NZ TRANSPORT AGENCY
WAKA KOTAHI

Dunedin One Way System (SH1) Cycle Survey Report

Report produced March 2014
(based on traffic surveys undertaken December 2013, and January & February 2014)

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Preamble

This report provides cycle count information from various Blocks within central city area of Dunedin. The purpose of collecting this count data is to assist the NZ Transport Agency in planning and developing cycle infrastructure needs. This report also also follows on from reports of previous cycle count information collected within the 2010/2011 and 2011/2012 summer periods.

At the time of undertaking these surveys, the NZ Transport Agency and the Dunedin City Council were consulting on a proposal to establish separated cycle lanes on the State Highway 1, one-way street system, within the central city. Information on this proposal is available through either viewing the Transport Agency website (direct link:

http://www.nzta.govt.nz/network/projects/project.html?ID=236);

or by contacting the Transport Agency offices: AA Centre, Moray Place, Dunedin, or by phone 03 951 3009).

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1. One-way system mid-block cycle surveys

Along the one-way system, cycle usage was surveyed a four pairs of sites, ie on both of the one way routes at the following Blocks.

a) Block 1: between the Leviathon Hotel and Stuart St
b) Block 2: between Saint Andrew St and Hanover St
c) Block 3: between Frederick St and Albany St
d) Block 4: between Dundas St and Howe St

1.1 Summary of one-way system mid-block daily cycle volumes.

Table 1 below, shows the calculated daily average cycle use volumes for each of the blocks surveyed.

DAILY CYCLE VOLUME	Leviathon hotel - Stuart St	St Andrew St - Hanover St	Frederick St - Albany St	Dundas St – Howe St
Northbound (from survey tables)	141	190	198	187
Holiday adjusted value *	**159**	**215**	**224**	**211**
Southbound (from survey tables)	127	193	208	196
Holiday adjusted value *	**143**	**218**	**235**	**221**
Combined volume (north & south daily cycle travel)	**302**	**433**	**459**	**432**

* As described in Section 4 – Annual Average Daily Traffic Estimation, it is appropriate to apply a scale factor to recognise that the surveys were undertaken over the summer university semester break, when many persons who might otherwise travel by cycle, were absent. This scale factor of 1.13 is taking from the Cycle Network and Route Planning Guide (LTSA 2004), and further surveys for late March are planned to further corroborate this.

By comparison, in February 2014, the Dunedin City Council also undertook 24 hour cycle counts on both North Rd (North East Valley) and Portsmouth Drive, where the average number of week-day cyclists recorded (combined for each direction of flow) was 322 and 380 respectively.

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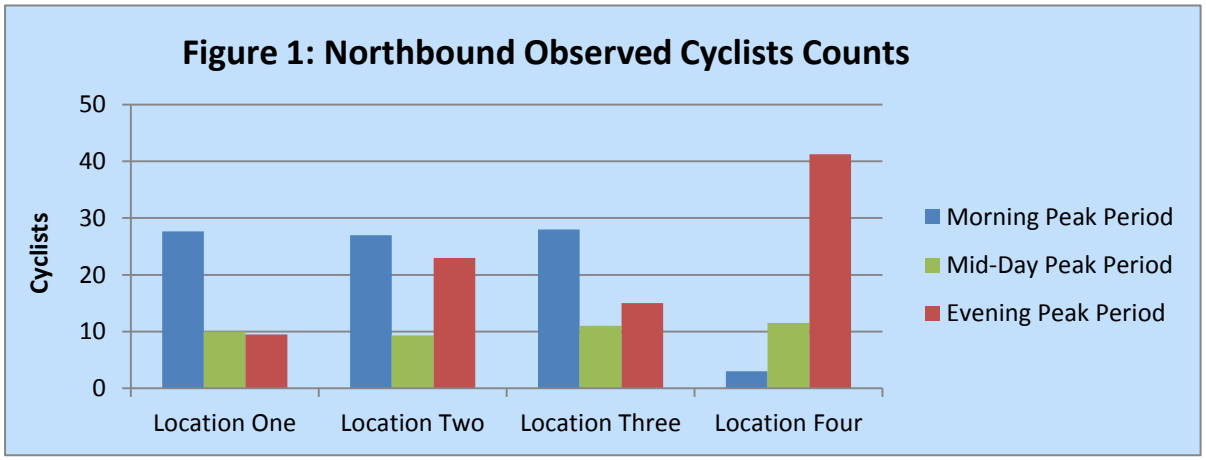
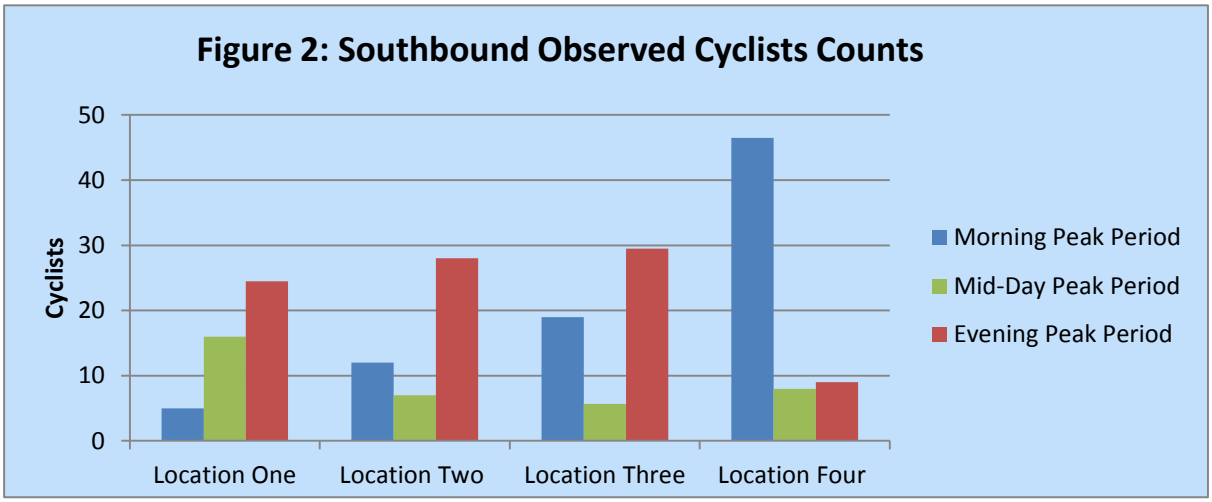
1.2 Summary of 'peak' hourly use change.

