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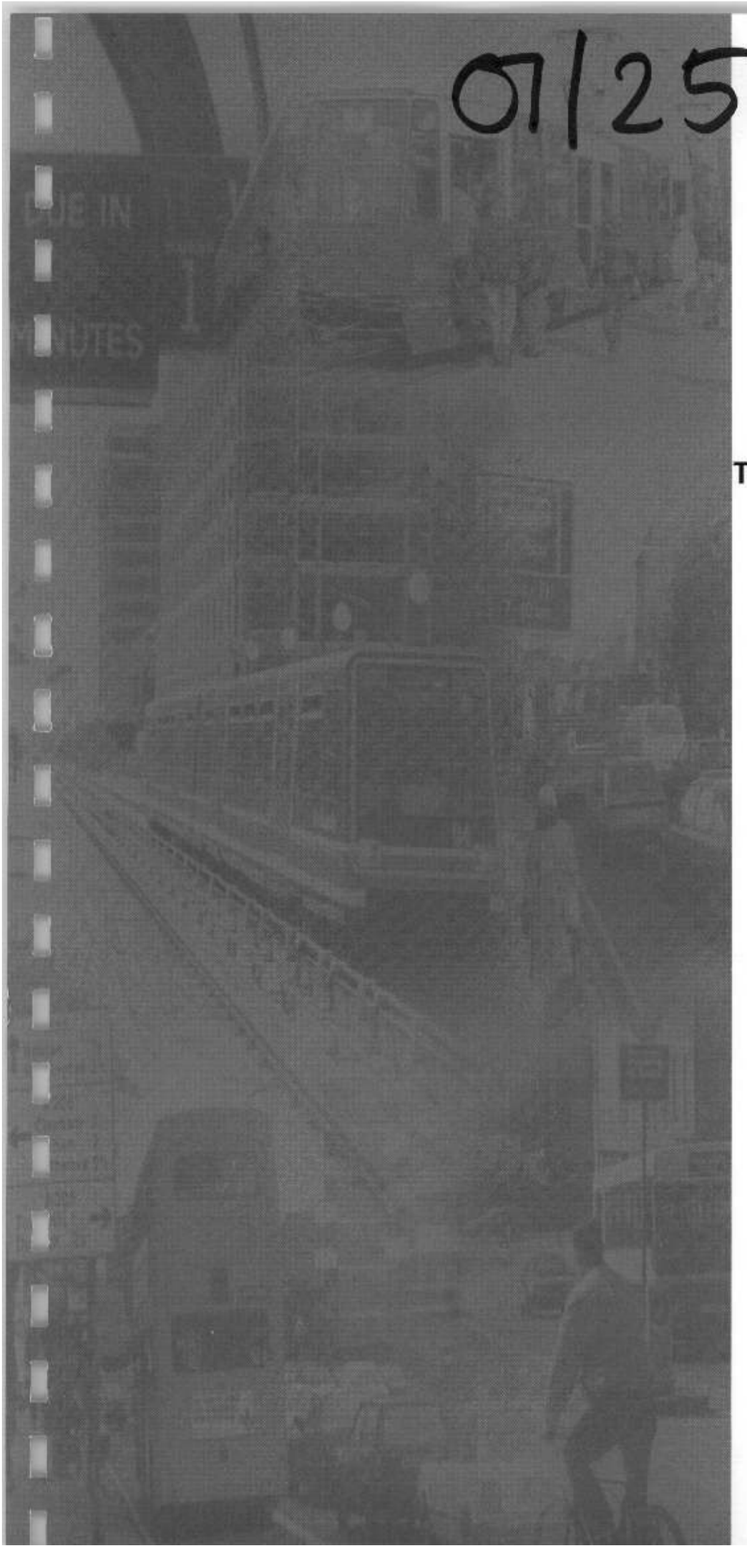

Twickenham Riverside Development

Traffic Impact and Parking Assessment

February 2002

Twickenham Riverside

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WS/Atkins

Berkshire House, 168-173 High Holborn, London, WC1V 7AA
Tel: (020) 7539 8033 Fax: (020) 7240 5037

Twickenham Riverside

Traffic Impact and Parking Assessment

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Appendices

1. Introduction

1.1 This report supports the transport assessment (dated September 2001) submitted for the Twickenham Riverside development. In particular it clarifies the following issues

- the traffic generation and impact on the surrounding highway network,
- parking demand and reserve capacity in off street car parks, and
- clarification of highway design issues

1.2 It must be emphasised that the original planning application did not propose to close the Embankment. Although there is an aspiration by the London Borough of Richmond to pedestrianise the Embankment (as sated in their UDP), it is not deemed necessary for the implementation of this development. Hence the new scheme has not been designed to compensate for the closure of this road, but has been designed to ensure that all additional traffic and the increase in parking can be accommodated within the town centre.

1.3 The final section of this report covers design issues, and discusses the amendments which have been made to the design, particularly along the service road.

2. Traffic Impact Assessment

TRAFFIC INCREASE ON KING STREET

2.1 The initial transport assessment showed the peak hour affect of traffic flows for different land use. To clarify the traffic growth the full details of the traffic impact TRAVL data from 7am to 12pm have been placed in a table, as shown in Appendix A

2.2 As agreed with the borough the TRAVL data provides a more realistic representation of similar development and land uses. TRAVL is a database that exists for London, where traffic surveys have been undertaken for various London developments. This data can then be sorted by location, land use, size and other specific site constraints, i.e. public transport accessibility.

2.3 The sites listed within the original transport assessment (Appendix C) were selected because of their similar size and a comparable Public Transport accessibility ratio.

CALCULATIONS

2.4 Traffic growth for the development and their impact on King Street has been calculated using the TRAVL data, by applying the trip rate factors for each hour of the day and the individual development land use.

2.5 A sub total of trips in, trips out and combined (in and out) trips has been generated for each land use, these totals were then combined to obtain an overall trip rate for each hour of the day as a result of all the new business.

2.6 This total was then manipulated by applying several factors to reach the final total given in passenger car units (PCU).

2.7 Firstly a 30% cross-visitation factor was applied to the restaurant total, this takes into account the vehicles which are making one trip into the town centre to visit more than one of the new facilities provided (i.e. people eating out before visiting the cinema).

2.8 The second factor to be applied was a reduction of 15% to all totals (except residential traffic), this factor takes into account the reduction in traffic now that local residents having these local amenities will not have to travel outside the town centre to visit the similar facilities that the development provides. Although 15% may seem a high this effectively equates to

- 4 trips (in and out) during the am peak,
- 9 trips during the midday peak, and
- 8 trips during the pm peak

2.9 Finally the total must be converted into passenger car units (PCU). A Passenger Car Unit (PCU) is a modelling tool to compare cars with buses, lorries etc.. For this development it was assumed that restaurant and retail units will have a split of 90% passenger traffic (cars) and 10% service traffic (vans, lorries).

