

Road Network Performance & Research

RNPR Traffic Note 11 August 2009

Cycle journey time reliability



Précis:

A summary and analysis of cycle journey time reliability measured through Geographical Positioning System devices.

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1 Introduction

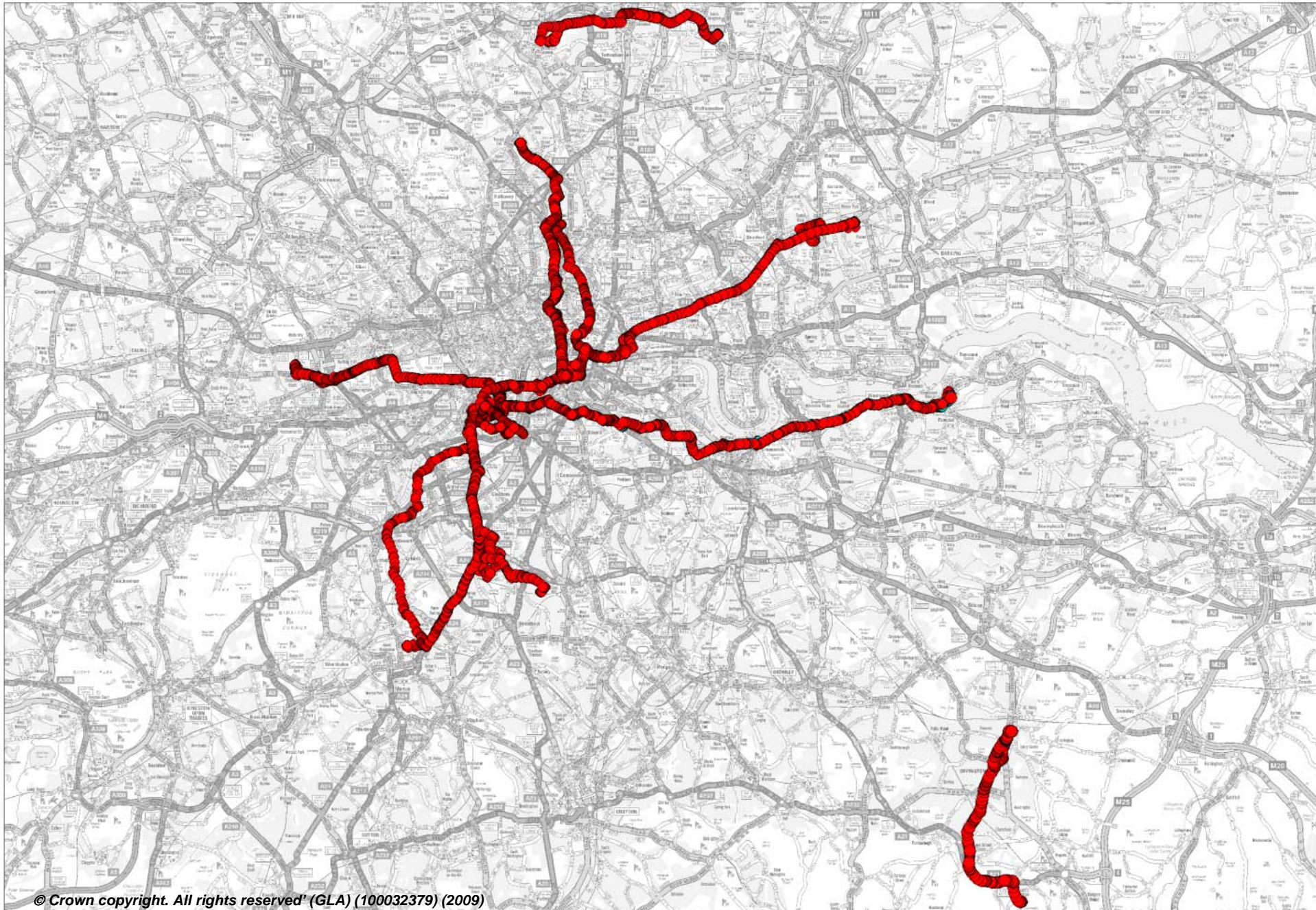
- 1.1 This traffic note, produced by Road Network Performance and Research (RNPR) within TfL, provides a summary and analysis of cycle journey time reliability.
- 1.2 The purpose of this note is to monitor cyclists' journey times using volunteers across different areas of London in order to test the hypothesis that cycle journey time reliability is invariable.
- 1.3 Using portable Geographical Positioning System devices (GPS) volunteers had their regular journeys to and from work recorded. The volunteers were provided with the GPS device for two weeks and asked to record all journeys to and from their work place.
- 1.4 The study took place between the 16th June 2008 and 27th June 2008 and between 7th July 2008 to the 18th July 2008 and saw 8 volunteers partake. The volunteers were asked to switch on the GPS device at the start of their trip, place their device in their bag when riding and then switch off the device at the end when the trip data was automatically saved. An inbound journey is a morning trip from home to work and outbound is the reverse journey in the evening peak. All inbound and outbound journeys took place within the morning peak 7:00am – 10:00am and the evening peak 4:00pm – 7:00pm respectively.
- 1.5 On completion of each survey the data was downloaded from the device to MapSource software before being systemised in excel and notepad and plotted as coordinates in MapInfo.
- 1.6 In MapInfo, marker points were selected as the route was divided into sectors. The marker points were approximately placed every 2-3km and were set out to help identify time deviation on each journey. The time at each marker point was noted for all journeys and then statistically analysed in Excel by means of Standard Deviation.
- 1.7 Figure 1 provides a map of all volunteers' journeys and Table 1 provides a reference of the start and end points of the routes.

Table 1: Start and end points of the volunteer's route

Volunteer ID	Route
1	Wood Green to Chingford
2	Crouch End to Southwark
3	Shepherds Bush to Southwark
4	Manor Park to Southwark
5	Thamesmead to Victoria
6	Colliers Wood to Victoria
7	Balham to St James's Park
8	Pratt's Bottom to Orpington

- 1.8 The remainder of this report provides analysis of each volunteer's journey and conclusions on the reliability of cycle journey time and the use of GPS software for recording such information.

Figure 1: All volunteers routes recorded from cycle journey time study



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2 Wood Green to Chingford

- 2.1 The Wood Green to Chingford route is 6km in length and outlined in Figure 2 overleaf. Beginning in Wood Green, the first 4km follows the cycle facilities alongside the A406 North Circular Road before turning south at Silver Street and continuing west along residential streets (Wilbury Way, Pasteur Gardens) to the destination in Wood Green. The final 'back street' stage involves crossing the busy A10 Great Cambridge Road.
- 2.2 Table 2 presents the results for this route, showing the total time for outbound journeys to be longer than that for inbound trips. This difference is apparent in standard deviation calculations, where, for inbound journeys, the total time standard deviation was 1.66; equivalent to approximately 1 minute 40 seconds. Standard deviation for outbound trips was 2.53 (2 minutes 30 seconds).
- 2.3 The standard deviation for the total average speed was lower for the outbound (1.39) than the inbound (1.64).
- 2.4 For the inbound journey Arcadian Gardens to Somerset Road, the standard deviation for 9 trips of the 2.8km stretch was 0.60 (36 seconds).
- 2.5 The outbound journey on the 19th June, which started at a much later time compared to all other dates, showed no significant difference in the total time.

