Kings Cross Traffic and Pedestrian Study

Final Report

Transport for London

May 2009

Kings Cross Traffic and Pedestrian Study

Final Report

10 Eastbourne Terrace,
London,
W2 6LG

Prepared by:

P. Ye, J. Parthezius, H. Al Rukabi and C.Adams

Approved by:

Steve Robinson

Status: Final Issue no: 4A Date: 08 May 2009

260109final report_py_ca9_rev a.doc

Contents

Tables

Figures

1 Introduction

1.1 Overview

1.1.1 Colin Buchanan (CB) has been commissioned by Transport for London (TfL) to carry out a traffic and pedestrian study in the Kings Cross area.

1.1.2 The objectives of the study are:

- to test various traffic management proposals
- to assess the accuracy of traffic flow assumptions made for St Pancras International Station
- to assess the pedestrian impact of St Pancras International Station on Borough Roads and the TLRN

1.1.3 The brief specifies carrying out accident Analysis, FRUIN analysis and the assessment of various traffic management proposals using traffic modelling.

1.1.4 This report sets out the findings of the traffic modelling of the traffic management proposals. In addition, this report provides summary of the findings of the traffic, FRUIN and casualties analyses that have been carried out. Full results of the traffic, FRUIN and casualties analyses have been reported in the Interim Report which was issued on 31 July 2008.

1.2 Background

1.2.1 In July 2005 TfL commissioned CB to carry out TRANSYT modelling of the signal controlled junctions on Euston Road from Mabledon Place to York Way on the TLRN and Camden and Islington borough roads in order to assess the likely impact on these roads following the opening of the CTRL station at St Pancras on 14 November 2007. Subsequently, CB was commissioned to further refine this modelling work to take account of revised flow estimates and to enable DTO to use a calibrated traffic model suitable for devising mitigation measures for various scenarios of planned and unplanned traffic disruption in and around King's Cross/St Pancras Stations.

1.3 Scope of this report

1.3.1 Chapter 2 of the report describes the study area. Chapter 3 describes the data sources and Chapter 4 contains the key collision figures. Chapter 5 contains the FRUIN Analysis and chapter 6 summarises the Traffic analysis undertaken. Chapter 7 details the base models used for the traffic modelling. Chapter 8 includes the proposed options and the modelling of these options. Chapter 9 includes details of Stakeholders Consultation. Chapter 10 sets out the revised proposed options. Chapter 11 summarises the Pedestrian Journey Time Comparison and the conclusions and key recommendations are included in Chapter 12 of this report.

2 Study Area

2.1 Overview

2.1.1 The study area is centred on St. Pancras and King's Cross stations. It consists of Euston Road, Pancras Road, York Way, Goods Way and Midland Road. It extents as far as Mabledon Place to the west, Kings Cross Road to the east and Goods Way to the north. Junctions on Euston Road form the key nodes of the study area. Figure 2.1 illustrates the study area.