2.10 A summary of the trips for each land use throughout the day is shown below in fig 2.1 and a full break down of each individual land use is enclosed in Appendix A.

Table 2.1 - Summary of Total Trips (In and Out)

Start Time	Residential	Cinema	Retail	Health Centre	Restaurant	Sub Total	Comments
7.00	9.20	0.00	8.71	23.99	0.00	41.91	
8.00	15.18	0.00	11.03	14.21	0.00	**40.41**	**am peak**
9.00	6.44	0.00	11.03	19.89	13.77	51.13	
10.00	5.98	0.00	27.64	20.84	12.08	66.53	
11.00	5.52	5.50	31.59	38.20	13.19	93.99	
12.00	6.44	11.00	37.99	28.41	14.82	**98.66**	**midday peak**
13.00	5.06	19.25	35.94	28.73	24.51	113.49	
14.00	7.36	27.50	32.68	37.57	22.46	127.57	
15.00	11.04	22.00	33.77	44.51	25.56	136.88	
16.00	11.04	22.00	18.65	36.62	22.76	111.07	
17.00	10.12	22.00	16.75	38.83	27.37	**115.06**	**pm peak**
18.00	16.56	22.00	18.52	44.20	20.13	121.41	
19.00	15.18	44.00	22.19	50.83	43.35	175.55	
20.00	12.42	60.50	16.88	27.15	70.02	186.97	
21.00	11.96	49.50	8.03	12.94	77.90	160.33	
22.00	7.36	33.00	0.00	17.05	58.88	116.28	
23.00	5.98	286.00	0.00	7.26	32.21	331.45	
Sub Total	**162.64**	**624.25**	**331.39**	**491.23**	**479.00**	**2088.70**	**total trips**
	162.64	**624.25**	**331.39**	**491.23**	**336.30**	**1945.80**	***minus 30% cross visitation**
	162.64	**530.61**	**281.68**	**417.54**	**285.00**	**1877.69**	****minus 15%**
	162.64	**624.25**	**295.76**	**491.23**	**299.25**	**1873.34**	*****total pcu's in and out**

**less 30% cross visitation has only been applied to restaurant trips. This takes into account the public who make one trip to the area and visit two facilities (i.e. eating out before visiting the cinema)*

***less 15% takes into account the decrease in outgoing traffic as local residents will no longer need to travel out of the town centre to visit the cinema, health centre etc.. This factor has not been applied to the residential car trips*

****PCU (passenger car units) cars have a unit of 1.0 and delivery lorries 1.5lt has been assumed that the restaurant and retail units will have a split of 90% passenger traffic and 10% service traffic*

2.11 Traffic flows along King Street are at their most critical (highest) during peak periods; 8-9am peak, and 5-6pm peak. During these periods of the day traffic flow is at its highest. The impact of the development will therefore focus on these periods of the day.

2.12 To calculate the impact of the development existing and proposed traffic flows on the two main King Street junctions have been considered. We have assumed that development traffic will be shared between these two junctions. This assumption is

based on the similarity of flows currently using both junctions and because there are no dominant movements. Furthermore to encourage the use of the available off street parking the car parks will have advance signing on the main approach roads to Twickenham. The location of the existing off street car parks in relation to the development (1 either side) further supports the assumed shared impact of traffic, on each of the main junctions.

Table 2.2 - Summary of Existing and Proposed Increase in Traffic Flow on King Street

Cross Deep/Heath Road/King Street Junction		**London Road/King Street/York Street/Water Lane Junction**	
AM Peak Hour (8-9am)		**AM Peak Hour (8-9am)**	
Existing Junction Flow	2589	Existing Junction Flow	2851
Development Flow	20	Development Flow	21
Total Predicted Flow	2609	Total Predicted Flow	2872
Percentage Increase	1%	Percentage Increase	1%
PM Peak Hour (5-6pm)		**PM Peak Hour (5-6pm)**	
Existing Junction Flow	2525	Existing Junction Flow	3267
Development Flow	58	Development Flow	59
Total Predicted Flow	2583	Total Predicted Flow	3326
Percentage Increase	2%	Percentage Increase	2%

2.13 The peak flow analysis shows that the increase in traffic on King Street is minimal. The worst case scenario is during the pm peak which runs between the hours of 5pm – 6pm with a total development trip rate of increase of 117 PCU's. When assigned to two junctions this figure is halved and accounts for just 2% of the total flow at the affected junction along King Street. This is illustrated by the peak hour flow diagrams enclosed in Appendix B.

2.14 The level of increase in traffic is minimal and would not be detrimental to existing traffic conditions along King Street. Modelling these impact flows could be carried out but given the size of the increase it is not deemed appropriate. Modelling software is purely a design tool and is not accurate to this degree of tolerance

2.15 A graphical representation of flows is shown in Appendix B.

2.16 We are not able to guarantee that development traffic will not drive around Water Lane, Embankment, and Wharf Lane searching for on-street parking spaces.

However, it is considered unlikely given that the following factors will deter and or encourage the use of off street parking

- The current demand for on-street spaces and high occupancy,
- The proposed information signing for the off street car parks, and
- The banned right turn exit from Wharf Lane into King Street restricting desired traffic movements

2.17 The existing parking problem on the Embankment is something that the borough needs to consider separately. The initial work and development of a Riverside Parking Strategy is still considered a step in the right direction but requires development and the resolution of a number of issues, to deliver the pedestrianisation of the Embankment.

3. Impact on Parking

ARRAGON ROAD AND HOLLY ROAD CAR PARKS

3.1 A 1-day survey was undertaken by WS Atkins of the reserve capacity in these two car parking buildings. It indicated that during a typical day there was always reserve capacity in both car parks with the minimum capacity being 28 spaces for Holly Road between 4 - 6pm and 156 spaces in Arragon Road between 2 – 4 pm. This generally agrees with the survey data collected by the LBRuT in March 2001.

3.2 Using the TRAVL trip data total trip rate flows have been calculated for each hour of the day from 7am to 11pm. The highest trip rate is between 8 - 9pm with 187 trips in total (this is the gross number of trips without any factors applied for cross visitation and or traffic reduction due to new local amenities). 187 trips is made up of 114 trips in and 73 trips out effectively giving a requirement of 41 parking spaces during this hour (114 - 73 = 41). This demand will easily be met by the two parking buildings which give a combined total of 509 available spaces during this time period. Table 2.3 below summarises the parking demand that will be generated by the new development.

