Designer.
Client decision	Agree with above
Action taken	No action required

2.5.3 Separator Style

Moderate

The design indicates that conventional separators are proposed for the edge between the southbound traffic lane, and the northbound cycle movement.

Given that the cyclist northbound are directly alongside the southbound traffic lane in a contra-flow arrangement. This places them directly adjacent to a conflicting traffic movement and could cause cyclists to veer away from the traffic lane. At night this movement would have cyclists approaching traffic in close proximity, with the bike headlights pointing directly ahead towards the vehicle, in a position that would not be typical under normal use. The SAT consider that the proposed facility will be new for users, and that a community lead education and information program should be implemented ahead of the installation of the new facilities.

The SAT are of the opinion that vertical separators would provide a higher level of comfort.

The SAT further consider that additional green surfacing is required to better define the cycle facility between Majoribanks St and the fire station. It is the opinion of the auditors that there is a lack of definition of the cycle lane for the section between Courtenay Place and Wakefield Street.

Recommendation(s)

1. Provide vertical separators alongside the opposing traffic lane for the separated cycle facility between Courtenay Place and Cable Street.
2. Implement a community education program on expected use and behaviours for the proposed new facilities.
3. Provide additional green surface markings along the section between Courtenay Place and Wakefield Street

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	The cycle separators include vertical delineators at either end – details to be provided in 100% design.	

Recommendation(s)

Safety Engineer comment	Agree with SAT. Disagree that green markings are required along the entire section. Green markings opposite Wakefield Street clear indicate purpose of facility for vehicles which is reinforced by separators (with vertical delineators). Agree with Designer. Behaviour at this location to be monitored and site modified if necessary.
Client decision	Agree with above
Action taken	No action required

2.5.4 Fire Station Area – Separator Type / Effectiveness **Moderate**

Further to Section 2.5.3 above, the SAT make the following comments on the proposed separator style and placement in and around the fire station.

1. The separator style needs to have a high level of impact with cyclists traversing in the opposing direction to the adjacent traffic stream. There is a high level of discouragement required to prevent motorists traversing along the new facility or using it to park in to drop off / pick up.
2. The separators will need to enable safe and effective movement of the fire engines over the facility. Separator's style and profile should be consulted with FENZ to ensure that they do not have any safety / operational issues.
3. The SAT consider that an elevated tabletop across the whole entrance of the fire station, painted red with cycle symbols may enable a suitable warning for all users, maximising the safe operation of the fire service over the cycle facility.
4. The drawings indicate a hold line for the fire station signals for cyclists on the southbound movement. The design should include all signals and aspects to control the northbound cyclist movement as well.

Recommendation(s)

1. Update the design to reflect the matters raised in Section 2.5.4, being:
   a) The separator style needs to have a high level of impact with cyclists traversing in the opposing direction to the adjacent traffic stream. There is a high level of discouragement required to prevent motorists traversing along the new facility or using it to park in to drop off / pick up.
   b) The separators will need to enable safe and effective movement of the fire engines over the facility. Separator's style and profile should be consulted with FENZ to ensure that they do not have any safety / operational issues.
   c) The SAT consider that an elevated tabletop across the whole entrance of the fire station, painted red with cycle symbols may enable a suitable warning for all users, maximising the safe operation of the fire service over the cycle facility.
   d) The drawings indicate a hold line for the fire station signals for cyclists on the southbound movement. The design should include all signals and aspects to control the northbound movement as well.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	1. Refer response to 2.5.3 2. Engagement has been undertaken with FENZ. 3. As noted in drawings, additional treatment of Fire Station access to be considered. 4. Agree with SAT – detail to be provided in 100% design.	

Recommendation(s)

Safety Engineer comment	Agree with Designer.
Client decision	Agree with above
Action taken	No action required

2.5.5 Oriental Parade Crossing point

Moderate

The new bi-directional facility follows the existing kerb line, traversing through a 90-degree curve to approach the Oriental Parade signals, as detailed in Figure 2-21 below.