Figure 2: Breakdown of volunteer route Wood Green to Chingford

Route Divider Map 

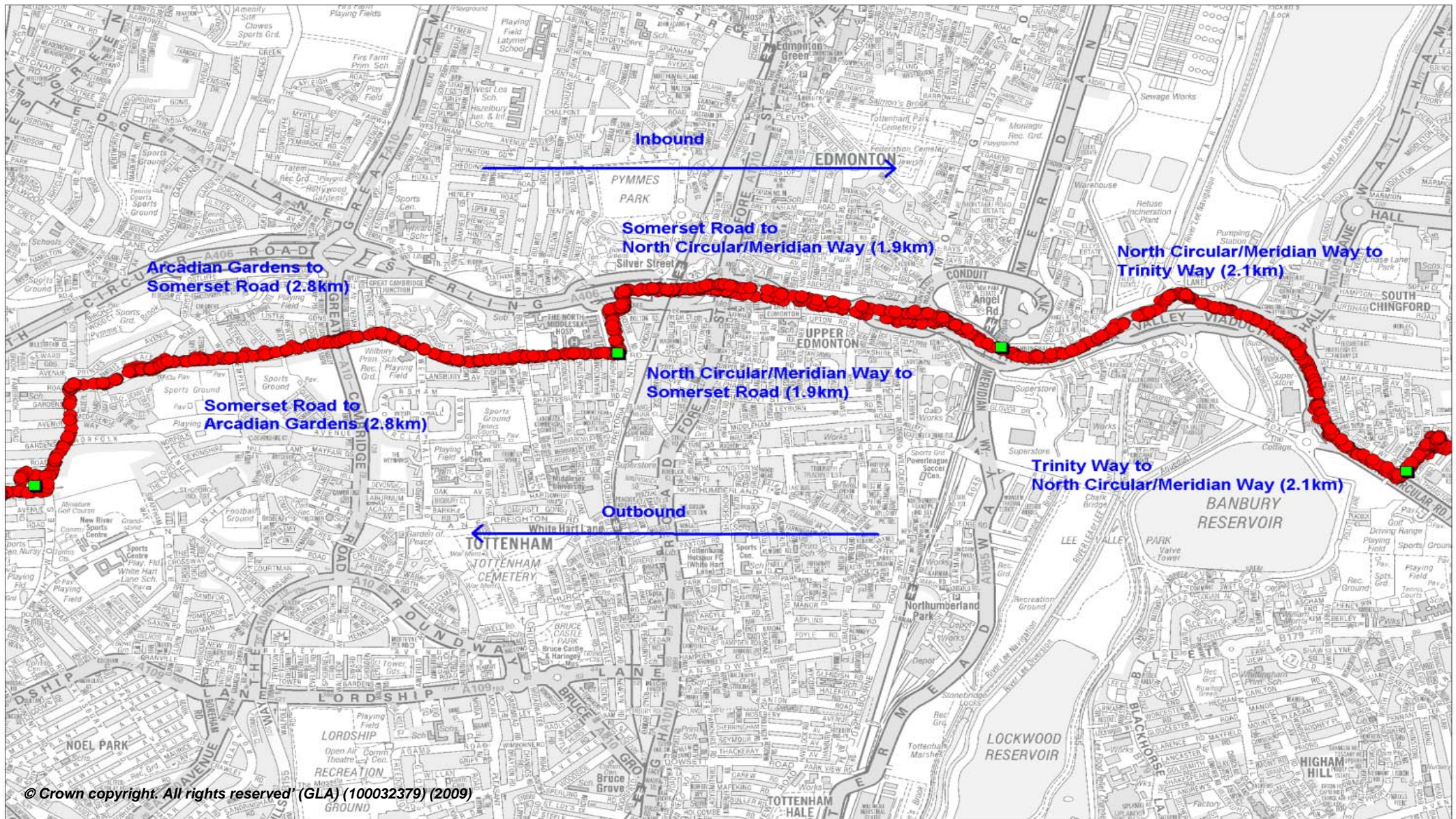


Table 2: Analysis of route Wood Green to Chingford

Direction	Run Date	Start Time	End Time	Arcadian Gardens to Somerset Road (2.8km)			Somerset Road to North Circular/Meridian Way Road (1.9km)			North Circular/Meridian Way to Trinity Way (2.1km)			Total (6.8 km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Inbound (am)	17.06	08:22	08:44	9	19	9	7	16	16	6	21	22	22	19
	18.06	08:33	08:55	8	21	8	7	16	15	7	18	22	22	19
	20.06	08:27	08:46	8	21	8	6	19	14	5	25	19	19	21
	23.06	08:26	08:47	8	21	8	7	16	15	6	21	21	21	19
	24.06	08:23	08:46	8	21	8	8	14	16	7	18	23	23	18
	25.06	08:22	08:40	7	24	7	6	19	13	5	25	18	18	23
	26.06	07:24	07:43	7	24	7	6	19	13	6	21	19	19	21
	27.06	07:24	07:45	8	21	8	8	14	16	5	25	21	21	19
	30.06	06:23	06:44	8	21	8	7	16	15	6	21	21	21	19
Summary			Mean Time	7.89	21.41	7.89	6.89	16.74	14.78	5.89	21.73	20.67	20.67	19.86
			Standard Deviation	0.60	1.66	0.60	0.78	1.89	1.20	0.78	2.87	1.66	1.66	1.64
Direction	Run Date	Start Time	End Time	Trinity Way to North Circular/Meridian Way (2.1km)			North Circular/Meridian Way to Somerset Road (1.9km)			Somerset Road to Arcadian Gardens (2.8km)			Total (6.8km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Outbound (pm)	16.06	17:00	17:25	8	16	8	7	16	15	10	17	25	25	16
	17.06	18:09	18:37	8	16	8	8	14	16	12	14	28	28	15
	19.06	19:21	19:49	8	16	8	8	14	16	12	14	28	28	15
	20.06	17:04	17:30	8	16	8	7	16	15	11	15	26	26	16
	24.06	17:06	17:30	9	14	9	6	19	15	9	19	24	24	17
	25.06	17:02	17:33	10	13	10	9	13	19	12	14	31	31	13
	27.06	16:03	16:34	8	16	8	8	14	16	15	11	31	31	13
Summary			Mean Time	8.43	15.05	8.43	7.57	15.28	16.00	11.57	14.85	27.57	27.57	14.93
			Standard Deviation	0.84	1.34	0.84	1.05	2.22	1.55	1.26	1.92	2.53	2.53	1.39

3 Crouch End to Southwark

- 3.1 The Crouch End to Southwark route is 9.5km in length and is depicted in Figure 3 opposite. The route begins by following the main A1201 Strand Green Road as far as the junction with A503 Seven Sisters Road. From here residential roads are followed around the Emirates Stadium, crossing the A1 Holloway Road before following more residential roads, mainly the B515 Liverpool Road. Upon reaching the A501 Pentonville Road, the route rejoins the main road network and proceeds directly south, crossing the River Thames at Blackfriars Bridge and following Blackfriars Bridge Road south to the destination in Southwark.
- 3.2 The results for this route are shown in Figure 3. The total time for inbound journeys can be seen to be slightly longer than that observed outbound, with standard deviation for all outbound trips being 1.21 (1 minute 12 seconds) and 2.19 (2minutes 11 seconds) inbound.
- 3.3 There was very little difference between the total average speeds for both inbound and outbound.
- 3.4 The outbound trips start times spanned across the entire pm peak. However, this did not affect the length of total journey times. Therefore, it is apparent that journey time is not dependant on start time.