Table 3.1 - Summary of parking demand from development

Start Time	trips in	trips out	extra parking spaces required	Comments
7.00	29.55	12.36	17	
8.00	20.64	19.78	**1**	**am peak**
9.00	34.47	16.66	18	
10.00	37.09	29.44	8	
11.00	54.24	39.75	14	
12.00	59.94	38.72	**21**	**mid peak**
13.00	68.64	44.85	24	
14.00	59.80	67.77	0	
15.00	71.72	65.16	7	
16.00	58.94	52.13	7	
17.00	54.37	60.83	**0**	**pm peak**
18.00	78.40	43.01	35	
19.00	102.57	72.98	30	
20.00	113.75	73.22	41	
21.00	78.71	86.99	0	
22.00	30.88	78.14	0	
23.00	26.37	94.32	0	

3.3 It must also be noted that the development has not been designed to encourage traffic as no extra car parking has been provided for the cinema, retail, restaurant and health centre facilities, the parking provided is solely for the use of residents. Therefore with no parking available, people will be less likely to travel by car and shift modes to use public transport.

CYCLE PARKING

3.4 Bicycle parking is provided at a rate of 1 per residential unit in the underground car park and 16 off the pedestrian link for the retail/residential use – equivalent to 1 per 75 sq/m.

3.5 It is envisaged that up to 32 additional bicycle parking spaces will be provided as part of the environmental improvements to the Embankment. These are indicated on the illustrative plans 0010/2-005 revD and 2-008.

4. Detailed Design Issues

SERVICE ROAD

4.1 The width of the service road has been kept to a minimum and at its narrowest point is only 3.0m wide. Although we agree that 3.0m is tight, it is adequate for a vehicle moving in a straight direction. Turning points at the entry and exit to the service road are have been widened to accommodate a 16.5 tonne artic.

4.2 The north eastern end of the service lane (where it meets Water Lane) has been widened by amending the alignment of the northern most kerb line.

4.3 The south western end of the service lane (where it meets Wharf Lane) has also been widened. Three changes were made to this intersection and are as follows:

- Retention of the tree on the south east side of the intersection and realigning this kerb;
- The realignment of the kerb on the north west side of the intersection; and
- Removal of a section of footpath on the south west side of Wharf Lane.

4.4 These changes will still allow adequate room on the pedestrian footway to the north east side of Wharf Lane. Drawings showing these changes are attached in Appendix C (Revised Figure 3.5 from original transport assessment).

4.5 The narrow width across the central point of the service road has been designed specifically for pedestrians. This width combined with the raised carriageway will slow traffic, making safer crossing for pedestrians. The point raised by the inspector (being: that because of the feature paving and raised carriageway the pedestrians would not be expecting traffic) may be true; however as mentioned above the raised and narrowed carriageway will slow traffic and will also make drivers aware of the increased pedestrian presence, providing a safe crossing point for pedestrians. Tactile paving and street furniture developed at detailed design stage will emphasise the conflict to pedestrians.

4.6 The gradient at the north eastern end of the service road has been reviewed The new design incorporates a gradient of 1:20 from Water lane to the beginning of the western most loading bay and a gradient of 1:40 along the length of the loading bay, design drawings are attached in Appendix D.

4.7 A shared pedestrian footway will be added (at final detailed design stage) to the south side of the service road within the loading bay at the car park entrance. This footway will be paved with a lowered kerb to allow service vehicles to park in this area when necessary.

ACCESS AND EGRESS ONTO KING STREET

4.8 Right turns from Wharf Lane to King Street are currently banned, however in order to further enforce this banned movement a central island on King Street will be positioned to physically prevent this turn.

DISABLED PEDESTRIAN ACCESS

4.9 As discussed above the new design for the service lane has reduced the gradient at the Water Lane end from 1:10 to 1:20, this gradient now meets the requirements of disabled pedestrians. Elsewhere around the site we are constrained by the existing gradients and site conditions.

TAXI AND COACH TRAFFIC

4.10 It is unlikely that the proposed development will attract coaches, due to the type of land use proposed. Therefore the requirement for a coach drop off and waiting was not considered necessary. Also Black cabs do not operate in the Twickenham area, therefore it was not deemed necessary to include a taxi rank as part of the development.

4.11 The use of the service road as a drop off facility will be of limited benefit due to the physical restriction on the right turn movement from Wharf Lane into King Street.

GREEN TRAVEL PLAN

4.12 The travel plan within the report concludes that estimated level of employment of the site is relatively small and split between various land users. The nature of employment will mean that any parking costs would seriously impinge employee's salaries and travelling by car is therefore unlikely. The value and benefit of a green travel plan in this size of development is limited.

Appendix A

Traffic Flow Calculations

Trip Rate Data - Residential

Number of Residential Units
46

Start Time	Trip Rate In	Trip Rate Out	Cumulative Trip Rate	No of Units	Residential Car Trips In	Residential Car Trips Out	Total Residential Car Trips
7.00	0.06	0.14	0.20	46.00	2.76	6.44	9.20
8.00	0.13	0.20	0.33	46.00	5.98	9.20	15.18
9.00	0.05	0.09	0.14	46.00	2.30	4.14	6.44
10.00	0.05	0.08	0.13	46.00	2.30	3.68	5.98
11.00	0.06	0.06	0.12	46.00	2.76	2.76	5.52
12.00	0.07	0.07	0.14	46.00	3.22	3.22	6.44
13.00	0.06	0.05	0.11	46.00	2.76	2.30	5.06
14.00	0.07	0.09	0.16	46.00	3.22	4.14	7.36
15.00	0.14	0.10	0.24	46.00	6.44	4.60	11.04
16.00	0.14	0.10	0.24	46.00	6.44	4.60	11.04
17.00	0.12	0.10	0.22	46.00	5.52	4.60	10.12
18.00	0.19	0.17	0.36	46.00	8.74	7.82	16.56
19.00	0.18	0.15	0.33	46.00	8.28	6.90	15.18
20.00	0.16	0.11	0.27	46.00	7.36	5.06	12.42
21.00	0.17	0.09	0.26	46.00	7.82	4.14	11.96
22.00	0.11	0.05	0.16	46.00	5.06	2.30	7.36
23.00	0.08	0.05	0.13	46.00	3.68	2.30	5.98
				sub total	84.64	78.20	162.84