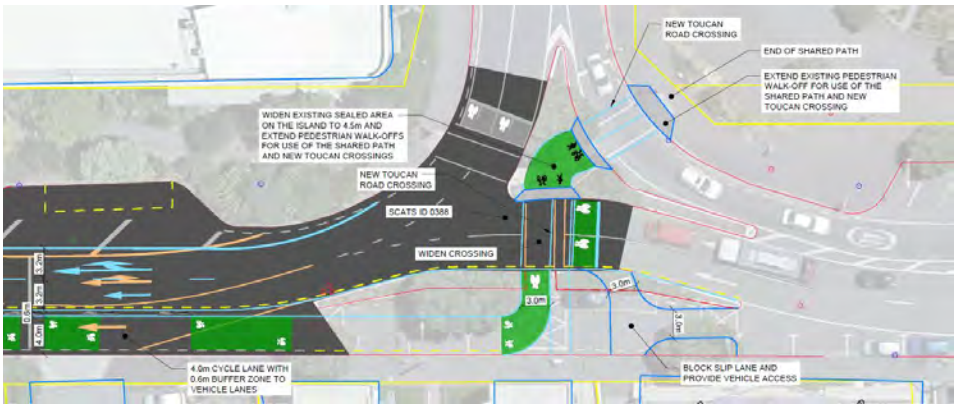


Figure 2-21: Proposed Oriental Parade Crossing point

The SAT identified that the proposed alignment has some elements that require further consideration. These include:

1. The pedestrian crossing leads directly into an existing kiosk (refer to Figure 2-25). The kiosk would require relocation to eliminate the hazard for the pedestrian movement.
2. The new alignment indicates that a mature tree would be removed to facilitate the new facility. The SAT consider that there is potential to retain the tree yet maintain the same level of access movement, by traversing around the tree. (Refer to Figure 2-22)
3. The tree is located at a position where there is an existing speed hump. Retention of the tree, and the speed hump will assist in speed moderation approaching the new crossing point. (Refer to Figure 2-22)
4. Existing high hedge type planting exists at the crossing point over Oriental Parade. (Refer to Figure 2-23 and Figure 2-24). This hedge is sufficiently high as to restrict the intervisibility between pedestrians / cyclists and the approaching traffic coming from Oriental Parade. The hedge should be trimmed / removed to maintain appropriate intervisibility.
5. The SAT observed existing manholes that would be within the movement zone of the new crossing points either side. The manhole tops are of a smooth steel surface and present a slip risk to cyclists, especially in wet conditions.

Figure 2-22: Existing speed hump and tree

Figure 2-23: Note vegetation blocks sight of car stopped at lights

Figure 2-24: Vegetation height masks car

Figure 2-25: Utility kiosk located at proposed crossing point

Figure 2-26: Service covers within proposed crossing point

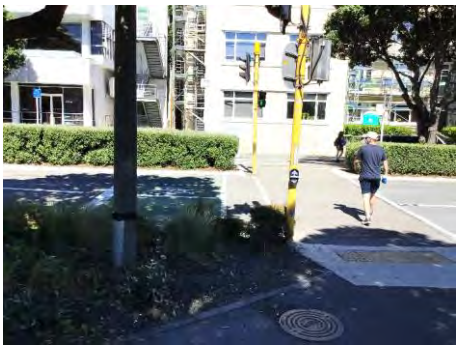


Figure 2-27: Service covers within proposed crossing point

Recommendation(s)

1. Amend the proposed alignment to utilise the existing tree and speed hump as a speed calming measure for cyclists approaching the Oriental Parade crossing.
2. Relocate the existing kiosk to enable a clear and safe pedestrian movement.