Figure 3: Breakdown of volunteer route Crouch End to Southwark

Route Divider Points ■

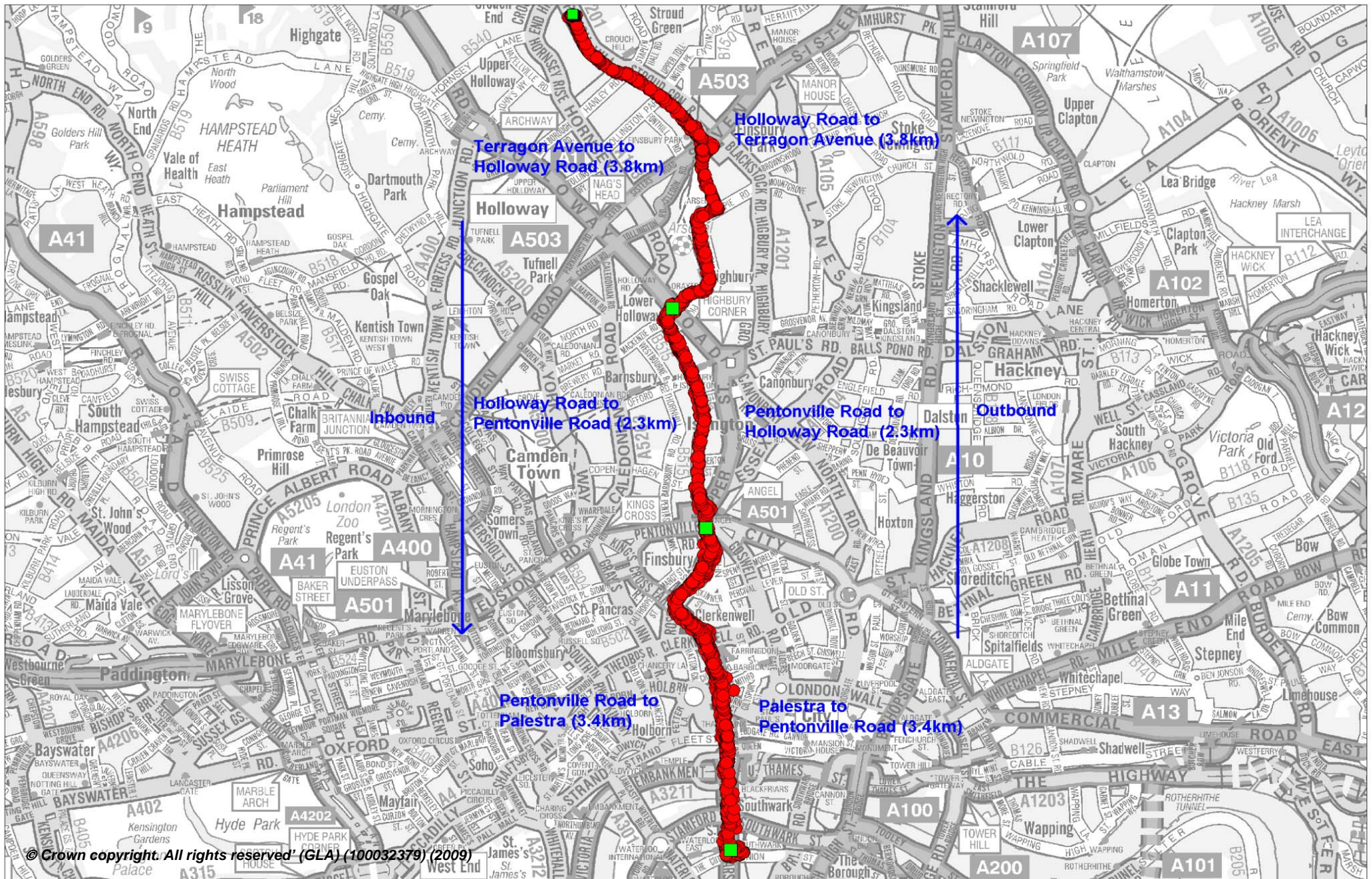


Table 3: Analysis of route Crouch End to Southwark

Direction	Run Date	Start Time	End Time	Tregaron Avenue to Holloway Road (3.8km)			Holloway Road to Pentonville Road (2.3km)			Pentonville Road to Palestra (3.4km)			Total (9.5 km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Inbound (am)	18.06	08:14	08:46	11	21	11	8	17	19	13	16	32	32	18
	19.06	09:04	09:32	10	23	10	7	20	17	11	19	28	28	20
	23.06	09:07	09:39	14	16	14	7	20	21	11	19	32	32	18
	24.06	09:04	09:32	10	23	10	6	23	16	12	17	28	28	20
	1.07	09:12	09:40	10	23	10	6	23	16	12	17	28	28	20
Summary			Mean Time	11.00	21.08	11.00	6.80	20.54	17.80	11.80	17.36	29.60	29.60	19.34
			Standard Deviation	1.73	2.83	1.73	0.84	2.46	2.17	0.84	1.21	2.19	2.19	1.39
Direction	Run Date	Start Time	End Time	Palestra to Pentonville Road (3.4km)			Pentonville Road to Holloway Road (2.3km)			Holloway Road to Tregaron Avenue (3.8km)			Total (9.5km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Outbound (pm)	17.06	18:22	18:51	12	17	12	7	20	19	11	21	30	30	19
	18.06	17:19	17:47	9	23	9	6	23	15	13	18	28	28	20
	20.06	18:31	19:00	13	16	13	7	20	20	9	25	29	29	20
	23.06	17:39	18:06	10	20	10	6	23	16	11	21	27	27	21
	25.06	19:05	19:32	10	20	10	6	23	16	11	21	27	27	21
	27.06	16:30	16:59	11	19	11	6	23	17	12	19	29	29	20
Summary			Mean Time	10.83	19.12	10.83	6.33	21.90	17.17	11.17	20.68	28.33	28.33	20.15
			Standard Deviation	1.47	2.55	1.47	0.52	1.70	1.94	1.33	2.62	1.21	1.21	0.86

4 Shepherds Bush to Southwark

- 4.1 The Shepherds Bush to Southwark route is 10.4km in length and is depicted in Figure 4 overleaf. The route begins by following the A4020 and A402 main roads (The Vale, Holland Park Avenue) requiring a crossing to be made of the busy West Cross Route. The mid section of the route cuts across three royal parks, Hyde Park, Green Park and St James's Park before crossing the River Thames at Westminster. The final stage of the route follows minor roads to the south of Waterloo Station to the destination in Southwark.
- 4.2 The results from this route are shown in Table 4. Although the route was only travelled three times outbound, the deviation for the total journey time was 0.58 (34 seconds). No deviation was evident at all for the Broad Walk to Ormiston Grove sector.
- 4.3 The standard deviation in time for total inbound journeys was 1.71 (1 minute 43 seconds) and for the outbound journey was 0.58 (35 seconds).
- 4.4 The highest sector standard deviation was experienced from Queen Victoria Memorial to Palestra inbound and the reverse outbound; this is despite being the shortest of the three sectors.