The following two graphs show the four blocks surveyed along each of the one way routes, and how usage changed between morning peak, mid-day and evening peak 1 hour time periods. The values were calculated by averaging the multiple observed hourly counts taken within morning peak, mid-day, or evening peak time frames. All counts were observed during the week-day (ie Monday – Friday).





From Figure 1 (northbound), it can be seen that at the on the northbound one-way route, usage is dominated by the morning peak demand, with the exception of the Block 4 (between Dundas St and Howe St) where there demand is in the afternoon peak. At the two extremities - Blocks One and Four, cycle use is dominated by a single period; whereas at the two more central blocks, the distribution of flows are a little more moderated through the day.

From Figure 2 (southbound), the distribution of cyclists throughout the day is a near mirror image to that of the northbound flow. That is, this time it is Block Four where the morning peak has the highest flow, whereas for the other three blocks it is the afternoon peak that has the highest flow.

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1.3 Individual Site Survey Record Summaries

Following are a series of individual count summary tables, from which the block, date, and time of each survey can be identified, as well as how many times the surveys were done at any one block. Observed hourly counts, and how from these an daily average cycle volume (referred to as Annual Average Daily Traffic – AADT cyclists) is also shown. For more detail as to the extrapolation of the daily average volume, from the observed hourly counts, refer to Section 4 – Annual Average Daily Traffic Estimation.

Table 2: Block One (Leviathon St – Stuart St) : Northbound

Period	Morning Peak Times			Mid-day Times	Evening Peak Times	
Date	6/12/2013	9/12/2013	27/01/2014	24/01/2014	6/12/2013	31/01/2014
Day	Friday	Monday	Monday	Friday	Friday	Friday
1 hour period start time	08:15	07:45	07:40	13:00	16:30	16:45
1st quarter	*	*	10	2	*	2
2nd quarter	*	*	6	3	*	3
3rd quarter	*	*	8	2	*	7
4th quarter	*	*	9	3	*	2
Total cyclists counted	28	22	33	10	5	14
Average: observed hourly counts			**28**	10		10
Hourly Scale Factor	0.174	0.174	0.174	0.068	0.061	0.061
Day Scale factor	0.163	0.161	0.161	0.163	0.163	0.163
Week Scale factor	1	1	1	1	1	1
Individual Calculated AADT	141.0	112.2	168.3	-	-	-
AADT (cyclists)			**141**	-		-

* single 60 minute count only (ie not recorded in 15 minute intervals)

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Table 3: Block One (Leviathon St – Stuart St) : Southbound

Period	Morning Peak Times		Mid-day Times	Evening Peak Times	
Period Start	07:45	07:45	13:00	16:30	16:45
Date	9/12/2013	27/01/2014	24/01 2014	9/12/2013	31/01/2014
Day	Monday	Monday	Friday	Monday	Friday
1 hour period start time	07:45	07:45	13:00	16:30	16:45
1st quarter		1	11		1
2nd quarter		0	2		5
3rd quarter		2	2		6
4th quarter		2	1		6
Total cyclists counted	5	5	16	31	18
Average observed hourly counts		**5**	16		**25**
Hourly Scale Factor	0.035	0.035	0.112	0.171	0.171
Day Scale factor	0.161	0.161	0.163	0.161	0.163
Week Scale factor	1	1	1	1	1
Individual Calculated AADT	126.8	126.8	125.2	160.9	92.3
AADT (cyclists)		-	-		**127**

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Table 4: Block Two (St Andrew St – Hanover St) : Northbound

Period	Morning Peak Times	Mid-day Times	Evening Peak Times	Other		
Period Start	08:00	13:00	16:45	10:00	14:00	14:00
Date	24/01/ 14	4/02/2014	27/01/ 14	10/12/13	20/12/13	27/01/2014
Day	Friday	Wednesday	Monday	Tuesday	Friday	Monday
Period Start	08:00	13:00	16:45	10:00	14:00	14:00
1st quarter	10	4	6			0
2nd quarter	5	3	4			0
3rd quarter	7	4	6			1
4th quarter	5	9	7			2
Total cyclists	27	20	23	7	5	3
Average observed hourly counts	**27**	20	23	7	5	3
Hourly scale factor	0.124	0.045	0.108			
Day Scale factor	0.163	0.167	0.161			
Week Scale factor	1	1	1			
Individual calculated AADT	190.9	380.2	189.0			
AADT (cyclists)	**190**					

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Table 5: Block Two (St Andrew St – Hanover St) : Southbound