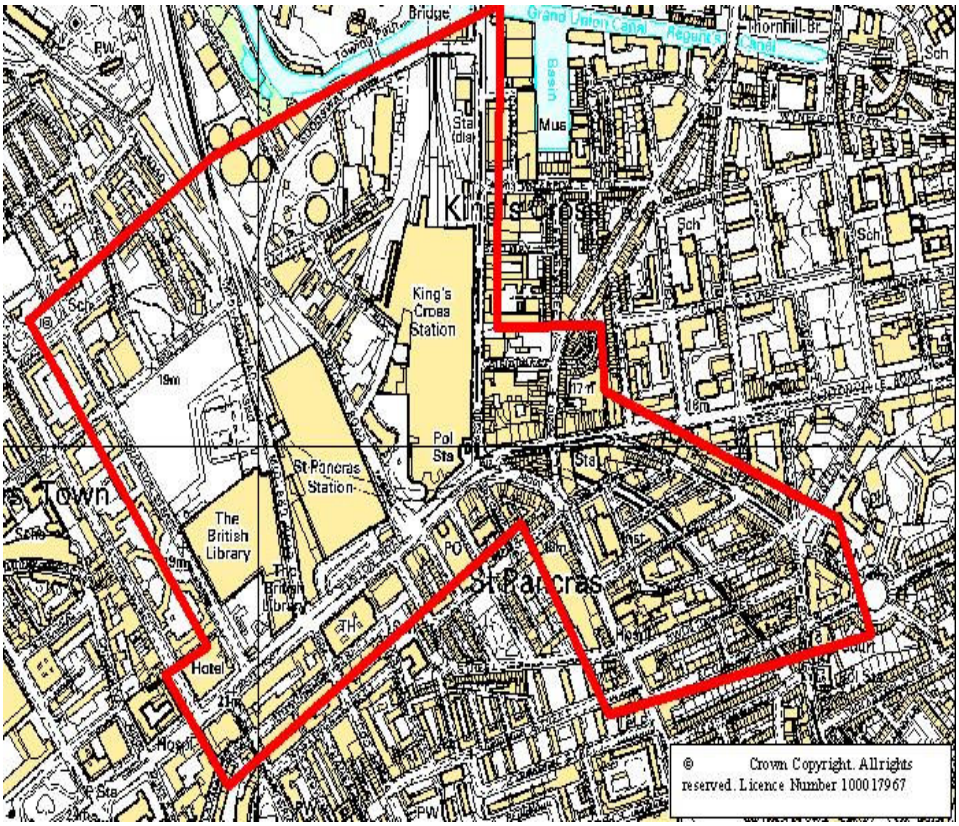


Figure 2.1: Kings Cross Study Area

2.2 Description of Junctions

2.2.1 There are five key junctions in the study area and the following paragraphs summarise the existing junction layouts.

Euston Road/Gray's Inn Road/Pentonville Road/York Way

2.2.2 The junction of Euston Road/Gray's Inn Road/Pentonville Road/York Way is a four-arm signalised junction. The northern and southern arms of the junction (York Way and Gray's Inn Road) are one-way northbound. Euston Road is two-way forming the western arm of the junction. Pentonville Road is one-way eastbound forming the eastern arm of the junction. A yellow box junction is marked across the eastbound lanes of Pentonville

Road. There are signalised pedestrian crossings across all arms of the junction. There are advanced stop lines on the approaches of Euston Road and Gray's Road to the junction.

Pentonville Road/Caledonian Road

2.2.3 The junction of Pentonville Road/Caledonian Road is a four-arm signalised junction. The northern arm and southern arms of the junction (Caledonian Road and Kings Cross Bridge) are one way southbound. Caledonian Road comprises three traffic lanes. A yellow box junction is marked across the eastbound carriageway of Pentonville Road only. The eastbound carriageway is at this point is buses only. There are signalised pedestrian crossings across the northern, southern and western arms of the junction.

Euston Road/Pancras Road

2.2.4 The junction of Euston Road/Pancras Road is a five-arm signalised junction. Pancras Road is a two-way road forming the northern arm of the junction. Only taxis and cycles can use the southbound carriageway of Pancras Road. Euston Road forms the eastern and western arms of the junction with three lanes in each direction. Argyle Street is one-way northbound. Argyle Street forms one of the southern arms of the junctions. Belgrove Street is the other southern arm. Belgrove Street is one-way southbound. A yellow box junction is marked across the eastbound lanes of Euston Road in the middle of the junction. There are staggered signalised pedestrian crossings across the northern and western arms. There is a cycle crossing across the westbound lane of the eastern arm of the junction.

York Way/Wharfdale Road

2.2.5 The junction of York Way/Wharfdale Road is a 3-arm signalised junction. Wharfdale Road is one-way in a westerly direction whilst the southern arm of York Way is one way northbound. There is a large central island on York Way at its junction with Wharfdale Road and pedestrian crossing facilities across all arms of the junction. The central island separates the northbound traffic lane from right turn traffic lane for traffic bound for Wharfdale Road. There are Advanced Stop Lines on the northern and southern arms of York Way for traffic turning into Wharfdale Road.

Euston Road/Midland Road/Judd Street

2.2.6 The Euston Road/Midland Road /Judd Street junction is a 4-arm signalised junction. Midland Road is one way southbound and Judd Street is one way northbound. Euston Road is four lanes eastbound with the nearside lane a bus lane and left turn lane and the far side lane a dedicated right turn lane. In a westbound direction Euston Road is three lanes with the nearside a dedicated left turn lane. There is a controlled staggered pedestrian crossing on the eastern arm of the junction and controlled straight across crossing on the north and south arms. There is an uncontrolled straight across pedestrian crossing on the western arm of the junction.