Recommendation(s)

3. Trim / remove the existing vegetation at the pedestrian crossing signals (Oriental Parade) to ensure clear intervisibility is maintained.
4. Change the manhole tops to a non-slip surface.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	1. Existing tree proposed to be maintained – to be clarified in 100% design. 2. Likely to be a high-cost item. If signals cabinet needs to be upgraded / replaced then suggest relocating, otherwise adjust design to direct pedestrians away from the signal cabinet. 3. Agree with SAT 4. Agree with SAT	
Safety Engineer comment	Agree with Designer.	
Client decision	1. Agree with above 2. Agree with above out of scope 3. Monitor and trim if required 4. Monitor and upgrade if required Intersection is being upgraded under LGWM targeted improvement.	
Action taken	Pass comments to LGWM for action	

3. Comments

The following comments are either:

- of a general nature; or
- cannot be related to any specific safety concern; or
- relate to previous safety concerns that may have been misinterpreted; or
- relate to subsequent design developments that could become safety concerns in a future safety audit; or
- relate to safety concerns that the designers are already aware of; or
- relate to design elements where the safety implications are not yet clear due to insufficient detail for the stage of the project.

These comments are included for the consideration of the designers and the client. Decision tracking tables are included to record responses, as attention paid to the comments may contribute to improving overall road safety.

3.1.1 Alternate Linkage to Courtenay Place

COMMENT

The following matter relates to an assessment that the SAT have relating to safe and effective access to Courtenay Place. This matter relates to a SANF consideration of the greater issues identified in our assessment of the current design. The SAT stress that this matter is raised to enable a consideration of alternate designs that may add on the current 90% design layout.

As raised in Section 2.5.2, the SAT have concerns on the current design's connection to the major cycle route along Courtenay Place, to be formed as part of the Golden Mile project. A member of the SAT undertook a SANF assessment of the initial design for the Golden Mile project and raised concerns in that report of the need for a high level of connection to the surrounding networks.

In considering this design, and also considering the connectivity options, the SAT raise the following design consideration for the project team.

The current pedestrian crossing south of the intersection has a suitable level of service for pedestrians, however this would not be suitable to incorporate cyclists as part of the crossing movement on the current crossing point. Access to the existing path through the central median also occurs immediately adjacent to the lane shift of the new facility.

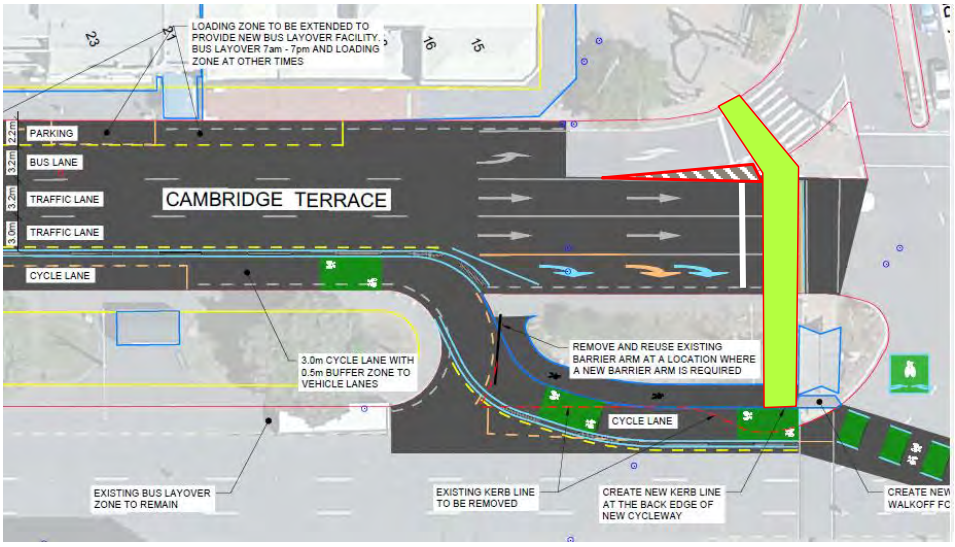


Figure 3-1: Alternate cyclist linkage to/from Courtenay Place

The SAT consider that there is a possible alternate linkage for cyclists from the new bi-directional facility, through the central island and across into Courtenay Place, running parallel with the current facility, as indicated in Figure 3-1 above.