Trip Rate Data - Retail

Retail gfa:m2
1361.5

Start Time	Trip Rate In	Trip Rate Out	Cumulative Trip Rate	gfa/100	Retail Trips In	Retail Trips Out	Total Retail Car Trips
7.00	0.53	0.11	0.64	13.62	7.22	1.50	8.71
8.00	0.52	0.29	0.81	13.62	7.08	3.95	11.03
9.00	0.54	0.27	0.81	13.62	7.35	3.68	11.03
10.00	1.20	0.83	2.03	13.62	16.34	11.30	27.64
11.00	1.21	1.11	2.32	13.62	16.47	15.11	31.59
12.00	1.45	1.34	2.79	13.62	19.74	18.24	37.99
13.00	1.26	1.38	2.64	13.62	17.15	18.79	35.94
14.00	1.20	1.20	2.40	13.62	16.34	16.34	32.68
15.00	1.15	1.33	2.48	13.62	15.66	18.11	33.77
16.00	0.61	0.76	1.37	13.62	8.31	10.35	18.65
17.00	0.59	0.65	1.24	13.62	8.03	8.85	16.88
18.00	0.75	0.61	1.36	13.62	10.21	8.31	18.52
19.00	0.86	0.77	1.63	13.62	11.71	10.48	22.19
20.00	0.42	0.82	1.24	13.62	5.72	11.16	16.88
21.00	0.08	0.51	0.59	13.62	1.09	6.94	8.03
22.00	0.00	0.00	0.00	13.62	0.00	0.00	0.00
23.00	0.00	0.00	0.00	13.62	0.00	0.00	0.00
				sub total	168.42	163.11	331.53

Trip Rate Data - Restaurants

Restaurant gfa:m2
583.5

Start Time	Trip Rate In	Trip Rate Out	Cumulative Trip Rate	gfa/100	Restuarant Trips In	Restaurant Trips Out	Total Restaurant Car Trips
7.00	0.00	0.00	0.00	5.84	0.00	0.00	0.00
8.00	0.00	0.00	0.00	5.84	0.00	0.00	0.00
9.00	2.36	0.00	2.36	5.84	13.77	0.00	13.77
10.00	0.89	1.18	2.07	5.84	5.19	6.89	12.08
11.00	1.54	0.72	2.26	5.84	8.99	4.20	13.19
12.00	1.91	0.63	2.54	5.84	11.14	3.68	14.82
13.00	2.98	1.22	4.20	5.84	17.39	7.12	24.51
14.00	1.17	2.68	3.85	5.84	6.83	15.64	22.46
15.00	2.94	1.44	4.38	5.84	17.15	8.40	25.56
16.00	2.28	1.62	3.90	5.84	13.30	9.45	22.76
17.00	2.35	2.34	4.69	5.84	13.71	13.65	27.37
18.00	2.22	1.23	3.45	5.84	12.95	7.18	20.13
19.00	6.14	1.29	7.43	5.84	35.83	7.53	43.35
20.00	8.36	3.64	12.00	5.84	48.78	21.24	70.02
21.00	6.60	6.75	13.35	5.84	38.51	39.39	77.90
22.00	3.05	7.04	10.09	5.84	17.80	41.08	58.88
23.00	1.06	4.46	5.52	5.84	6.19	26.02	32.21
				sub total	267.53	211.46	479.00

Trip Rate Data - Cinema

Cinema (Seats)
550

Start Time	Trip Rate In	Trip Rate Out	Cumulative Trip Rate	No of Seats	Cinema Trips In	Cinema Trips Out	Total Cinema Car Trips
7.00	0.00	0.00	0.00	550.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	550.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	550.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	550.00	0.00	0.00	0.00
11.00	0.01	0.00	0.01	550.00	5.50	0.00	5.50
12.00	0.02	0.00	0.02	550.00	11.00	0.00	11.00
13.00	0.03	0.01	0.04	550.00	16.50	2.75	19.25
14.00	0.02	0.03	0.05	550.00	11.00	16.50	27.50
15.00	0.02	0.02	0.04	550.00	11.00	11.00	22.00
16.00	0.02	0.02	0.04	550.00	11.00	11.00	22.00
17.00	0.02	0.02	0.04	550.00	11.00	11.00	22.00
18.00	0.03	0.01	0.04	550.00	16.50	5.50	22.00
19.00	0.05	0.03	0.08	550.00	27.50	16.50	44.00
20.00	0.08	0.03	0.11	550.00	44.00	16.50	60.50
21.00	0.05	0.04	0.09	550.00	27.50	22.00	49.50
22.00	0.01	0.05	0.06	550.00	5.50	27.50	33.00
23.00	0.03	0.12	0.15	550.00	16.50	66.00	82.50
				sub total	214.50	206.25	420.75

Trip Rate Data - Health and Fitness Centre

Health Centre gfa:m2
3157

Start Time	Trip Rate In	Trip Rate Out	Cumulative Trip Rate	gfa/100	Health Centre Trips In	Health Centre Trips Out	Total Health Centre Car Trips
7.00	0.62	0.14	0.76	31.57	19.57	4.42	23.99
8.00	0.24	0.21	0.45	31.57	7.58	6.63	14.21
9.00	0.35	0.28	0.63	31.57	11.05	8.84	19.89
10.00	0.42	0.24	0.66	31.57	13.26	7.58	20.84
11.00	0.65	0.56	1.21	31.57	20.52	17.68	38.20
12.00	0.47	0.43	0.90	31.57	14.84	13.58	28.41
13.00	0.47	0.44	0.91	31.57	14.84	13.89	28.73
14.00	0.71	0.48	1.19	31.57	22.41	15.15	37.57
15.00	0.68	0.73	1.41	31.57	21.47	23.05	44.51
16.00	0.63	0.53	1.16	31.57	19.89	16.73	36.62
17.00	0.51	0.72	1.23	31.57	16.10	22.73	38.83
18.00	0.95	0.45	1.40	31.57	29.99	14.21	44.20
19.00	0.61	1.00	1.61	31.57	19.26	31.57	50.83
20.00	0.25	0.61	0.86	31.57	7.89	19.26	27.15
21.00	0.12	0.46	0.58	31.57	3.79	14.52	18.31
22.00	0.08	0.23	0.31	31.57	2.53	7.26	9.79
23.00	0.00	0.00	0.00	31.57	0.00	0.00	0.00
				sub total	244.98	237.09	482.07

Trip Rate Data -Total Trips In

Start Time	Residential	Cinema	Retail	Health Centre	Restaurant	Sub Total	Comments
7.00	2.76	0.00	7.22	19.57	0.00	29.55	
8.00	5.98	0.00	7.08	7.58	0.00	**20.64**	**am peak**
9.00	2.30	0.00	7.35	11.05	13.77	34.47	
10.00	2.30	0.00	16.34	13.26	5.19	37.09	
11.00	2.76	5.50	16.47	20.52	8.99	54.24	
12.00	3.22	11.00	19.74	14.84	11.14	**59.94**	**midday peak**
13.00	2.76	16.50	17.15	14.84	17.39	68.64	
14.00	3.22	11.00	16.34	22.41	6.83	59.80	
15.00	6.44	11.00	15.66	21.47	17.15	71.72	
16.00	6.44	11.00	8.31	19.89	13.30	58.94	
17.00	5.52	11.00	8.03	16.10	13.71	**54.37**	**pm peak**
18.00	8.74	16.50	10.21	29.99	12.95	78.40	
19.00	8.28	27.50	11.71	19.26	35.83	102.57	
20.00	7.36	44.00	5.72	7.89	48.78	113.75	
21.00	7.82	27.50	1.09	3.79	38.51	78.71	
22.00	5.06	5.50	0.00	2.53	17.80	30.88	
23.00	3.68	16.50	0.00	0.00	6.19	26.37	
sub total	84.64	214.50	168.42	244.98	267.53	**980.08**	**trips in**
	84.64	214.50	168.42	244.98	187.27	**899.82**	***minus 30% cross visitation**
	84.64	182.33	143.15	208.24	159.18	**777.54**	****minus 15%**
	84.64	214.50	150.31	244.98	167.14	**861.58**	****total pcu's in**