Figure 4: Breakdown of volunteer route Shepherds Bush to Southwark

Route Divider Points ■

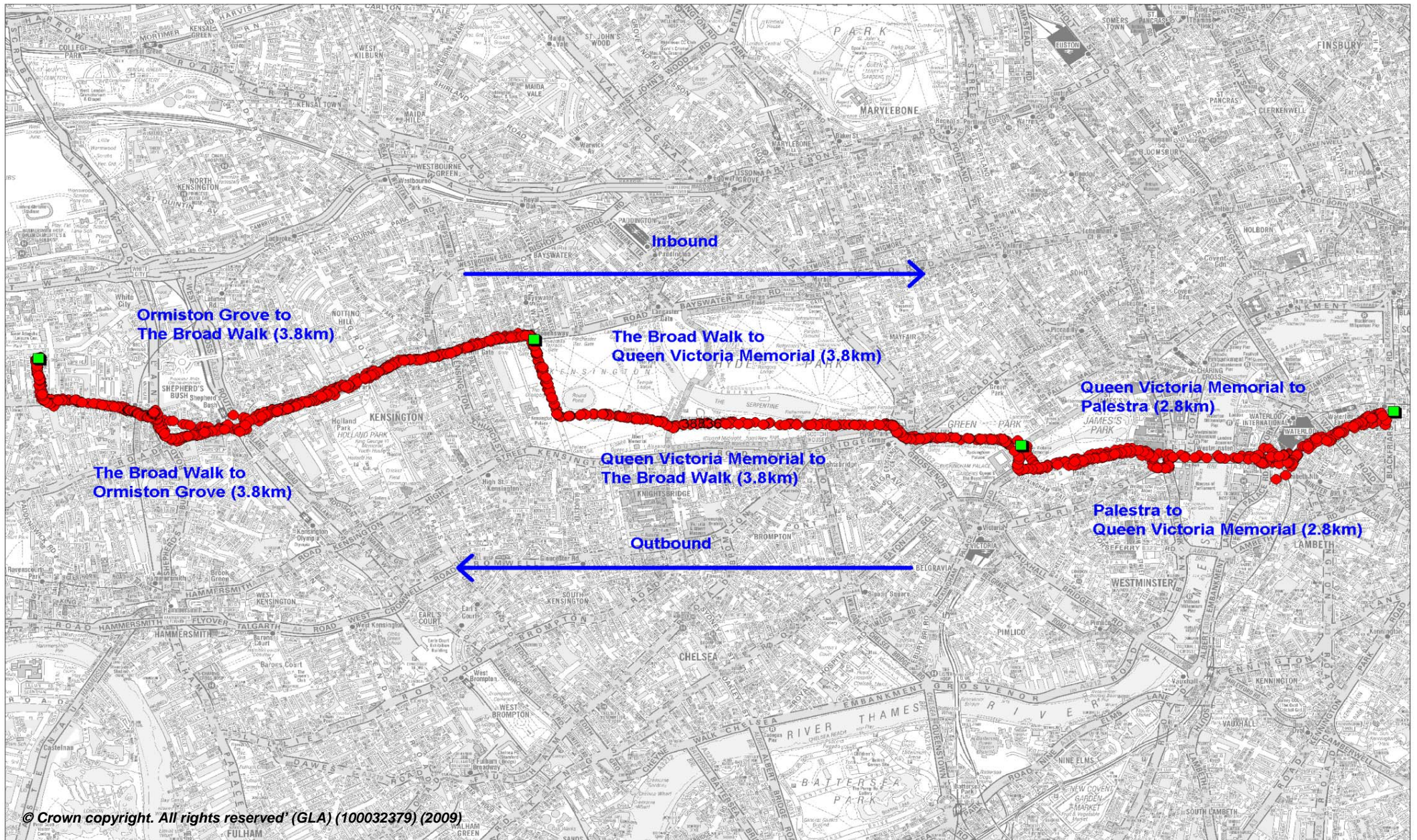


Table 4: Analysis of route Shepherds Bush to Southwark

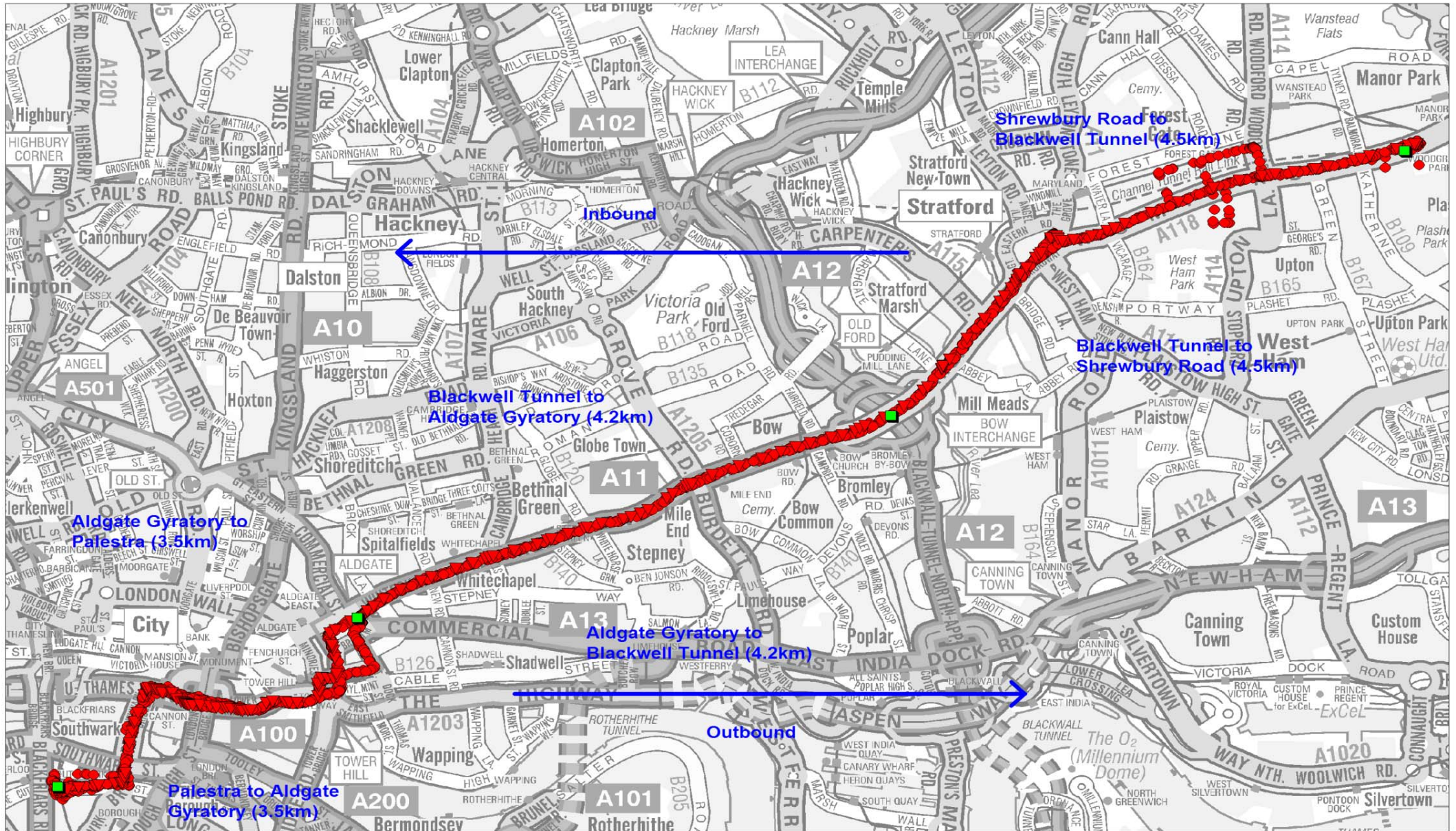
Direction Run Date Start Time End Time				Ormiston Grove to The Broad Walk (3.8km)			The Broad Walk to Queen Victoria Memorial (3.8km)			Queen Victoria Memorial to Palestra (2.8km)			Total (10.4 km)	
Inbound (am)				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
		16.06.08	08:44	09:22	16	14	16	12	19	28	10	17	38	38
	17.06.08	07:59	08:35	15	15	15	11	21	26	10	17	36	36	16
	01.07.08	08:32	09:09	15	15	15	11	21	26	11	15	37	37	15
	02.07.08	08:26	09:06	17	13	17	11	21	28	12	14	40	40	14
Summary			Mean Time	15.75	14.52	15.75	11.25	20.30	27.00	10.75	15.72	37.75	37.75	15.12
			Standard Deviation	0.96	0.86	0.96	0.50	0.86	1.15	0.96	1.35	1.71	1.71	0.67
Direction Run Date Start Time End Time				Palestra to Queen Victoria Memorial (2.8km)			Queen Victoria Memorial to The Broad Walk (3.8km)			The Broad Walk to Ormiston Grove (3.8km)			Total (10.4km)	
Outbound (pm)				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
		16.06.08	18:36	19:15	12	14	12	13	18	25	14	16	39	39
	30.06.08	18:53	19:31	10	17	10	14	16	24	14	16	38	38	15
	07.07.08	19:05	19:44	11	15	11	14	16	25	14	16	39	39	15
Summary			Mean Time	11.00	15.36	11.00	13.67	16.70	24.67	14.00	16.29	38.67	38.67	14.74
			Standard Deviation	1.00	1.40	1.00	0.58	0.72	0.58	0.00	0.00	0.58	0.58	0.22

5 Manor Park to Southwark

- 5.1 The Manor Park to Southwark route is 12.2km in length and is depicted in Figure 5 opposite. This route, with the exception of the final 150m, is entirely situated on the main road network. Beginning in Manor Park on the A118, the route follows the A11 and Lower Thames Street, before crossing the River Thames at Southwark Bridge and following Blackfriars Bridge Road to the destination in Southwark.
- 5.2 The results from this route are shown in Table 5. The shortest sector, Aldgate Gyratory to Palestra and its reverse journey can be seen to be the slowest of the three sectors. The outbound sector also showed the least variation between trips (based on 8 runs), with a standard deviation of 0.89 (53 seconds).
- 5.3 The outbound total time deviation was affected by an external factor during the run on 1st August. This resulted in the outbound standard deviation increasing to 3.15 (3 minutes 9 seconds).
- 5.4 There was a variation of 2 minutes 8 seconds between total times on inbound journeys.

Figure 5: Breakdown of Volunteer route Manor Park to Southwark

■ Route Divider Points



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Table 5: Analysis of route Manor Park to Southwark

Direction	Run Date	Start Time	End Time	Shrewbury Road to Blackwell Tunnel (4.5km)			Blackwell Tunnel to Aldgate Gyratory (4.2km)			Aldgate Gyratory to Palestra (3.5km)			Total (12.2 km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Inbound (am)	25.07	07:21	07:56	11	25	11	10	25	21	14	15	35	35	21
	30.07	07:17	07:50	11	25	11	9	28	20	13	16	33	33	22
	1.08	07:25	08:04	14	19	14	11	23	25	14	15	39	39	19
	4.08	07:21	07:57	12	23	12	11	23	23	13	16	36	36	20
	8.08	07:21	07:59	12	23	12	13	19	25	13	16	38	38	19
	11.08	07:26	08:01	11	25	11	11	23	22	13	16	35	35	21
	13.08	07:13	07:47	11	25	11	11	23	22	12	18	34	34	22
Summary			Mean Time	11.71	23.21	11.71	10.86	23.46	22.57	13.14	16.02	35.71	35.71	20.56
			Standard Deviation	1.11	1.98	1.11	1.21	2.63	1.90	0.69	0.85	2.14	2.14	1.21
Direction	Run Date	Start Time	End Time	Palestra to Aldgate Gyratory (3.5km)			Aldgate Gyratory to Blackwell Tunnel (4.2km)			Blackwell Tunnel to Shrewbury Road (4.5km)			Total (12.2km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time	Average Speed
Outbound (pm)	24.07	17:24	18:02	11	19	11	11	23	22	16	17	38	38	19
	25.07	17:21	17:55	12	18	12	10	25	22	12	23	34	34	22
	30.07	17:20	17:59	13	16	13	11	23	24	15	18	39	39	19
	1.08	17:18	18:00	12	18	12	10	25	22	20	14	42	42	17
	4.08	17:23	18:01	12	18	12	11	23	23	15	18	38	38	19
	7.08	17:35	18:07	10	21	10	10	25	20	12	23	32	32	23
	8.08	17:25	18:00	12	18	12	11	23	23	12	23	35	35	21
11.08	17:23	17:59	12	18	12	11	23	23	13	21	36	36	20	
Summary			Mean Time	11.75	17.97	11.75	10.63	23.77	22.38	14.38	19.33	36.75	36.75	20.05
			Standard Deviation	0.89	1.46	0.89	0.52	1.19	1.19	2.77	3.29	3.15	3.15	1.72

route changed due to police cordon

6 Thamesmead to Victoria

- 6.1 The Thamesmead to Victoria route is 19.0km in length and depicted in Figure 6 overleaf. The route begins in Thamesmead and follows the main A206 all the way to Deptford, crossing the busy junction with the Blackwall Tunnel Approach Road on the way. From Deptford the route follows minor and residential roads through Millwall, crossing the A2 and passing to the south of the Elephant and Castle junction. The route crosses the River Thames at Lambeth Bridge and follows further minor roads to the destination in Victoria.
- 6.2 The results from this route are shown in Table 6. The average time for the inbound journey was 1 hour 6 minutes and 40 seconds, with a deviation of 2 minutes and 48 seconds between the six times that the volunteer travelled the route on the inbound direction.
- 6.3 The average total journey time for the outbound was a little longer than that of the inbound. The 1 hour 8 minutes and 30 seconds was rode at an average speed of 16.4km per hour. The standard deviation between the six times that the volunteer travelled the route was 3.62 (3 minutes 47 seconds).
- 6.4 Blackwall Tunnel Southern Approach to Harrier Mews sector and its reverse journey was the longest section. The 5.7km had an approximate journey time of 20 minutes in both directions. The deviation between all trips on sector 1 on the outbound was 38 seconds and for the inbound on sector 4 1 minute 3 seconds.