3 Data Source

3.1 Traffic Count Data

3.1.1 Traffic surveys were carried out on 3rd June 2008 capturing classified turning counts at the following sites:

- Mabledon Place/Euston Road
- Midland Road/Euston Road
- Pancras Road/Euston Road
- York Way/Gray's Inn Road/Pentonville Road/Euston Road
- Caledonian Road/ Pentonville Road
- Kings Cross Road/ Pentonville Road
- York Way/Wharfdale Road
- King's Cross Road/Swinton Street/Penton Rise
- Gray's Inn Road/Swinton Street
- Gray's Inn Road/Theobald's Road
- Eversholt Street/Oakley Square South
- Midland Road/Brill Place
- Pancras Road/Midland Road
- Pancras Road/Camley Street
- York Way/Goods Way
- York Way/Copenhagen Street
- Marchmont Street/Tavistock Place

3.1.2 The traffic surveys were conducted in the following time periods:

- AM peak 07:00 – 10:00
- Inter peak 12:00 – 14:00
- PM peak 16:00 – 19:00

3.1.3 The turning count surveys were undertaken at all of the junctions in the study area and included in the modelling.

3.1.4 Summary spreadsheets from the turning counts survey can be found in Appendix A.

3.2 Saturation Flows

3.2.1 Saturation flow surveys have been carried out to measure saturation flows for existing links for the AM peak and the PM peak periods. The recent AM saturation flows were measured for some junctions on 4 June 2008, 6 August 2008 and 9 September 2008 between 08.00 and 09.30 on site. In addition, more measurements were taken by reviewing video footages of the study area.

3.2.2 For junctions that have not been modified in 2008, 2007's saturation flow measurements were used in the model. In 2007, the AM saturation flows were measured on 31 May 2007. The PM saturation flows were measured on 05 June 2007 between 17.00 and 18.00

3.2.3 For junctions in region 506 (02/266,02/267), saturation flows could not be measured on site due to the fact that junctions were not saturated during the peak periods. TRL formula RR67 was used to estimate saturation flows for those links.

3.2.4 Table 3.1 shows the saturation flow for each link.

Table 3.1: Saturation Flows

Junction ID	Junction Name	Junction Arm	Link	Sat flow	Source	Why RR67
02/064	Euston / Ossulston	Euston EB	648	3180	2007 Site	
		Euston WB (Middle+Outside Lane)	642	3394	2007 Site	
		Ossulston SB	641	1532	RR67	Light Traffic
		Mabledon Place NB	643	3350	RR67	Light Traffic
02/017	Euston / Midland	Euston EB (2 Middle lanes)	174	3125	2008 Video	
		Euston WB (Middle+Outside Lane)	172	3193	2008 Video	
		Judd Street NB	173	1770	2008 Site	
		Midland Road Straight & Left Turn (Outside lane)	171	1686	2008 Site	
		Midland Road Straight & Left Turn (Nearside Flare)	171(flare)	1458	2008 Site	
		Midland Road Right Turn (Nearside Lane)	175	1666	2008 Site	
02/018	Euston / Pancras	Euston EB (Middle+Outside Lane)	184	3306	2008 Video	
		Euston WB Middle	182	1976	2008 Site	
		Euston WB Right Turn	186	1668	2008 Site	
		Pancras Road SB	181	1670	2008 Site	
02/021	Euston / York Way	Euston EB (Middle+Outside Lane)	214	3267	2008 Site	
		Gray Inn Straight	213	2513	2008 site	
		Gray Inn Left Turn	1933	3083	2008 Site	
02/049	Caledonian / Pentonville	Caledonian Road SB Middle lane	491	1592	2008 Site	
		Euston EB	494	3520	2008 Video	
03/069	Pentonville / Kings cross road	Pentonville EB	814	3346	2008 Video	
		Pentonville EB Right Turn	3694	1728	2008 Video	
03/006	Kings cross road / Penton Rise	Kings croos Road	61	3880	2008 Video	
		Penton Rise SB	62	3171	2008 Video	
02/164	Gray Inn Road / Swinton Road	Swinton Road WB	1642	3394	2008 Site	
		Gray Inn Road NB	1643	5340	RR67	Light Traffic
		Argyle street EB	1644	1571	RR67	Light Traffic
02/069	Kings cross Bridge / Gray Inn road	Kings cross Bridge SB	691	2557	2008 Video	
		Gray Inn Road NB (Middle 2 + Outside Lane)	693	3113	2008 Video	
02/021	York Way / Wharfdale	York Way SB	2211	1504	2008 Video	
		York Way NB Straight	2273	1505	2008 Video	
		York Way NB Right turn	2213	1525	2008 Video	
02/188	York Way / Goods Way	York Way NB (Ahead lane)	1883	1548	2008 Video	
		York Way NB (Left turn flare)	1883(flare)	1557	2008 Video	
		York Way SB Nearside	1885	1739	2008 Site	
		York Way SB Outside	1881	1618	2008 Site	
		Goods Way EB Right turn	1884	1530	2008 Video	
02/266	Goods Way / Camley St	Goods Way WB	2662	1850	RR67	Light Traffic
		Goods Way EB	2664	3835	RR67	Light Traffic
		Camley St SB	2661	1760	RR67	Light Traffic
		Pancras RD NB Nearside	2667	1590	RR67	Light Traffic
		Pancras RD NB Outside	2663	1740	RR67	Light Traffic
02/267	Goods Way / Midland Road	Goods Way WB Nearside	2676	1700	RR67	Light Traffic
		Goods Way WB Outside	2674	1930	RR67	Light Traffic
		Pancras Rd SB Nearside	2673	1700	RR67	Light Traffic
		Pancras Rd SB Outside	2671	1950	RR67	Light Traffic
		Midland Rd NB	2679	1855	RR67	Light Traffic
02/292	Midland Road	Midland Road N to S	2921	1820	RR67	Light Traffic
02/293	Midland Road	Midland Road N to S	2931	1820	RR67	Light Traffic
02/294	Pancras Road	Pancras RD S to Pancras RD N	2943	3580	RR67	Light Traffic
		Pancras RD N to Pancras RD S	2941	1820	RR67	Light Traffic