Period	Morning Peak Times	Mid-day Times		Evening Peak Times	Other Counts	
Date	11/12/2013	10/12/2013	30/01/2014	29/01/ 2014	6/12/2013	16/12/2013
Day	Wednesday	Tuesday	Thursday	Wednesday	Friday	Monday
1 hour period start time	08:00	11:00	13:00	16:45	10:00	14:00
1st quarter	-		1	6		
2nd quarter	-		3	10		
3rd quarter	-		2	7		
4th quarter	-		1	5		
Total cyclists counted	12	5	7	28	6	9
Average observed hourly counts	12		6	**28**		
Hourly Scale Factor	0.108	0.052	0.057	0.124		
Day Scale factor	0.167	0.166	0.17	0.167		
Week Scale factor	1	1	1	1		
Individual calculated AADT	95.0	82.7	103.2	193.2		
AADT (cyclists)	-		-	**193**		-

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Table 6: Block Three (Frederick St – Albany St) : Northbound

Period	Morning Peak Tmes	Mid-day Times	Evening Peak Times	Other Times	
Date	31/01/2014	29/01/2014	24/01/2014	20/12/2013	11/12/ 2013
Day	Friday	Wednesday	Friday	Friday	Wednesday
1 hour period start time	8:00	13:00	16:45	15:30	14:00
1st quarter	9	3	4		
2nd quarter	12	6	3		
3rd quarter	3		4		
4th quarter	4	1	4		
Total cyclists	28	11	15	5	7
Average observed hourly counts	**28**	11	15		
Hourly Scale Factor	0.124	0.057	0.108		
Day Scale factor	0.163	0.167	0.163		
Week Scale factor	1	1	1		
Individual calculated AADT	197.9	165.1	121.7		
AADT (cyclists)	**198**				

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Table 7: Block Three (Frederick St – Albany St) : Southbound

Period	Morning Peak Times	Mid day Times		Evening Peak Times		Other Times
Date	12/12/2013	28/01/14	16/12/13	29/01/2014	3/02/2014	16/12/2013
Day	Thursday	Tuesday	Monday	Wednesday	Monday	Monday
Period Start	08: 00	13:00	11:00	17:00	16:45	10:00
1st quarter		2		9	7	
2nd quarter		1		3	18	
3rd quarter		3		8	9	
4th quarter		3		2	3	
Total cyclists	19	9	4	22	37	4
Average observed hourly counts	19		6.5		**30**	4
Hourly Scale Factor	0.108	0.057	0.052	0.124	0.124	-
Day Scale factor	0.17	0.166	0.166	0.167	0.161	-
Week Scale factor	1	1	1	1	1	-
Individual calculated AADT	147.8	135.9	66.2	151.8	264.8	-
AADT (cyclists)	-	-	-		**208**	-

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Table 8: Block Four (Dundas St – Howe St) : Northbound

Period	Morning Peak Times		Mid- day Times
Date	29/01/2014	3/02/2014	6/12/2013
Day	Wednesday	Monday	Friday
Period Start	8:00	8:00	12:00:00
1st quarter	1	2	
2nd quarter	0	0	
3rd quarter	1	0	
4th quarter	1	1	
Total cyclists	3	3	21
Average observed hourly counts		3	21
Hourly Scale Factor	0.0141	0.0141	0.0985
Day Scale factor	0.167	0.161	0.163
Week Scale factor	1	1	1
Individual calculated AADT	182.0	188.8	186.9
AADT (cyclists)			

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Table 8 (continued) : Block Four (Dundas St – Howe St) : Northbound

Period	Evening Peak Period 16:30-18:00				Other
Date	18/12/2013	20/01/2014	16/12/2013	30/01/14	23/01/14
Day	Wednesday	Monday	Monday	Thursday	Thursday
Period Start	17:00	17:00	17:00	16:45	14:00
1st quarter		16		9	2
2nd quarter		7		4	0
3rd quarter		12		12	0
4th quarter		11		12	0
Total cyclists	29	46	53	37	2
Average observed hourly counts				**41**	
Hourly Scale Factor	0.192	0.192	0.192	0.192	
Day Scale factor	0.167	0.161	0.161	0.17	
Week Scale factor	1	1	1	1	
Individual calculated AADT	129.2	212.6	244.9	161.9	
AADT (cyclists)				**187**	

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Table 9: Block Four (Dundas St – Howe St) : Southbound

Period	Morning Peak Times		Mid day Times	Evening Peak Times	
Date	29/01/2014	3/02/2014	12/12/2013	19/12/2013	28/01/2014
Day	Wednesday	Monday	Thursday	Thursday	Tuesday
Period Start	8:00	8:00	12:00	17:00	17:00
1st quarter	8	9			4
2nd quarter	7	13			2
3rd quarter	11	15			3
4th quarter	10	20			0
Total cyclists	36	**57**	8	9	9
Average observed hourly counts		47	8		9
Hourly Scale Factor	0.208	0.208	0.054	0.041	0.041
Day Scale factor	0.167	0.161	0.17	0.17	0.166
Week Scale factor	1	1	1	1	1
Individual calculated AADT	148.0	243.0	124.5	184.5	188.9
AADT (cyclists)		196	-		-

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1.4 Cumberland St Video Survey

During April, July and November in 2013 a video survey was undertaken on Cumberland Street, on the northbound one-way system, outside Dunedin Hospital (between Hanover St and Frederick St). This provided cycle count data over multiple periods of consecutive hours, although few 'whole' survey counts could be retrieved.