Trip Rate Data -Total Trips Out

Start Time	Residential	Cinema	Retail	Health Centre	Restaurant	Sub Total	Comments
7.00	6.44	0.00	1.50	4.42	0.00	12.36	
8.00	9.20	0.00	3.95	6.63	0.00	**19.78**	**am peak**
9.00	4.14	0.00	3.68	8.84	0.00	16.66	
10.00	3.68	0.00	11.30	7.58	6.89	29.44	
11.00	2.76	0.00	15.11	17.68	4.20	39.75	
12.00	3.22	0.00	18.24	13.58	3.68	**38.72**	**midday peak**
13.00	2.30	2.75	18.79	13.89	7.12	44.85	
14.00	4.14	16.50	16.34	15.15	15.64	67.77	
15.00	4.60	11.00	18.11	23.05	8.40	65.16	
16.00	4.60	11.00	10.35	16.73	9.45	52.13	
17.00	4.60	11.00	8.85	22.73	13.65	**60.83**	**pm peak**
18.00	7.82	5.50	8.31	14.21	7.18	43.01	
19.00	6.90	16.50	10.48	31.57	7.53	72.98	
20.00	5.06	16.50	11.16	19.26	21.24	73.22	
21.00	4.14	22.00	6.94	14.52	39.39	86.99	
22.00	2.30	27.50	0.00	7.26	41.08	78.14	
23.00	2.30	66.00	0.00	0.00	26.02	94.32	
sub total	78.20	206.25	163.11	237.09	211.46	**896.11**	**trips out**
	78.20	206.25	163.11	237.09	148.02	**832.67**	***minus 30% cross visitation**
	78.20	175.31	138.64	201.53	125.82	**719.50**	****minus 15%**
	78.20	206.25	145.57	237.09	132.11	**799.22**	*****total pcu's out**

Trip Rate Data -Total Trips (In and Out)

Start Time	Residential	Cinema	Retail	Health Centre	Restaurant	Sub Total	Comments
7.00	9.20	0.00	8.71	23.99	0.00	41.91	
8.00	15.18	0.00	11.03	14.21	0.00	**40.41**	**am peak**
9.00	6.44	0.00	11.03	19.89	13.77	51.13	
10.00	5.98	0.00	27.64	20.84	12.08	66.53	
11.00	5.52	5.50	31.59	38.20	13.19	93.99	
12.00	6.44	11.00	37.99	28.41	14.82	**98.66**	**midday peak**
13.00	5.06	19.25	35.94	28.73	24.51	113.49	
14.00	7.36	27.50	32.68	37.57	22.46	127.57	
15.00	11.04	22.00	33.77	44.51	25.56	136.88	
16.00	11.04	22.00	18.65	36.62	22.76	111.07	
17.00	10.12	22.00	16.88	38.83	27.37	**115.20**	**pm peak**
18.00	16.56	22.00	18.52	44.20	20.13	121.41	
19.00	15.18	44.00	22.19	50.83	43.35	175.55	
20.00	12.42	60.50	16.88	27.15	70.02	186.97	
21.00	11.96	49.50	8.03	18.31	77.90	165.70	
22.00	7.36	33.00	0.00	9.79	58.88	109.02	
23.00	5.98	82.50	0.00	0.00	32.21	120.69	
Sub Total	162.84	420.75	331.53	482.07	479.00	**1876.18**	**total trips**
	162.84	420.75	331.53	482.07	335.30	**1732.49**	***minus 30% cross visitation**
	162.84	357.64	281.80	409.76	285.00	**1497.04**	****minus 15%**
	162.84	420.75	295.89	482.07	299.25	**1660.80**	*****total pcu's in and out**

SUMMARY OF RESULTS

Total Trips In	980.08
*Total Trips In - 30% cross visitation	899.82
**Total trips In - 15%	777.54
***Total PCU's In	861.58
Total Trips Out	896.11
*Total Trips Out - 30% cross visitation	832.67
**Total Trips Out - 15%	777.54
***Total PCU's Out	799.22
Total Trips In and Out	1876.18
*Total Trips In and Out - 30% cross visitation	1732.49
**Total Trips In and Out -15%	1497.04
***Total PCU's In and Out	1660.80

**less 30% cross visitation has only been applied to restaurant trips. This takes into account the public who make one trip to the area and visit two facilities (i.e.eating out before visiting the cinema)*

***less 15% takes into account the decrease in outgoing traffic as local residents will no longer need to travel out of the town centre to visit the cinema, health centre etc.. This factor has not been applied to the residential car trips*

****PCU (passenger car units) cars have a unit of 1.0 and delivery lorries 1.5. It has been assumed that the restaurant and retail units will have a split of 90% passenger traffic and 10% service traffic*

SUMMARY OF PEAK FLOWS

Trips In		Trips Out	
am peak 8am - 9am		am peak 8am - 9am	
Total Trips In	20.64	Total Trips Out	19.78
*Total Trips In - 30% cross visitation	20.64	Total Trips Out - 30% cross visitation	19.78
**Total trips In - 15%	18.44	**Total Trips Out - 15%	18.19
***Total PCU's In	20.99	Total PCU's Out	19.98
mid peak 12pm - 1pm		mid peak 12pm - 1pm	
Total Trips In	59.94	Total Trips Out	38.72
*Total Trips In - 30% cross visitation	56.60	Total Trips Out - 30% cross visitation	37.61
**Total trips In - 15%	51.44	**Total Trips Out - 15%	33.39
***Total PCU's In	57.80	Total PCU's Out	39.81
pm peak 5pm - 6pm		pm peak 5pm - 6pm	
Total Trips In	54.37	Total Trips Out	60.83
*Total Trips In - 30% cross visitation	50.25	Total Trips Out - 30% cross visitation	56.74
**Total trips In - 15%	47.04	**Total Trips Out - 15%	52.40
***Total PCU's In	55.45	Total PCU's Out	61.96