3.2.5 Site data sheets and the calculation spreadsheets are available on request.

3.3 Journey Time Data

3.3.1 Journey time surveys were undertaken along Euston Road eastbound and westbound, Kings Cross Road southbound, Gray's Inn Road northbound, York Way northbound, Goods Way westbound, Midland Road southbound and Pancras Road northbound. The measurements were made on 3 June 2008 and 17 June 2008 during the peak hours.

3.3.2 The routes were broken down into timing sections as outlined in Table 3.2.

Table 3.2: Journey Time Route Description

Route	Descriptions
Euston eastbound	From Ossulston/Euston to Caledonian Road / Pentonville Road
Kings Cross eastbound	From Caledonian Road/Pentonville Road to Kings Cross Road/Swinton Road
Kings Cross westbound	From Kings Cross Road/Swinton Road to Euston Road/Gray's Inn Road
Euston westbound	From Euston Road/Gray's Inn Road to Ossulston/Euston
York Way northbound	From York Way/Euston to York Way/Goods Way
Goods Way westbound	From York Way/Good Way to Goods Way/Midland Road
Midland Road southbound	From Goods Way/Midland Road to Midland Road/Euston
Pancras Road northbound	From Euston/Pancras Road to Pancras Road/Goods Way

3.3.3 The individual sections have been presented in the figure below:

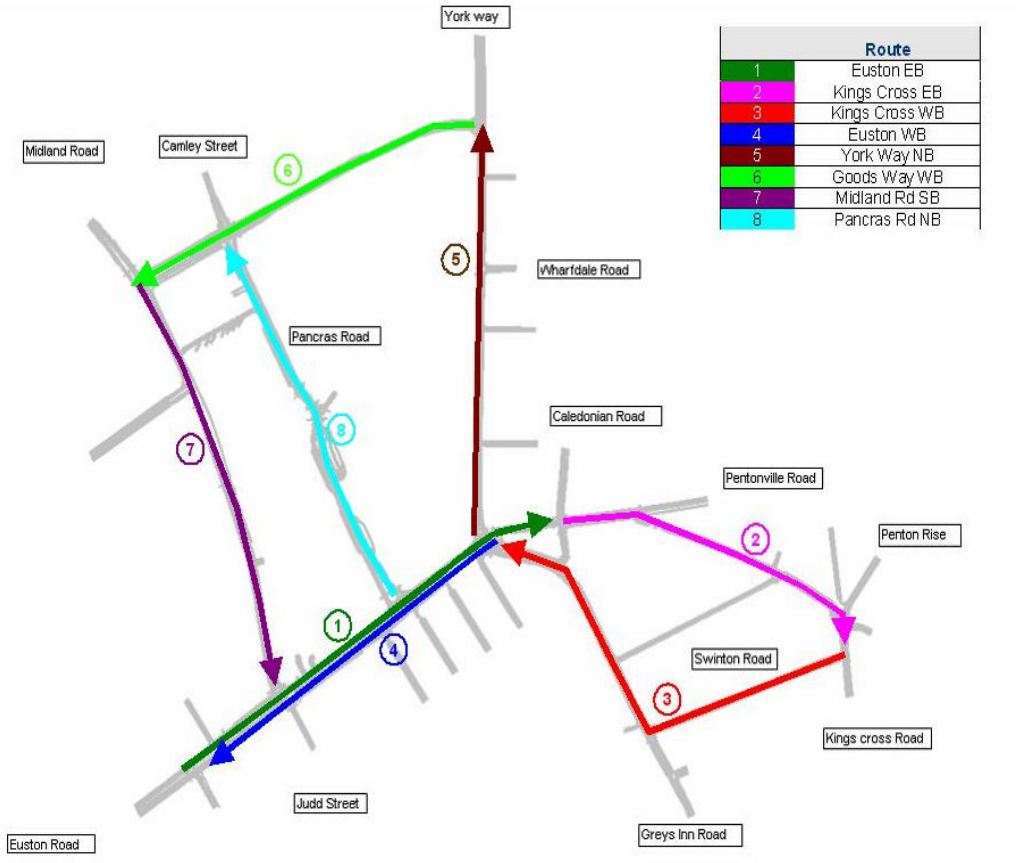


Figure 3.1: Journey Time Sections Description

3.3.4 During each time period, ten runs of journey time measurement have been carried out for most of the routes.

3.4 Signal Data

3.4.1 Signal data has been obtained: Timing Sheets, UTC Plans, Controller Specifications, M16 SCOOT Messages, ACHK and ASTRID data have been provided by TfL DTO.

3.4.2 The latest Timing Sheets have been used to update the method of control, stage minimum and intergreen for the junctions. Base UTC Plans, ACHK, ASTRID and M16 data have been used to update the cycle time, stage sequence, stage green times and changing points.

3.4.3 M16 data received was for the 17 of June 2008 For the AM peak, DTO provided ACHK data for the 17 of June 2008. For the inter peak, ACHK data was provided for the 19 of June 2008. For the PM peak, the ACHK data was provided for the 20 of June 2008.

3.5 Bus Data

3.5.1 Bus timetables have been obtained form TfL. These timetables have been used to estimate bus frequencies. A factor of one bus equal to two PCUS has been used to convert the bus frequencies to PCUs.

3.6 Two Wheelers

3.6.1 Following TfL advice, cyclists and motorcyclists were not included in the model as their equivalent PCU values are only a small proportion of the total traffic in the study area.