Too gain an overall daily usage volume, each of the cycle counts for the same hour in any number of days was summed together and an average calculated for that hour period. This was done and the averages collated for all 24 hour periods; and from this the averaged daily traffic (cyclist) flow for this block was determined to be 140 cyclists per day.

Table 10: Cumberland St video survey average hourly cycle counts and average daily total

Hour	Average Cyclists
12:00:00 a.m.	2.00
1:00:00 a.m.	2.00
2:00:00 a.m.	1.00
3:00:00 a.m.	1.00
4:00:00 a.m.	1.00
5:00:00 a.m.	2.00
6:00:00 a.m.	2.30
7:00:00 a.m.	9.30
8:00:00 a.m.	17.25
9:00:00 a.m.	7.92
10:00:00 a.m.	7.83
11:00:00 a.m.	7.17
12:00:00 p.m.	9.92
1:00:00 p.m.	8.00
2:00:00 p.m.	6.10
3:00:00 p.m.	6.50
4:00:00 p.m.	9.08
5:00:00 p.m.	15.08
6:00:00 p.m.	8.90
7:00:00 p.m.	4.00
8:00:00 p.m.	2.50
9:00:00 p.m.	3.38
10:00:00 p.m.	1.91
11:00:00 p.m.	3.00
Average Daily Total	139.13

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2. Travel route demand cycle surveys

To help assess which routes cyclist were most dependent upon, movement surveys were undertaken at three key intersections within / or which lead into the central city area. These were:

- Cumberland St (southbound) / Brook St (which leads into Leith St)
- Saint Andrew St / Anzac Ave
- North Rd / Bank St (which leads into George St)

In addition a cycle volume was undertaken on George St

2.1 Duke Street and Cumberland Street Intersection

There is a shared path/cycle way around the botanical gardens which links North East Valley to this intersection with Cumberland St (the southbound one-way) with Brook St. From this intersection cyclists can either continue along the one-way route to cycle past the university and towards the central city areas, or continue along the shared path in Brook St, which links to both upper Castle St and Leith St – both of which are 'quiet' streets and lead directly into the heart of the university campus. This latter route can also be taken to link to the technical college and onto the harbour-side cycle network.

Cyclists could also travel along Duke St to Leith Valley; but when cycling from/to North East Valley, the Bank St route affords a more direct path.

Table 11: Cumberland St (Southbound) / Brook St

Cumberland St (Southbound) / Brook St		
Date	17/12/2013	5/02/2014
Period	9:15-10:15	17:00 – 18:00
Southbound cyclists on Cumberland Street (ie same direction as one-way traffic)	14	10
Southbound cyclists into Brook Street	3	1
Northbound cyclists on Cumberland Street (on footpath – against flow of traffic)	0	2
Northbound cyclists from Brook Street	2	13
Northbound cyclists on Gt King St	-	41

A key observation from these surveys is that the demand from south-bound cyclists to use the one-way system is much stronger than that of the alternative route via Brook St.

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In the evening peak, the demand is such that Brook Street can still be regarded as a popular route; however when compared with northbound cyclists on Gt King St at the same period, the demand for use of the one-way system is again greater.

2.2 Anzac Ave and Saint Andrew St Intersection

This intersection forms the northern/city end of the harbour-side cycle network – it links through to Portsmouth Drive, and hence the wider Peninsula & South Dunedin network.

The diagrams below show the relative movement patterns for both morning and afternoon.

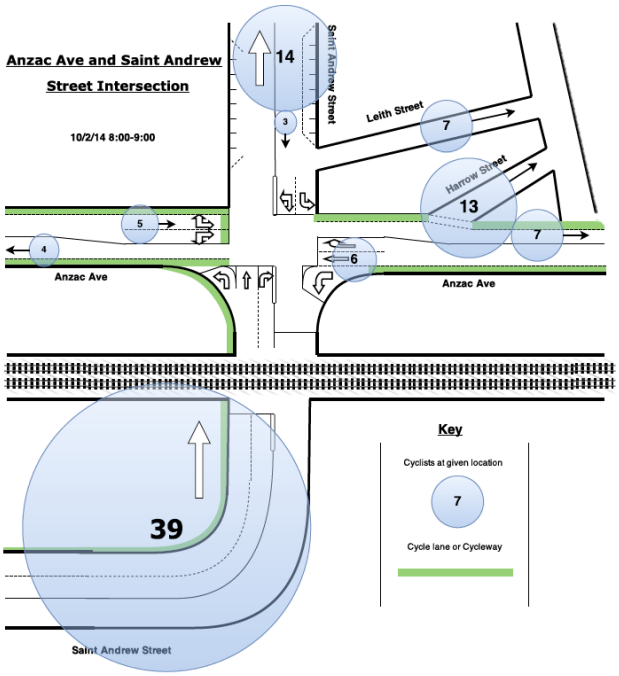

Figure 3: Morning Peak Movements (8am – 9am)