Trips In and Out
am peak 8am - 9am

Total Trips In and Out	40.41
*Total Trips In and Out - 30% cross visitation	40.41
**Total trips In and Out - 15%	36.63
***Total PCU's In and Out	40.97

mid peak 12pm - 1pm

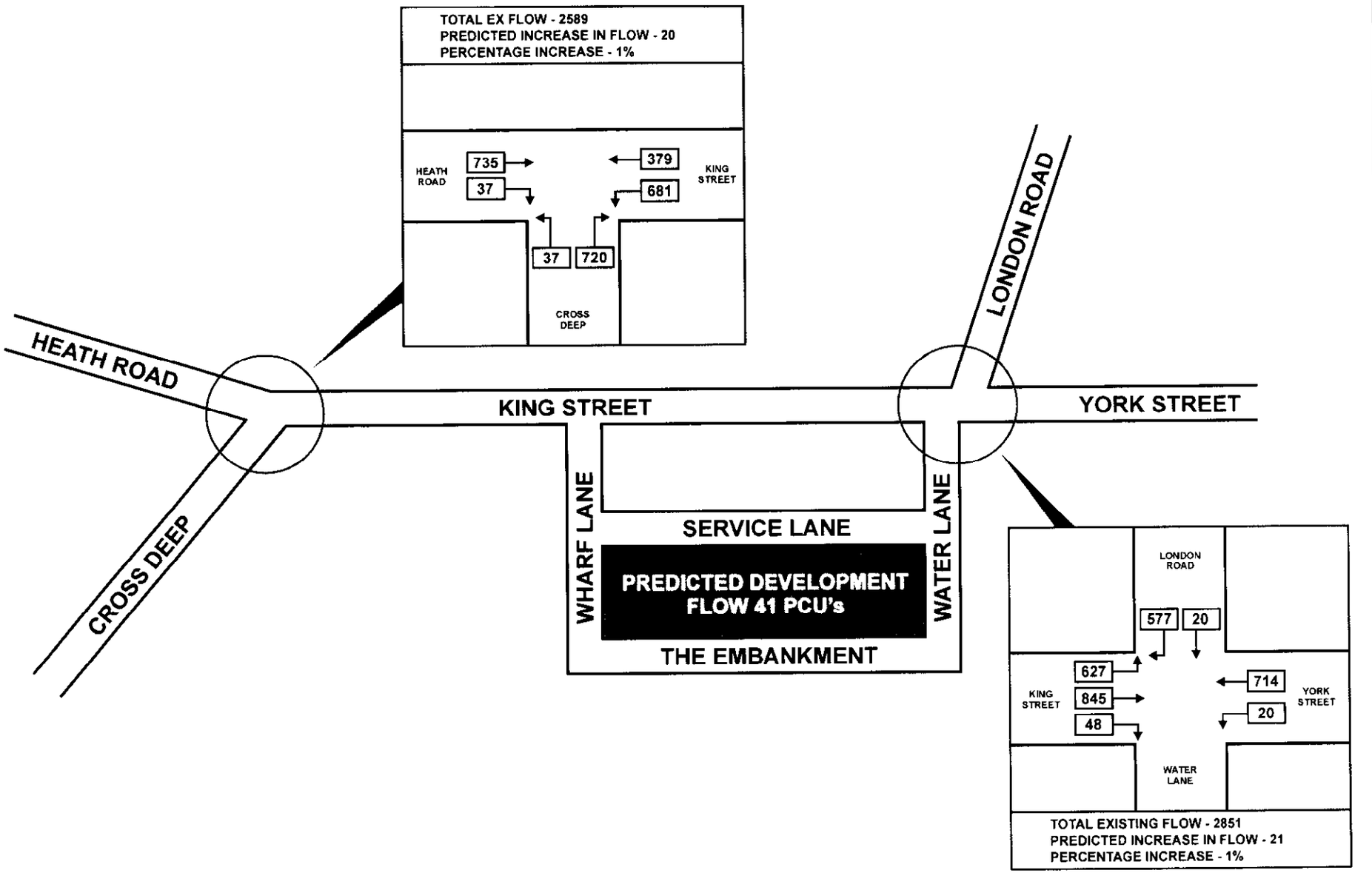
Total Trips In and Out	98.66
*Total Trips In and Out - 30% cross visitation	94.21
**Total trips In and Out - 15%	84.83
***Total PCU's In and Out	97.61

pm peak 5pm - 6pm

Total Trips In and Out	115.20
*Total Trips In and Out - 30% cross visitation	106.99
**Total trips In and Out - 15%	99.44
***Total PCU's In and Out	117.41