This could be achieved through the formation of a new path through the central median, with porous pavers over the garden to maintain tree health. The limit line of the northbound movement can be moved back to facilitate the inclusion of a new crossing feature, ASB for through movements, and inclusion of a longer splitter island.

Figure 3-2: View west from Kent Terrace to Cambridge Tce and Courtenay Place beyond

Figure 3-3: View of alternate cyclist connection utilising existing ASBs.

The formation of a shared path system at the connection to the cycle facility will facilitate the safe mixing of movements during peak periods.

Recommendation(s)

1. Consider the design option to incorporate a cycle facility parallel to the current pedestrian movement over Cambridge Terrace.

Designer response	The team have been working with the Golden Mile team and have identified a future layout to provide a signalised connection to be constructed as part of the Golden Mile project.
Safety Engineer comment	Agree with Designer. To be resolved in future development of cycleways.
Client decision	Agree with above
Action taken	Ongoing meetings with LGWM

3.1.2 Side Road Controls

Comment

Existing side road controls are not reflected in the current drawing set. The SAT have assumed that this is a draughting error.

Risk is that removal of side road controls will increase the risk to cyclists in the through movement

The SAT recommend that all existing side road controls be incorporated into the drawing set

Designer response	Agree that existing side road controls should be shown in drawing set.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree with above
Action taken	Plans updated

4. Audit Statement

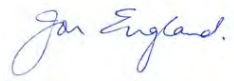
We declare that we remain independent of the design team, and have not been influenced in any way by any party during this road safety audit.

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed or modified in order to improve safety.

We have noted the safety concerns that have been evident in this audit, and have made recommendations that may be used to assist in improving safety.

Signed  Date 8 March 2022

Mike Smith, Senior Principal Transportation Engineer – Road Safety, Stantec Christchurch

Signed  Date 8 March 2022

Jon England, Senior Principal Road Safety Engineer, Stantec Wellington

5. Response and Decision Statements

System designers and the people who use the roads must all share responsibility for creating a road system where crash forces do not result in death or serious injury.

5.1 Designer's Responses

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report and I have responded accordingly to each safety concern with the most appropriate and practical solutions and actions, which are to be considered further by the safety engineer (if applicable) and project manager.

Signed  Date 9/03/2022

Sam Thornton, CMEngNZ CPEng, Principal Transportation Engineer, WSP

5.2 Safety Engineer's Comments (if applicable)

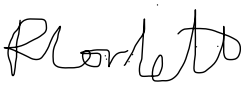
I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report together with the designer's responses. Where appropriate, I have added comments to be taken into consideration by the project manager when deciding on the action to be taken.

Date 11/03/2022

Dennis Davis, Principal Transport Engineer, Wellington City Council

5.3 Project Manager's Decisions

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report, together with the designer's responses and the comments of the safety engineer (if applicable), and having been guided by the auditor's ranking of concerns have decided the most appropriate and practical action to be taken to address each of the safety concerns.



Signed Date 29.04.2022

[Project Manager's name, qualification, position, company]

5.4 Designer's Statement

I certify that the project manager's decisions and directions for action to be taken to improve safety for each of the safety concerns have been carried out.

Signed  Date 02/05/2022

Chris Groom, BPlan, Senior Transport Planner, WSP

5.5 Safety Audit Close Out

The project manager is to distribute the audit report incorporating the decisions to the designer, safety audit team leader, safety engineer, and project file.

Date:.....29.04.2022.....

(ClickHeretoAddReferenceInfo)


Appendices

Appendix A Supplied Drawings and reports

Material was supplied in electronic form

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