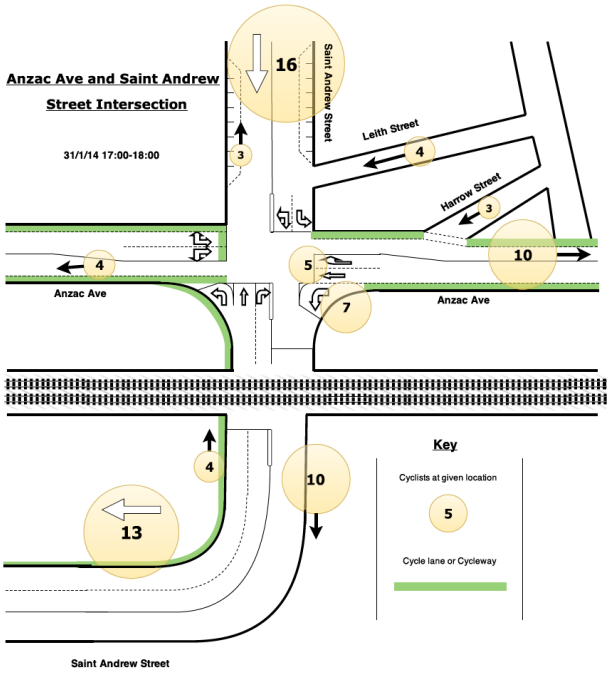

Figure 4: Afternoon Peak Movements (5pm – 6pm)

In the morning peak, the majority of cyclists arrive at this intersection from the Thomas Burns St cycle-way (across the rail lines). Approximately 1/3 or cyclists then depart towards the city via St Andrew St, and 2/3 depart towards the university environs via Leith St, Harrow St, or Anzac Ave.

To note, also that the rail station over-bridge affords cyclists with a 'push-bike' alternative link from Thomas Burns St, to travel more directly towards Stuart St.

In the afternoon peak, the movement pattern is arguably more skewed to cyclists arriving from the city via St Andrew St (approximately half), and the balance arriving from the university environs via the other streets.

Of note, is that of those cyclists departing the intersection via the Ward St route (across the rail lines), nearly half remain on the road, a opposed to using the shared path. This suggests that the shared-path, is less accessible from this direction.

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Table 12: Anzac Ave Intersection Movements

Anzac Ave Intersection Movements		
Date	10/2/14	31/1/14
Period	8:00-9:00	17:00-18:00
Saint Andrew Street (Above) Towards Intersection	3	**16**
Saint Andrew Street (Above) Towards City Centre	**14**	3
Leith Street Towards Saint Andrew Street	1	4
Leith Street Towards Hanover Street	7	0
Harrow Streeet Towards Anzac Ave	0	3
Harrow Street Towards Hanover Street	**13**	0
Anzac Ave (Right) Towards Stadium	7	**10**
Anzac Ave (Right) Traffic Lights Bay	6	5
Anzac Ave (Right) Turning Bay into Saint Andrew Street	0	7
Saint Andrew Street Cycleway (Below) Towards Intersection	**39**	4
Saint Andrew Street (Below) On road cyclists Away from Intersection	1	**10**
Saint Andrew Street Cycleway (Below) Away from Intersection	1	**13**
Anzac Ave (Left) Towards Intersection	5	2
Anzac Ave (Left) Towards Castle Street	4	4
Total	**54**	**36**

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2.3 North Dunedin Gardens Shopping Centre

This intersection is at the base of North East Valley, and from here cyclists can choose to travel to their central city destinations via Bank St (which leads onto George St); or to continue along North Rd (labelled here as Gt King St), to reach the head of the one-way system Cumberland St/Gt King St convergence, and also the shared path link to Brook St.

The diagrams below shows the relative movement patterns for both morning and afternoon.

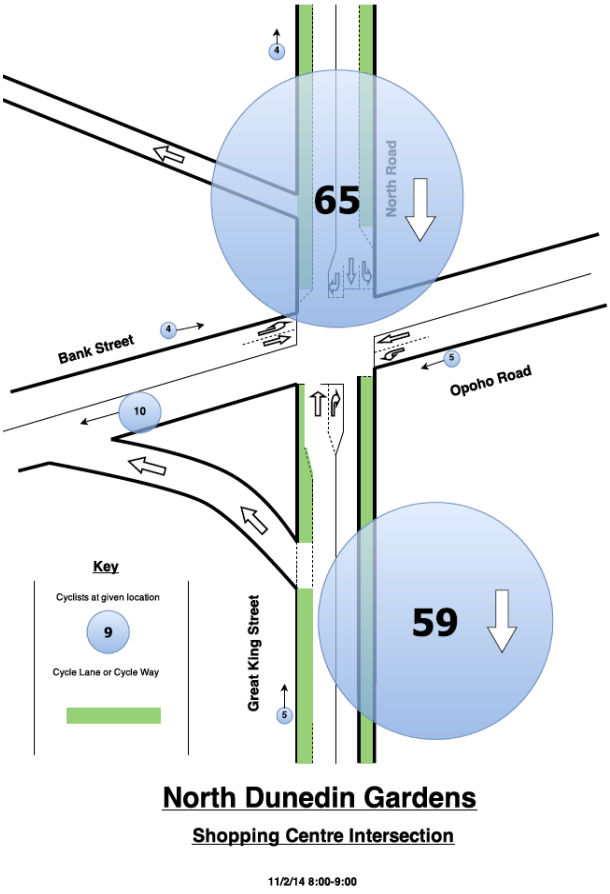

Figure 5 Morning Peak Movements (8am – 9am)