Appendix B

Traffic Flow Diagrams



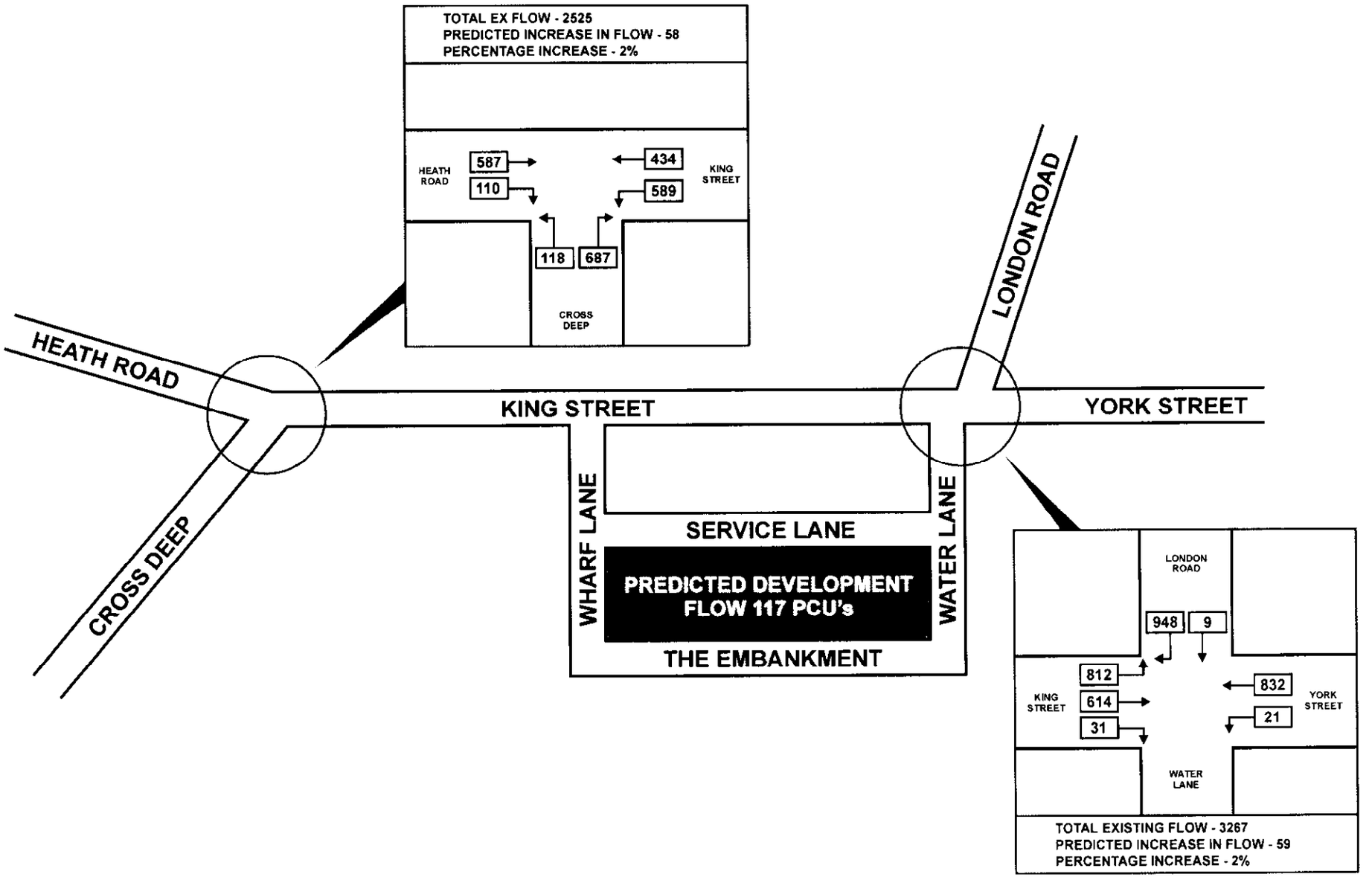
WS/Atkins

Project

Existing Traffic Flows
Twickenham Riverside development - AM Peak Flow (8.00 - 9.00)

Drawing No.

BV6846\002\twick-flow diagram (AM)



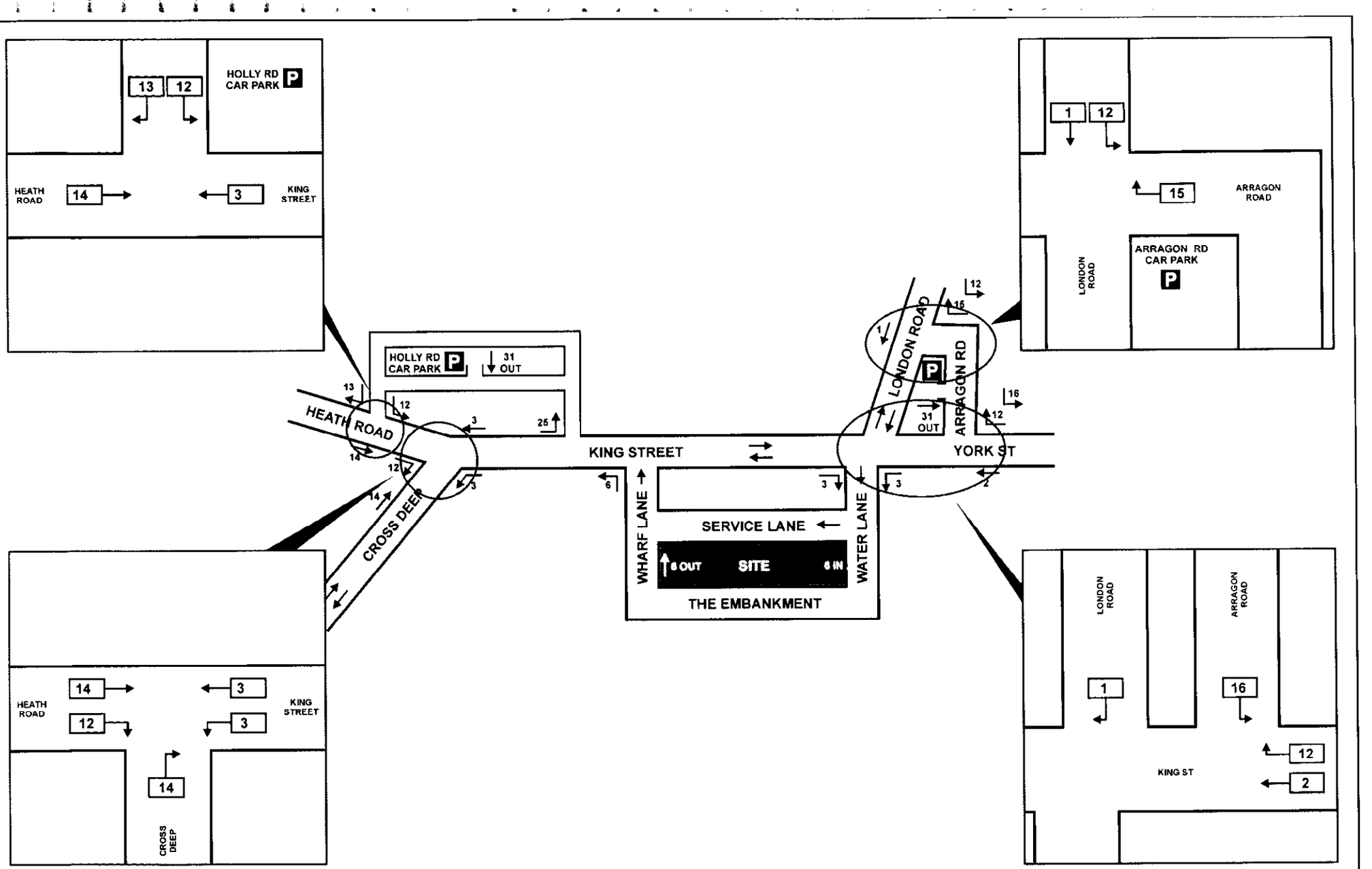
WS/Atkins

Project

Existing Traffic Flows
Twickenham Riverside development - PM Peak Flow (17.00 - 18.00)

Drawing No.

BV6846\002\twick-flow diagram (PM)



WS/Atkins

Project

Assigned Development Traffic Flows - PM Peak Flow (17.00 - 18.00)

Drawing No.