Figure 6: Breakdown of volunteer route Thamesmead to Victoria

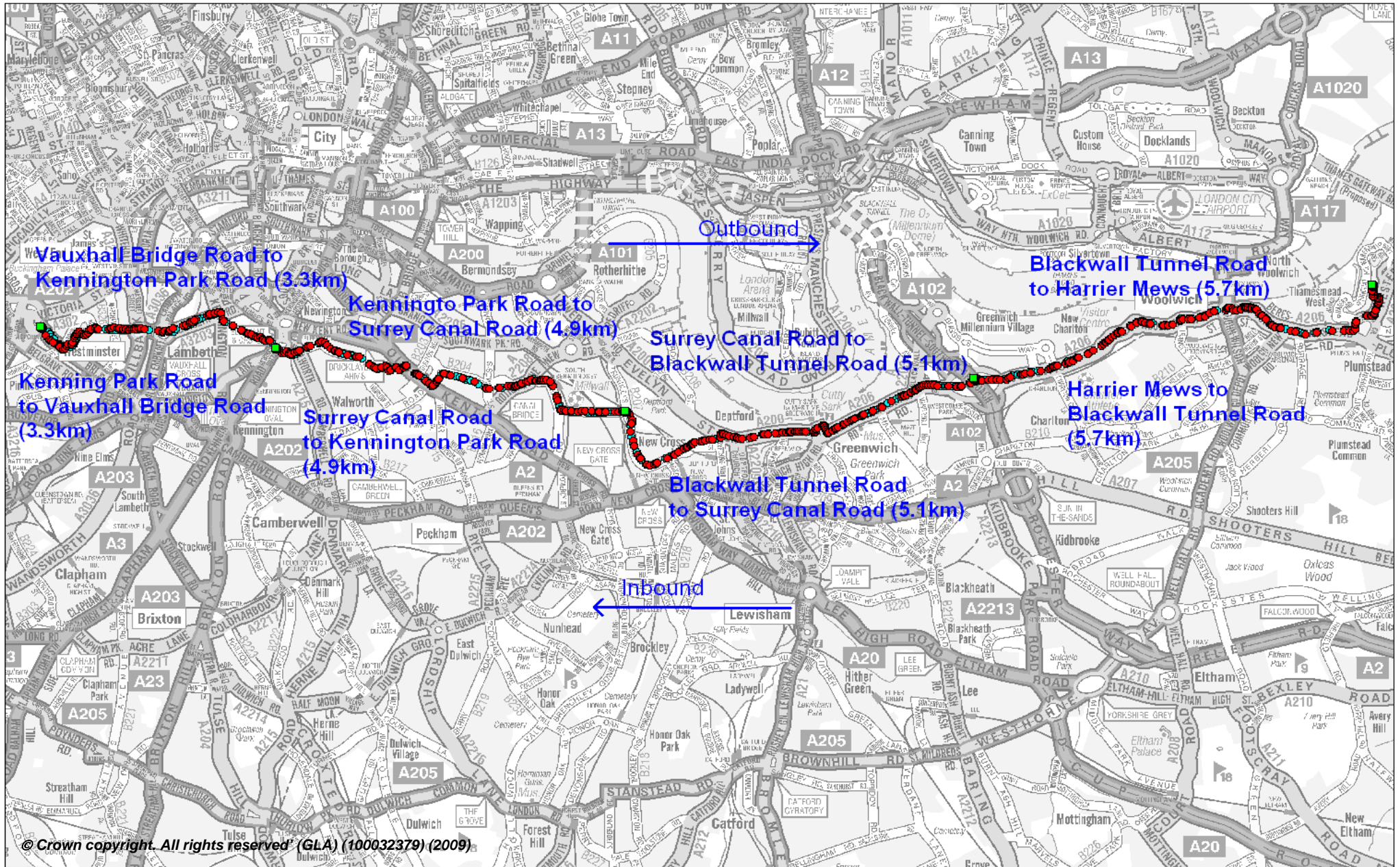


Table 6: Analysis of route Thamesmead to Victoria

				Vauxhall Bridge Road to Kennington Park Road (3.3km)			Kennington Park Road to Surrey Canal Road (4.9km)			Surrey Canal Road to Blackwall Tunnel Southern Approach (5.1km)			Blackwall Tunnel Southern Approach to Harrier Mews (5.7km)			Total (19km)	
Outbound (pm)	Run Date	Start Time	End Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
		31.03.08	16:55	18:05	14	14	14	17	17	31	19	16	50	20	17	70	70
	2.04.08	17:30	18:39	14	14	14	20	15	34	15	20	49	20	17	69	69	17
	3.04.08	17:43	18:52	14	14	14	15	20	29	17	18	46	22	16	68	68	17
	4.04.08	18:06	19:09	11	18	11	18	16	29	15	20	44	19	18	63	63	18
	7.04.08	16:28	17:34	14	14	14	16	18	30	15	20	45	21	16	66	66	17
	8.04.08	16:55	17:59	12	17	12	15	20	27	17	18	44	20	17	64	64	18
Summary			Mean Time	13.17	15.18	13.17	16.83	17.65	30.00	16.33	18.88	46.33	20.33	16.86	66.67	66.67	17.13
			Standard Deviation	1.33	1.67	1.33	1.94	1.93	2.37	1.63	1.80	2.58	1.03	0.84	2.80	2.80	0.73
				Harrier Mews to Blackwall Tunnel Southern Approach (5.7)			Blackwall Tunnel Southern Approach to Surrey Canal Road (5.1)			Surrey Canal Road to Kennington Park Road (4.9km)			Kennington Park Road to Vauxhall Bridge Road (3.3km)			Total (19km)	
Inbound (am)	Run Date	Start Time	End Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
		2.04.08	08:51	10:02	21	16	21	17	18	38	19	15	57	14	14	71	71
	3.04.08	09:04	10:07	20	17	20	15	20	35	16	18	51	12	17	63	63	18
	4.04.08	09:17	10:22	20	17	20	16	19	36	15	20	51	14	14	65	65	18
	7.04.08	08:49	10:01	20	17	20	17	18	37	18	16	55	17	12	72	72	16
	8.04.08	07:48	08:58	20	17	20	17	18	37	18	16	55	15	13	70	70	16
	9.04.08	09:04	10:14	19	18	19	17	18	36	17	17	53	17	12	70	70	16
Summary			Mean Time	20.00	17.11	20.00	16.50	18.59	36.50	17.17	17.23	53.67	14.83	13.55	68.50	68.50	16.68
			Standard Deviation	0.63	0.54	0.63	0.84	1.00	1.05	1.47	1.52	2.42	1.94	1.83	3.62	3.62	0.91

7 Colliers Wood to Victoria

- 7.1 The Colliers Wood to Victoria route is 9.6km in length and depicted in Figure 7 opposite. The route follows the main A24 all the way from the start in Colliers Wood, before crossing Clapham Common and then following B class roads to cross the River Thames at Chelsea Bridge and then continuing along B roads to Victoria.
- 7.2 The results from this route are shown in Table 7, with little difference between the total journey time for the inbound and outbound directions evident. The standard deviation for the total time on the inbound direction was 1.13; equivalent to 1 minute 8 seconds. The standard deviation for the outbound was 0.89 (53 seconds).
- 7.3 For sectors two and three on the outbound direction the deviation between all 8 trips was 28 seconds.
- 7.4 The outbound trips start times spanned across the entire pm peak; however, this did not affect the length of total journey times. Therefore, it is apparent that journey time is not dependant on start time.