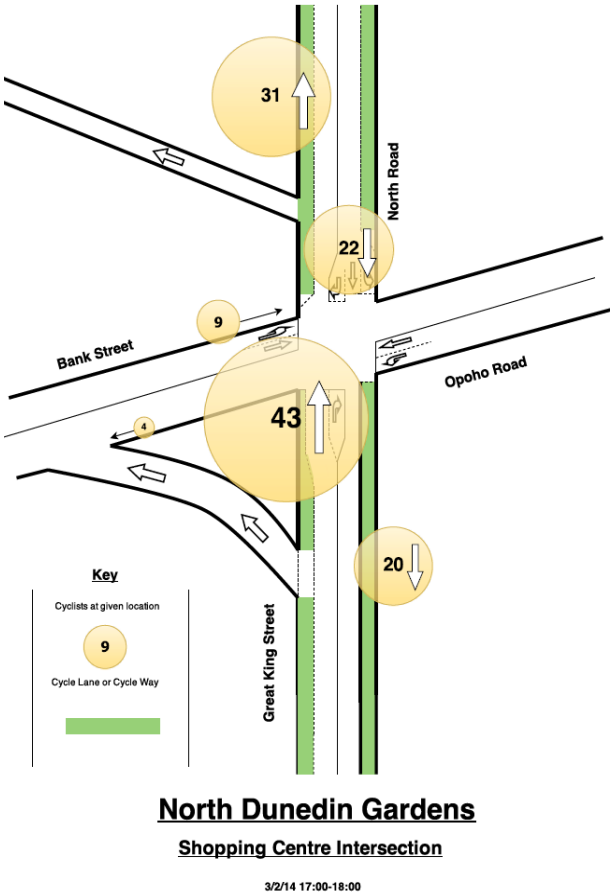

Figure 8 Evening Peak Movements (5pm – 6pm)

As evident from both morning and afternoon perspectives, the demand to use the Bank St / George St route is much less than the demand for use of the link through to the head of the one-way system and Brook St.

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Table 13: North Dunedin Gardens Shopping Centre

North Dunedin Gardens Shopping Centre		
Date	11/2/14	3/2/14
Period	8:00-9:00	17:00-18:00
North Road Towards Intersection	65	22
Opoho Road Towards Intersection	5	0
Great King Street Towards Intersection	5	**43**
Bank Street Towards Intersection	4	**9**
North Road Away from Intersection	4	31
Opoho Road Away from Intersection	0	0
Great King Street Away from Intersection	**59**	20
Bank Street Away from Intersection	**10**	4
Total Cyclists	79	74

Note, because each cyclist entered and exited the intersection they contributed towards two values. Therefore the total number of cyclists is not calculated by the sum of all survey points but by the total amount of incoming cyclists. There were a number of cyclists who travelled through the Botanic Gardens, Gladstone Road, or stopped at the shopping centre. These cyclists then did not go through two survey points, and this resulted in the incoming and outgoing cyclist numbers to be different.

2.4 George Street

This survey was undertaken to provide a further comparison of travel demand between the one-way system and George St. This survey location on George St was adjacent to the Dundas Street intersection, and such that a direct comparison the 'Block Four' surveys of the one-way system could be made. An AADT estimate was also made using the Cycle Network and Route Planning Guide[1] scale factors, as George Street is a typical two way and two peak period road.

[1] (Land Transport Safety Authority 2004)

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Table 14: George St

George Street						
Date	29/01/2014			30/01/2014		
Period	8:00-9:00			16:45-17:45		
Day	Wednesday			Thursday		
Direction	South	North	Both	South	North	Both
1st quarter cyclists	11	0	11	2	6	8
2nd quarter cyclists	1	0	1	1	5	6
3rd quarter cyclists	7	0	7	1	7	8
4th quarter cyclists	4	2	6	3	2	5
Total cyclists	**23**	2	25	7	**20**	27
1st quarter scale factor	0.025			0.029		
2nd quarter scale factor	0.026			0.038		
3rd quarter scale factor	0.031			0.043		
4th quarter scale factor	0.02			0.046		
Day Scale factor	0.167			0.163		
Week Scale factor	1.02			1.02		
Individual calculated AADT	219.07			162.81		
AADT (cyclists)	**191**					
Block 4 – one way southbound	**36**					
Block 4 – one way northbound					**37**	

When observing the peak southbound and northbound cycle flows on George St, there was also a line of sight through to the one-way system. This enabled the respective peak southbound and northbound cycle flows on the one-way system to also be counted, and a direct comparison in cycle travel by route, then made. These results are also tabled here. Whether through comparison of these 'same time' observations, or through comparing averages of the peak cycle flows, it is clear that the one-way system is being used by cyclists to best meet their particular travel needs, more than George St .

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3. Other continuity surveys

In addition to the central city surveys, two other surveys were undertaken to provide a measure of continuity/change over time assessment; these survey sites were at Andersons Bay Rd (the Oval) and on the harbour-side shared path at Ravensbourne.

3.1 Andersons Bay Road (State Highway 1, at the Oval)

This survey was taken in the same manner to those surveys of the previous two years, and in the morning and evening peak periods. AADT estimations were also made using the Cycle Network and Route Planning Guide.

Table 15: Andersons Bay Rd

Andersons Bay Road and Caversham Bypass Motorway Intersection		
Date	19/12/2013	10/02/2014
Period	7:45 – 8:45	17:00 – 18:00
Cyclists North	17	5
Cyclists South	2	35
Total	19	40
Hourly Scale Factor	0.107	0.167
Daily Scale Factor	0.17	0.161
Week Scale Factor	1	1
Individual calculated AADT	149.2	212.5
2013/14 AADT (cyclists)	**181**	
2012/13 AADT (cyclists)	**177**	
2011/12 AADT (cyclists)	**169**	

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3.1 Ravensbourne Harbour Cycle Way

This survey was performed in a repeat manner to those undertaken within the previous two summers. No attempt is here made to establish an average daily cycle volume, as the shared path receives a high proportion of recreational use. Because of this, the use of the shared path is likely to have quite a different pattern of use throughout the day, than that used in the Cycle Route and Network Planning Guide; eg it cannot be assumed that the levels of early morning and late afternoon recreational cycling activity are similar. This making it much less accurate to determine a daily total based on a single hourly count (see Section 4 Average Annual Daily Traffic (AADT) Estimation).