BV6846\002\Assigned

Appendix C

Design Drawings – Tracking plots of vehicle turning circles

NORTH

VIEW 01

VIEW 02

VIEW 01

1:250

VIEW 02

Blue detail is from Topographic Survey

1:250

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ACAD file:
BV6846/002/Reports/

Notes:-

Rev	Revision	Drawn	Date	Chk'd	Appr'd
A	Kerb line altered to accomodate 16.5T Artic.	BT	Jan '02		

Client: DAWNAY DAY

Project Title: TWICKENHAM RIVERSIDE

Drawing Title: ACCESS TO SERVICE ROAD 12M RIGID (BUS)

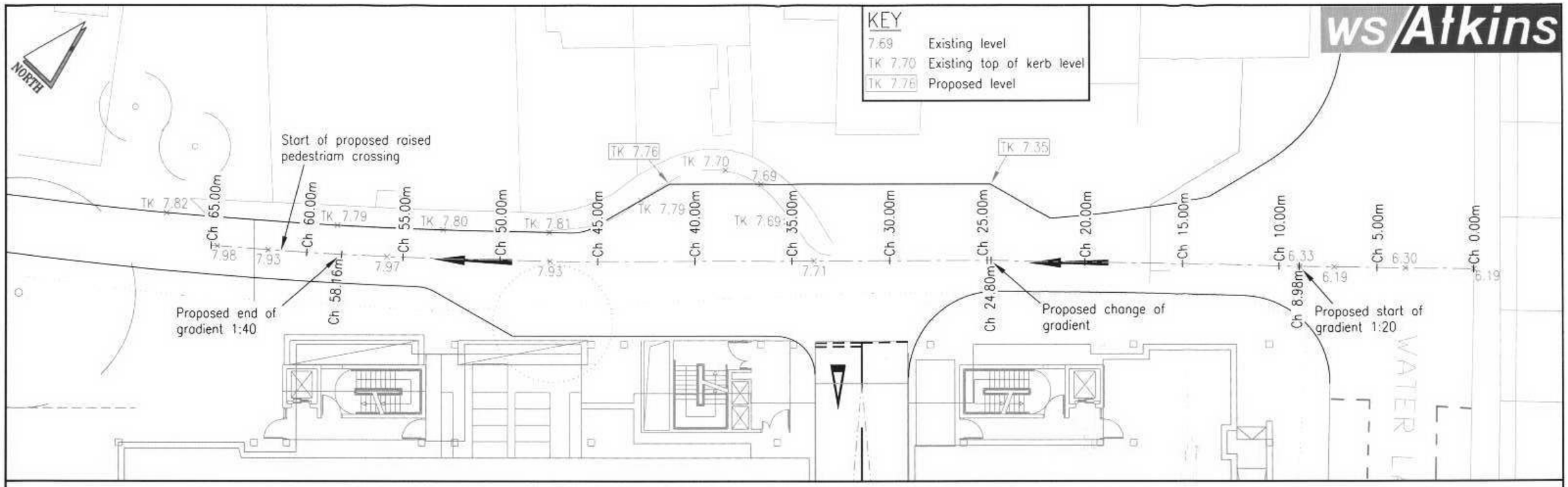
WS Atkins Consultants Ltd.
Berkshire House
168 - 173 High Holborn
LONDON
WC1V 7AA
Telephone 0171 497 1502
Fax 0171 240 5037

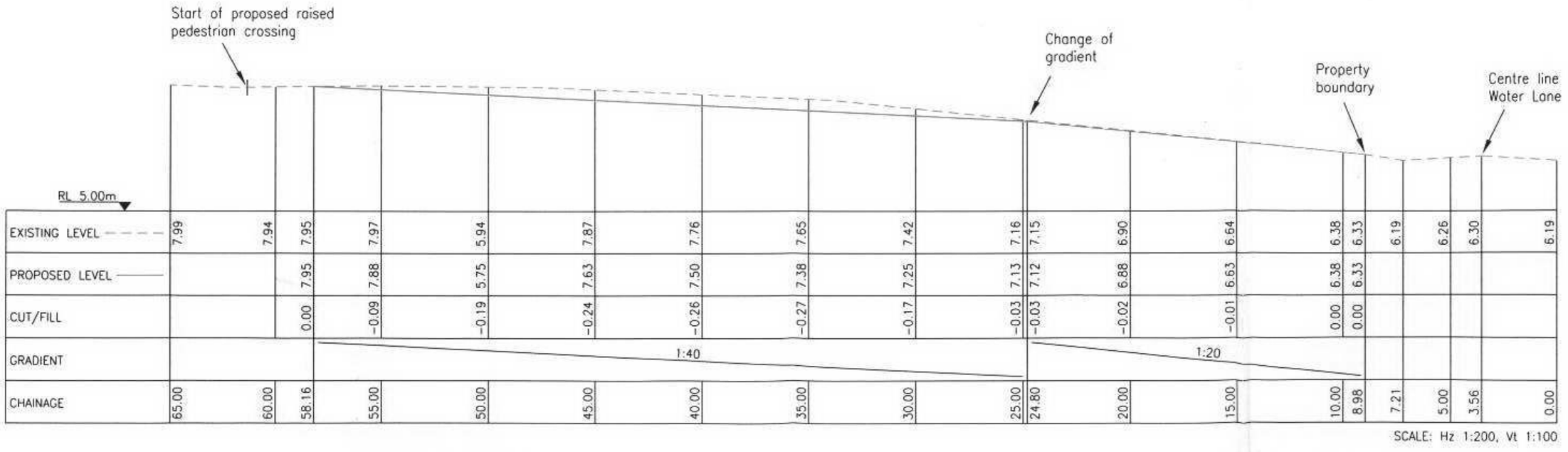
Scales	Surveyed	Drawn
1:750	OS	PG
Designed	**Date**	**Checked** / **Approved**
	JUNE 2001	

Drawing Status	Drawing Number	Rev
PRELIMINARY	FIGURE 3.5	A

Appendix D

Design Drawings – Long section showing new gradient on service road





EXISTING LEVEL	7.99		7.94		7.95	7.97		5.94		7.87		7.76		7.65		7.42		7.16	7.15		6.90		6.64		6.38	6.33		6.19		6.26	6.30		6.19
PROPOSED LEVEL					7.95	7.88		5.75		7.63		7.50		7.38		7.25		7.13	7.12		6.88		6.63		6.38	6.33						
CUT/FILL					0.00	-0.09		-0.19		-0.24		-0.26		-0.27		-0.17		-0.03	-0.03		-0.02		-0.01		0.00	0.00						
GRADIENT						1:40													1:20													
CHAINAGE	65.00		60.00		58.16	55.00		50.00		45.00		40.00		35.00		30.00		25.00	24.80		20.00		15.00		10.00	8.98		7.21		5.00	3.56		0.00

SCALE: Hz 1:200, Vt 1:100

ACAD file:

Notes:-

Rev	Revision	Drawn	Date	Chk'd	Appr'd

Client: DAWNAY DAY

Project Title: TWICKENHAM RIVERSIDE

Drawing Title: LONGITUDINAL SECTION

ws Atkins
WS Atkins Consultants Ltd.
Berkshire House
168 - 173 High Holborn
LONDON
WC1V 7AA
Telephone 0207 497 1562
Fax 0207 240 5837

Scales		Surveyed	Drawn
1:200			BT
Designed	Date	Checked	Approved
	Jan 2002		
Drawing Status	Drawing Number		Rev