Figure 7: Breakdown of volunteer route Colliers Wood to Victoria

Route Divider Points ■

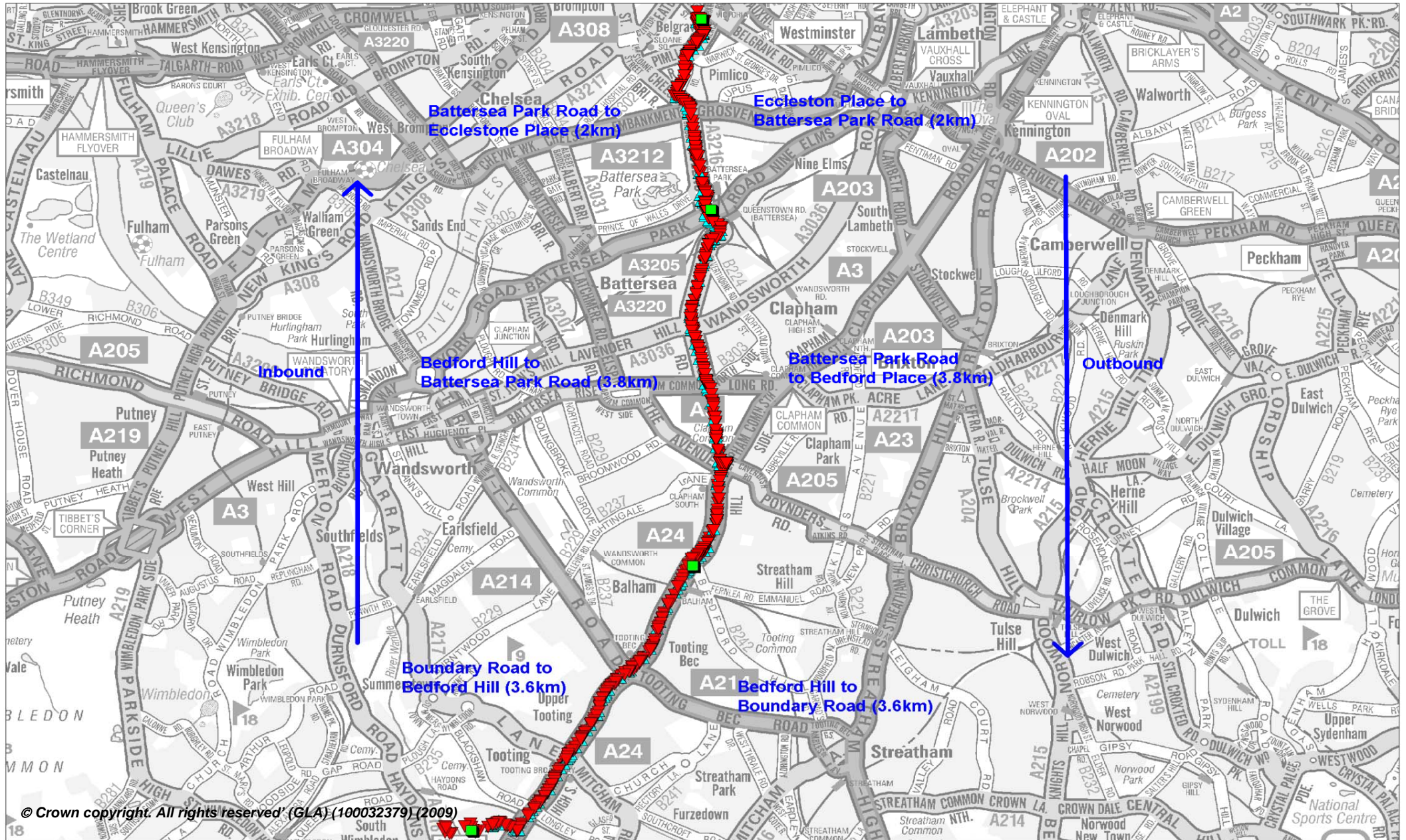


Table 7: Analysis of route Colliers Wood to Southwark

				Boundary Road to Bedford Hill (3.6km)			Bedford Hill to Battersea Park Road (3.8km)			Battersea Park Road to Eccleston Place (2.0km)			Total (9.4 km)	
	Run Date	Start Time	End Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
	Inbound (am)	16.06.08	07:48	08:19	14	15	14	10	23	24	7	17	31	31
17.06.08		07:49	08:20	14	15	14	11	21	25	6	20	31	31	18
18.06.08		08:31	09:01	11	20	11	13	18	24	6	20	30	30	19
19.08.08		07:49	08:20	11	20	11	10	23	21	10	12	31	31	18
23.06.08		07:49	08:18	11	20	11	11	21	22	7	17	29	29	19
24.06.08		07:18	07:46	11	20	11	10	23	21	7	17	28	28	20
25.06.08		07:53	08:23	12	18	12	11	21	23	7	17	30	30	19
26.06.08		07:58	08:27	10	22	10	11	21	21	8	15	29	29	19
Summary			Mean Time	11.75	18.63	11.75	10.88	21.11	22.63	7.25	16.95	29.88	29.88	18.90
			Standard Deviation	1.49	2.20	1.49	0.99	1.77	1.60	1.28	2.59	1.13	1.13	0.72
				Eccleston Place to Battersea Park Road (2.0km)			Battersea Park Road to Bedford Hill (3.8km)			Bedford Hill to Boundary Road (3.6km)			Total (9.4km)	
	Run Date	Start Time	End Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
	Outbound (pm)	16.06.08	19:18	19:49	6	20	6	12	19	18	11	20	29	29
17.06.08		17:01	17:32	8	15	8	11	21	19	11	20	30	30	19
18.06.08		17:14	17:45	8	15	8	12	19	20	11	20	31	31	18
19.06.08		16:59	17:30	8	15	8	12	19	20	11	20	31	31	18
23.06.08		19:20	19:49	7	17	7	12	19	19	10	22	29	29	20
24.06.08		18:33	19:03	7	17	7	12	19	19	11	20	30	30	19
25.06.08		17:49	18:18	7	17	7	12	19	19	10	22	29	29	20
26.06.08		18:39	19:07	7	17	7	11	21	18	11	20	29	29	20
Summary			Mean Time	7.25	16.70	7.25	11.75	19.43	19.00	10.75	20.13	29.75	29.75	19.17
			Standard Deviation	0.71	1.70	0.71	0.46	0.80	0.76	0.46	0.91	0.89	0.89	0.56

8 Balham to St James's Park

- 8.1 The route from Balham to St James's Park is 7.6km in length and depicted in Figure 8 overleaf. The route begins by following residential roads, crossing Clapham Common and the following B roads to the River Thames, crossing over at Chelsea Bridge. Thereafter the route passes over minor roads until the destination in St James's Park.
- 8.2 The results from this route are shown in Table 8. Average inbound journey time was 27 minutes. There was a deviation of 1 minute and 35 seconds between the 5 times that the volunteer travelled the route on the inbound direction.
- 8.3 The average total journey time for the outbound was a little longer than that of the inbound. The route was rode at an average speed of 16.3km per hour. The standard deviation between the 4 times that the volunteer travelled the route was 1.83 (1 minute 50 seconds).
- 8.4 The outbound trips start times ranged from 15:37 to 18.08. However, the different start times did not affect the total time for the volunteer to ride the entire route.