To establish a reasonable use pattern (or hourly factors), additional surveys would be required, particularly to assess whether the morning peak use is a prevalent as the afternoon peak use. From observations, it was also apparent that the proportion of return (recreational) trips would be reasonably high.

Notwithstanding this, the table below compares the observed cycle counts from this current survey, with those of previous years. And from this, it can be seen that the shared path is becoming much more popular in use.

Table 16: West Harbour Shared Path

West harbour shared path : Ravensbourne			
Date			4/02/2014 - Wednesday
2 Hour Period			17:45 – 19.45
Travel Direction	Towards Maia	Towards City	Combined
Cyclists (2 hour observations)			
Current observations	68	35	**103**
2012/13	25	9	**34**
2011/12	36	10	**46**
Pedestrians			
Observed Pedestrian Volume (2 hours) incl. runners.	41	35	**76**

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4. Average Annual Daily Traffic (AADT) Estimation

The volume of traffic travelling along any given road is not constant between hours within the same day, across days of the week, and even within weeks of the year. The same is also true for cycle travel, and indeed this can be more variable than that of other road users. As traffic surveys tend to be periodic only, to determine an typical daily volume (referred to as an Annual Average Daily Traffic volume – AADT), it is necessary to apply scale factors to any one hour of observed counts taken. For cycle volumes the following formula is applied:

$$AADT_{Cyc} = Count * \frac{1}{H} * \frac{1}{D} * \frac{W}{7}$$

Where: ***Count*** *= Result of the count period (typically hourly)*
H *= Scale factor for time of the day*
D *= Scale Factor for day of the week*
W *= Scale Factor for week of the year*

(Cycle Network and Route Planning Guide, LTSA, 2004)

4.1 Scale factor for time of day

As there can be considerable variability in travel between observed hourly counts throughout the day, in deriving an AADT for the one-way system surveys, it was the peak hour, or average of peak hours (where more than one count for the same time of day) that was "scaled-up". This is because the influence that a single observed cyclists makes to the assessed daily total, is less when scaling-up a peak hour volume, as opposed to an off peak our volume.

The daily travel time/volume profile as developed by the Cycle Network and Route Planning Guide[2] is shown below.

Figure A2.1 Weekday daily cycling count profile corresponding to H-weekday for all sites in Table A2.1.

Figure 7: Typical Hourly Distribution of Cycle Traffic

[2] (Land Transport Safety Authority, 2004)

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This however, assumes a two-way road, where a peak in travel demand occurs in both the morning and afternoon. As the Dunedin one-way system is not a typical road, it could not be assumed that there will be both a morning and evening peak period. So as to determine more reasonable (conservative) peak hour scale factors, the individual surveys at any one block were consolidated so as to determine a more reliable profile (ie most sites were surveyed at least 3 different times of the day. For sites at Blocks 1 and 4, these profiles as based on 'observed' traffic counts are illustrated below.

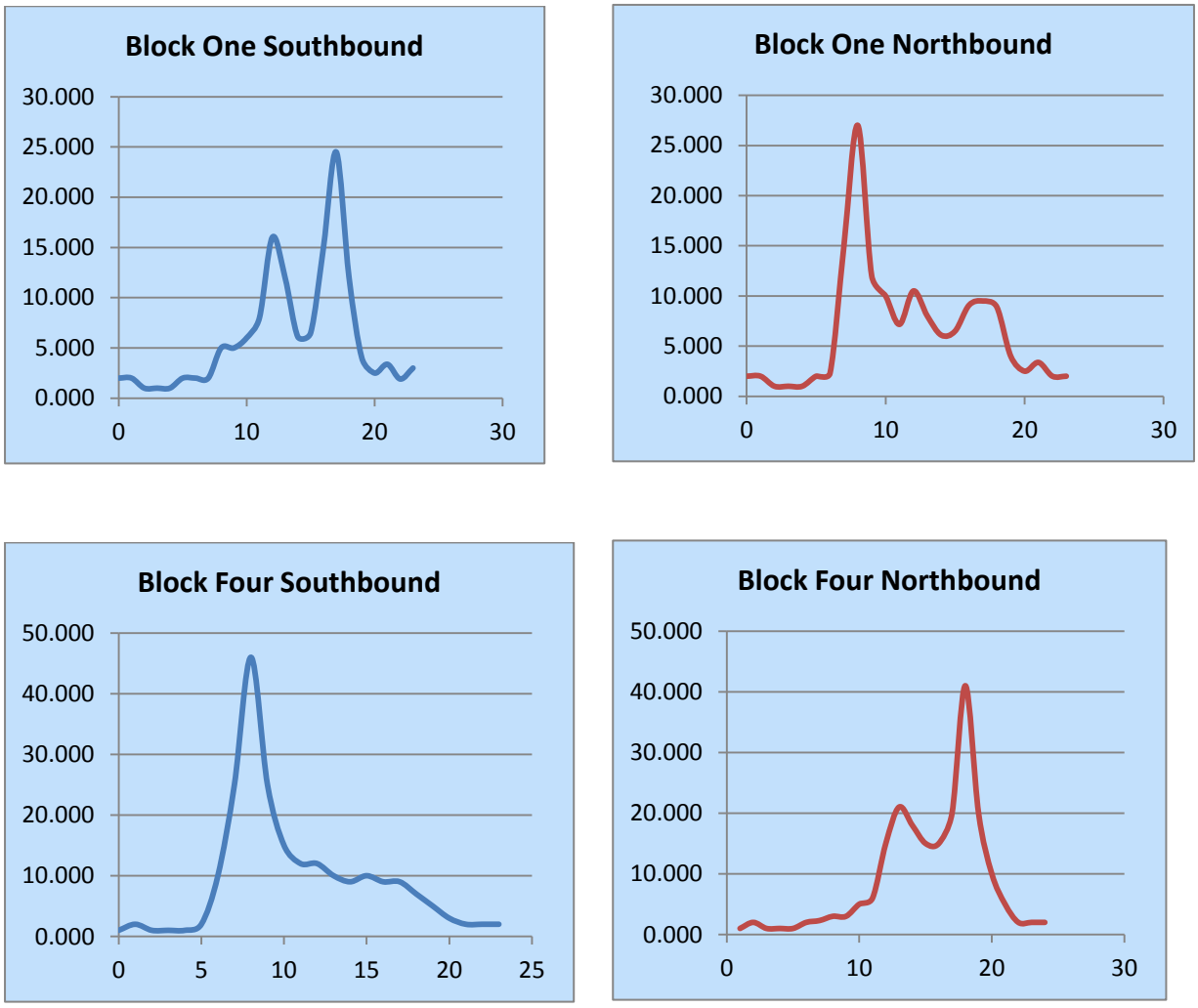

Figure 8: Applied Hourly Distribution Graphs for Blocks 1 and 4.

From this the hourly scale factors were able to be more reliably adjusted to recognise that the peak flow is representative of the total days flow on the following basis:

- 21% for sites with a strong peak only
- 19% for sites with a strong peak period and mid-day activity
- 17% for sites with a weaker single peak, and mid-day activity.

In mid-2013 a video survey was undertaken on Cumberland Street, outside the Dunedin Hospital. When the hourly counts from this survey were collated and consolidated, the daily profile illustrated below was able to be produced.

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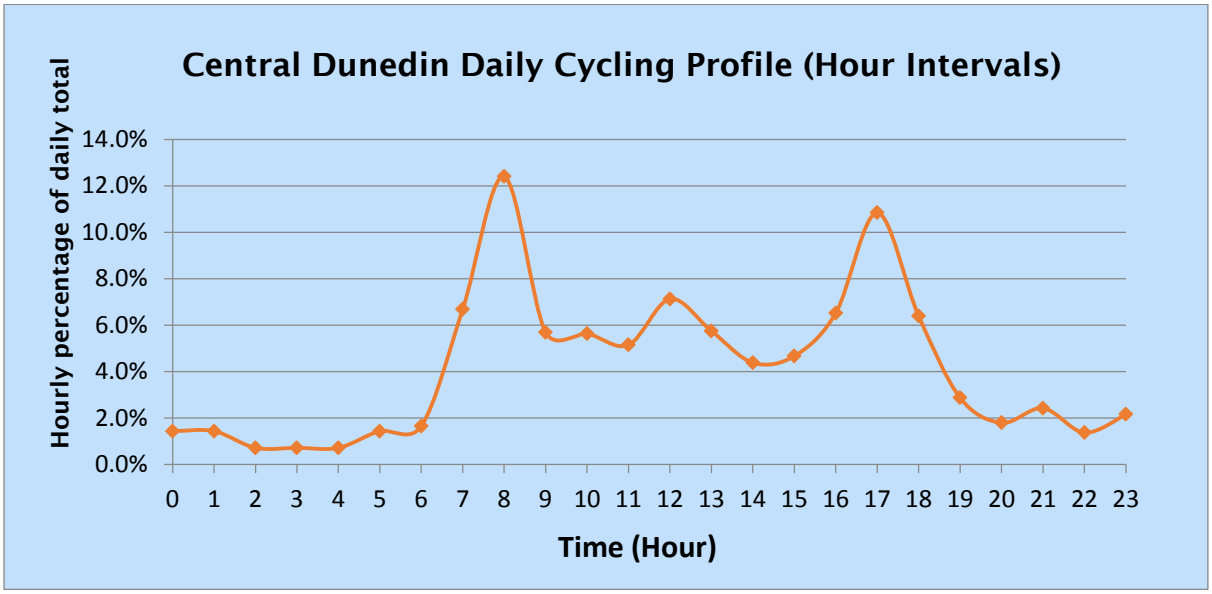

Figure 9: Hourly Distribution of Cycle Traffic on Cumberland St (Hospital Block)

Based on the surveys, collated profiles produced for sites at Blocks Two and Three, were found to be a reasonable fit with the above profile. This profile was therefore used for those northbound survey sites at Blocks 2 and 3. For the southbound survey sites at the same blocks, the profile was also use – but in mirror image.

4.2 Day of the Week Scale factor

The scale factors used to take account of difference in travel demand across the days of the week, are those set out in the Cycle Network and Route Planning Guide (2004).

4.3 Period of the Year Scale Factor

The surveys were undertaken within the education sector summer holiday period, although no surveys were done within the most popular whole of public holiday period over the Christmas break (no surveys between 20 December and 20 January).

Although the period of year scale factors as set out in the Cycle Network and Route Planning Guide are orientated to the secondary school year, for the summer holiday period at least, it is reasonable that the relevant scale factor is used here also (x 1.13). This recognises the substantial influence that the university has on traffic generation, and the amenability of cycle use for travel to and from the university.