Figure 8: Breakdown of volunteer route Balham to St James's Park

Route Divider Points

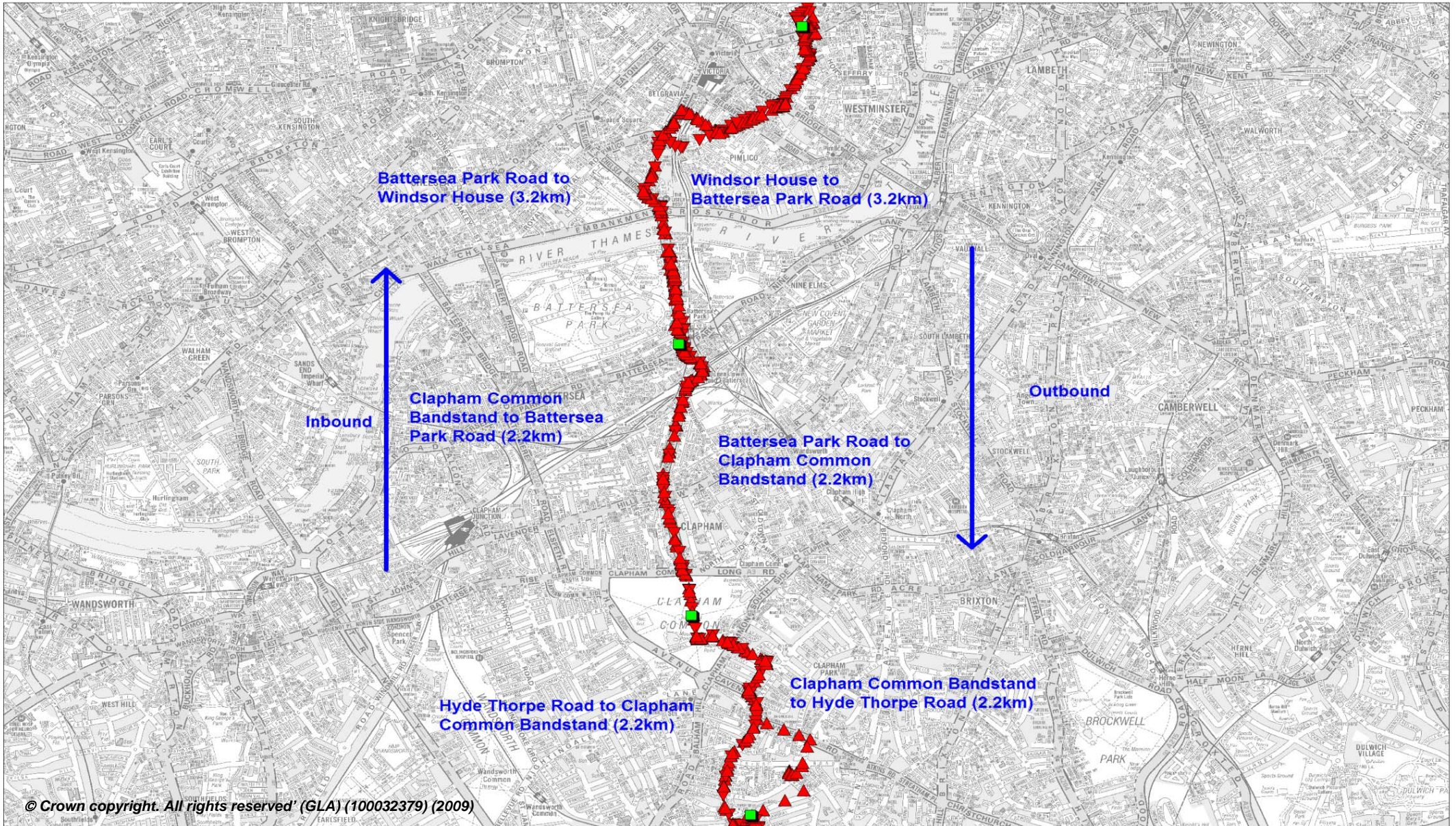


Table 8: Analysis of route Balham to St James's Park

Direction		Run Date	Start Time	End Time	Hyde Thorpe Road to Clapham Common Bandstand (2.2km)			Clapham Common Bandstand to Battersea Park Road (2.2km)			Battersea Park Road to Windsor House (3.2km)			Total (7.6 km)	
					Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Inbound (am)	7.07	08:28	08:54	8	17	8	8	17	16	10	19	26	26	18	
	9.07	07:36	08:04	6	22	6	9	15	15	13	15	28	28	16	
	15.07	08:35	09:04	10	13	10	9	15	19	10	19	29	29	16	
	16.07	08:46	09:11	6	22	6	7	19	13	12	16	25	25	18	
	17.07	06:26	06:53	7	19	7	6	22	13	14	14	27	27	17	
Summary				Mean Time	7.40	18.51	7.40	7.80	17.34	15.20	11.80	16.58	27.00	27.00	16.94
				Standard Deviation	1.67	3.77	1.67	1.30	3.12	2.49	1.79	2.53	1.58	1.58	0.99
Direction		Run Date	Start Time	End Time	Windsor House to Battsea Park Road (3.2km)			Battersea Park Road to Clapham Common Bandstand (2.2km)			Clapham Common Bandstand to Hyde Thorpe Road (2.2km)			Total (7.6km)	
					Time (min)	Average Speed	Elapsed Time	Time (min)	Average Speed	Elapsed Time	Time (min)	Average Speed	Elapsed Time	Total Time	Average Speed
Outbound (pm)	8.07	17:03	17:32	11	17	11	10	13	21	9	15	30	30	15	
	9.07	16:12	16:41	13	15	13	7	19	20	9	15	29	29	16	
	15.07	16:37	16:04	11	17	11	7	19	18	9	15	27	27	17	
	16.07	18:08	18:34	12	16	12	7	19	19	7	19	26	26	18	
Summary				Mean Time	11.75	16.42	11.75	7.75	17.44	19.50	8.50	15.71	28.00	28.00	16.34
				Standard Deviation	0.96	1.30	0.96	1.50	2.83	1.29	1.00	2.10	1.83	1.83	1.07

9 Pratt's Bottom to Orpington

- 9.1 The Pratt's Bottom to Orpington route is 7.6km in length and is depicted in Figure 9 opposite. The route begins along a short section of rural roads before following the main A21 and then the A223 to Orpington High Street. The route then traverses the traffic free High Street before rejoining the main road network to follow the A224 northwards to the destination in St Mary Cray.
- 9.2 The results for this route are shown in Table 9. In general, the outbound journey times were much longer than the inbound journeys. The outbound journey times are higher in each of the sectors. The average journey time inbound was 21 minutes 33 seconds, this is compared to 30 minutes 38 seconds outbound.
- 9.3 The average speeds were slower in the outbound than the inbound. The total average speed for the inbound journeys was 21km per hour, this is compared to 15km per hour in the outbound.
- 9.4 The standard deviation for the 9 inbound journeys was 1.42 (1 minute 25 seconds), the standard deviation for 8 outbound trips was 2.56 (2 minutes 34 seconds).
- 9.5 The Pratt's Bottom to Orpington volunteer start time varied on each day travel day. This had little impact on the total time. An example of this can be seen on the outbound trips on the 11th July 2008 and on the 16th July 2008, where both trips were 30 minutes in length, despite one starting at 15:21 and the other at 17:19.

Figure 9: Breakdown of volunteer route Pratt's Bottom to Orpington

Route Divider Points ■

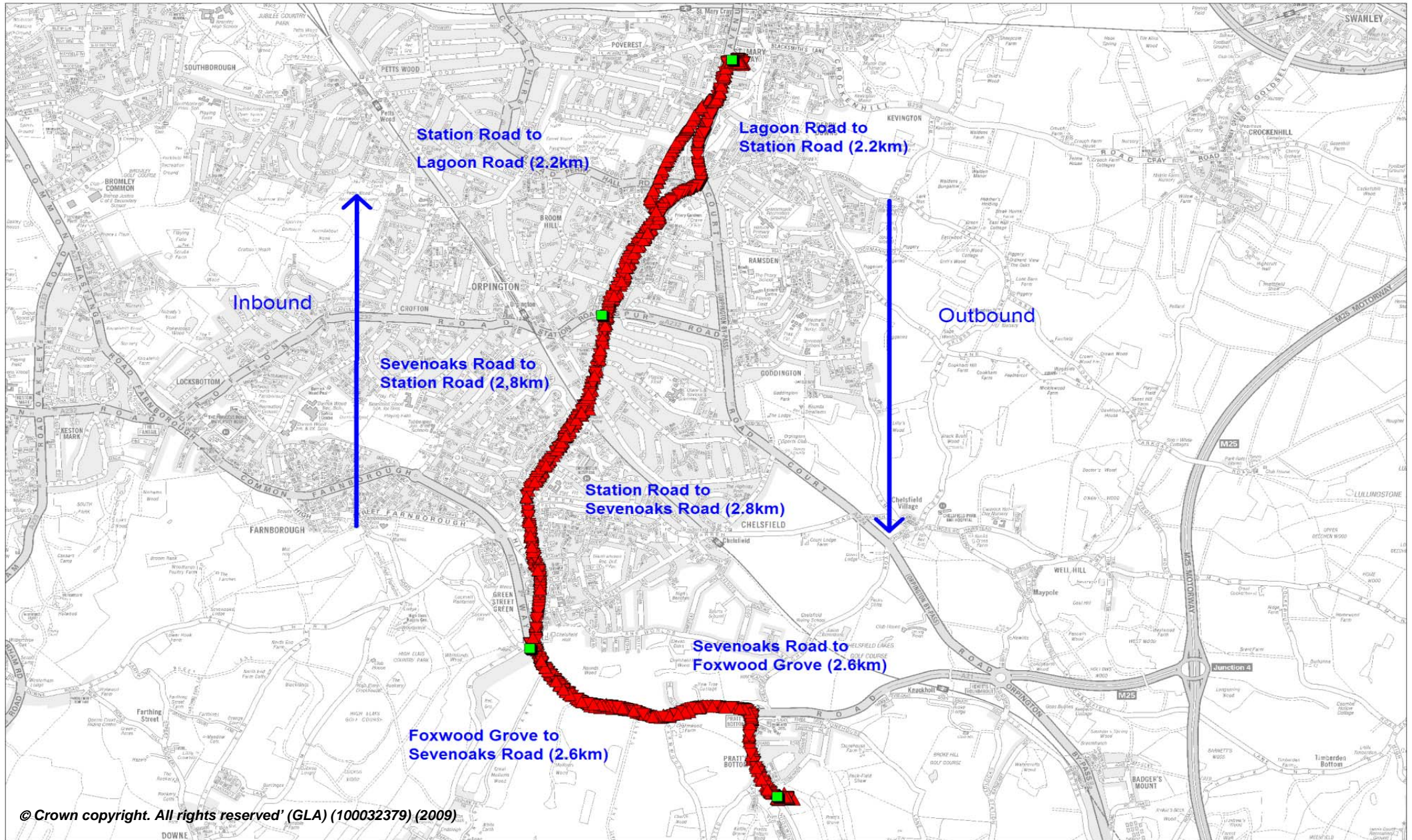


Table 9: Analysis of route Pratt's Bottom to Orpington

Direction	Run Date	Start Time	End Time	Foxwood Grove to Sevenoaks Road (2.6km)			Sevenoaks Road to Station Road (2.8km)			Station Road to Lagoon Road (2.2km)			Total (7.6 km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Inbound (am)	7.07	07:14	07:35	7	22	7	7	24	14	7	19	21	21	22
	8.07	07:15	07:36	6	26	6	7	24	13	8	17	21	21	22
	9.07	07:17	07:38	6	26	6	7	24	13	8	17	21	21	22
	10.07	07:18	07:40	6	26	6	8	21	14	8	17	22	22	21
	11.07	07:15	07:36	6	26	6	7	24	13	8	17	21	21	22
	16.07	09:30	09:52	6	26	6	7	24	13	9	15	22	22	21
	17.07	09:29	09:54	8	20	8	7	24	15	10	13	25	25	18
	18.07	09:33	09:53	6	26	6	7	24	13	7	19	20	20	23
	21.07	07:33	07:54	6	26	6	7	24	13	8	17	21	21	22
Summary	Mean Time			6.33	24.87	6.33	7.11	23.67	13.44	8.11	16.45	21.56	21.56	21.23
	Standard Deviation			0.71	2.36	0.71	0.33	1.00	0.73	0.93	1.78	1.42	1.42	1.28
Direction	Run Date	Start Time	End Time	Lagoon Road to Station Road (2.2km)			Station Road to Sevenoaks Road (2.8km)			Sevenoaks Road to Foxwood Grove (2.6km)			Total (7.6km)	
				Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Time (min)	Average Speed (km/h)	Elapsed Time	Total Time (min)	Average Speed (km/h)
Outbound (pm)	04.07.08	16:27	16:59	11	17	11	11	15	22	10	16	32	32	14
	07.07.08	15:21	15:51	9	21	9	11	15	20	10	16	30	30	15
	08.07.08	15:29	15:57	9	21	9	10	17	19	9	17	28	28	16
	10.07.08	15:21	15:49	9	21	9	10	17	19	9	17	28	28	16
	11.07.08	15:21	15:51	9	21	9	11	15	20	10	16	30	30	15
	16.07.08	17:19	17:49	8	24	8	10	17	18	12	13	30	30	15
	17.07.08	17:20	17:51	9	21	9	9	19	18	13	12	31	31	15
	18.07.08	17:15	17:51	16	12	16	10	17	26	10	16	36	36	13
Summary	Mean Time			10.00	20.02	10.00	10.25	16.46	20.25	10.38	15.26	30.63	30.63	14.97
	Standard Deviation			2.56	3.69	2.56	0.71	1.17	2.66	1.41	1.88	2.56	2.56	1.17

10 Cycle Journey Times - Conclusion

10.1 The above analysis has shown that cycle journey times are relatively constant. Standard deviation can be seen in Table 10 to only exceed 3 on two occasions in the 16 route journeys. The first was on the outbound of Route 4 Manor Park to Southwark, when a police diversion changed the volunteer's route. The second time was on the outbound of Route 5 Thamesmead to Victoria, a journey which was over 1 hour and 8 minutes long and 19km in distance. The remaining 14 routes displayed standard deviation in journey times from 0.58 (on a 38 minute journey) to 2.8 (on a 1 hour 7 minute journey). This shows that cycling offers consistency and reliability in journey times.

Table 10: Summary of all routes

		Average Time	Standard Deviation	% Deviation	Seconds deviation
Route 1	Inbound	20.67	1.66	8.0	100
	Outbound	27.57	2.53	9.8	152
Route 2	Inbound	29.60	2.19	7.4	131
	Outbound	28.33	1.21	4.3	73
Route 3	Inbound	37.75	1.71	4.5	103
	Outbound	38.67	0.58	1.5	35
Route 4	Inbound	35.71	2.14	6.0	68
	Outbound	36.75	3.15	8.6	189
Route 5	Inbound	66.67	2.80	4.2	108
	Outbound	68.50	3.62	5.3	217
Route 6	Inbound	29.88	1.13	3.8	68
	Outbound	29.75	0.89	3.0	53
Route 7	Inbound	27.00	1.58	5.8	95
	Outbound	28.00	1.83	6.5	110
Route 8	Inbound	21.56	1.42	6.6	85
	Outbound	30.63	2.56	8.4	154

10.2 Using Route 6 Colliers Wood to Victoria as a detailed example; the same 9.4km outbound journey was completed on 9 separate occasions and the variation between all those journeys was 53 seconds on a journey time of 30 minutes. Route 8, Pratt's Bottom to Orpington inbound journey was travelled 9 times with an average time of 21 minutes 34 seconds, deviation from this time on the 9 journeys was 1 minute 25 seconds.

10.3 The analysis of each volunteer's route has illustrated that time of day does not have an influence on overall journey time. Route 7 Balham to St. James's Park is one example; where an am journey leaving Balham at 06.26 does not stand out as an anomaly against other am journeys leaving at 7 o'clock or 8 o'clock.

10.4 The above analysis has shown that journey times are very consistent per rider, and far more independent of traffic conditions than larger vehicles such as cars. Cyclists do not travel in the main traffic stream and therefore avoid the main barriers (barring signals) that other road users face.

11 GPS Technology

- 11.1 The GPS devices (transponders) used in this study have proven to be an effective method for recording cycle journey times from which average journey times and journey time variability for individual cyclists can be obtained. However, they require each cyclist to carry a transponder, so the sample is generally restricted to a small number of volunteers. The GPS device is simple to use, as the volunteer has only to switch on the device at the beginning of the journey and switch off at the end. The analysis is also straight forward as the information can be downloaded directly into Microsoft Excel.
- 11.2 The previously used method in recording cycle journey times requires observers to stand at fixed timing points along a route, recording the time each cyclist passes the timing point and identifying characteristics of the cyclist. This method has the benefit that it can record all, or a large sample of, cyclists using a specific route. However, the main problem with this method is the identification of each cyclist, which is done by recording the colour of the cyclist's helmet, jacket and cycle frame, and the subsequent matching. Complete matches, used to confirm that a cyclist has passed two consecutive timing points, are often few in number due to the difficulty in describing, for example, the colour of a cyclist's helmet (which may be multi-coloured). In addition, many cyclists turn on or off the route being monitored further reducing the number of matches.
- 11.3 The analysis of each volunteer's route illustrates that time of day does not have an influence on overall journey time. Route 7 Balham to St. James's Park is one example; where an am journey leaving Balham at 06.26 does not stand out as an anomaly against other am journeys leaving at 7 o'clock or 8 o'clock.
- 11.4 The previous used method would provide a larger sample of recorded journey times, if the matching could be improved, enabling a better average journey time and journey time variability across all cyclists to be calculated.
- 11.5 Further work is required to compare the two methodologies, identifying their strengths and weaknesses, in order to recommend which type of survey should be used for different circumstances and data requirements.

12 Contacts for further information

- 12.1 If you require further information on this traffic note or have any other related queries please contact:

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13 Library of traffic notes

Other technical notes in the RNPR series include:

Technical notes

- ITIS – Validation Paper July 2005
- RNPR Technical Note 1 – ITIS Speed Survey Data
- RNPR Technical Note 2 – Traffic Delays in London on Weekdays, Saturdays and Sundays
- RNPR Technical Note 3 – Total vehicle delay for London
- RNPR Technical Note 4 - Validation of radar traffic monitoring equipment (published as an internal working document)
- RNPR Technical Note 6 - Validation of automatic traffic & cycle counters 2006 (published as an internal working document)

Traffic Notes

DfT NRTCC Counts

- RNPR Traffic Note 1 – Traffic levels on major roads in Greater London 1993-2007 (Published November 2008. Update with 2008 flows due in Autumn 2009)

TfL Automatic Traffic Counts

- RNPR Traffic Note 2 - Expansion factors for road traffic counts in London

TfL Cordon and Screenline Counts

- RNPR Traffic Note 3 – TfL Cordon and Screenlines 1975 to 2008
- RNPR Traffic Note 5 - Major and Minor traffic flows measured through TfL Cordon surveys

ITIS and Moving Observer Survey Data

- RNPR Traffic Note 4 – Traffic Speed in London 2003-2007 (Draft in preparation – publication date TBC)
- RNPR Traffic Note 6 – Traffic delays in the London Boroughs 2007 (published on LondonStreetWorks website)

Cycling

- RNPR Traffic Note 7 - Weather conditions and the levels of cycling on the TLRN
- RNPR Traffic Note 8 – Proportion of cyclists violating red lights
- RNPR Traffic Note 9 – Cycling trends in London
- RNPR Traffic Note 10 – TfL Pedestrian and Cycle Thames Screenline Surveys 2006-2007
- RNPR Traffic Note 11 – Cycling journey time reliability

14 Other useful documents

- Travel in London 2008 –
<http://www.tfl.gov.uk/assets/downloads/corporate/travel-in-london-report-number-1.pdf>
- Transport Statistics for Great Britain 2008 –
<http://www.dft.gov.uk/adobepdf/162469/221412/221546/226956/261695/roadstats08tsc.pdf>