4 Collision Analysis

4.1.1 Key accident figures are shown below. The full accident figures form part of the interim report dated 31 July 2008.

4.2 The study area for collision analysis

4.2.1 A study polygon was created for the area under investigation to include the roads between and including the following junctions in the Kings Cross Area of Camden:

- Euston Road/York Way/Gray's Inn Road/Pentonville Road
- Pentonville Road/Caledonian Road
- York Way/Wharfdale Road
- Pancras Road/Euston Road

4.3 Methodology

4.3.1 Collision Data for the King's Cross area was provided by LRSU (London Safety Road Unit) for three years to 31 December 2007[1]. The AccsMap program for collision analysis and mapping was used in the analysis of this data.

4.3.2 In addition to a review of all collisions within the study area, special consideration was given to pedestrian casualties and collisions occurring within the study area and, in particular, at the four junctions described above.

4.3.3 Wherever possible, comparisons were made between the study area results obtained and the data Transport for London averages in Inner Boroughs reported in TfL's "Levels of Collision Risk in Greater London" Issue 11 (December 2006). An accident plot showing balloon diagrams for the collisions occurring during the study period is shown on Drawing 137971/OS/001 in Appendix A of the interim report, and a summary of this data can be found in Appendix B of the same report.

4.4 Overview of Collisions

4.4.1 In the 36 months period to 31 December 2007, a total of 49 collisions[2] occurred within the study area, resulting in 50 casualties. Of these, 2 were fatalities and 12 resulted in serious injury. There were 17 collisions involving pedestrians (2 resulting in a fatality, and a further 5 resulting in serious injury).

4.4.2 The average percentage of collisions involving pedestrians at all TLRN sites is 21.1%. The percentage of collisions involving pedestrians within the study area is considerably higher at 34.7%.

4.4.3 Tables 4.1 and 4.2 summarise the annual change in the total number of collisions and pedestrian collisions by severity in the study period during the 36 months investigated.

[1] Latest 36 months of available data
[2] One collision in the output was identified as a duplicate, and so has been excluded from analysis: Police Ref: 0107EK40031

Table 4.1: Annual change in total collisions by severity (From January 2005 to December 2007)

Year	Severity				Total
	Fatal	Serious	%KSI	Slight	
01 Jan 2005 - 31 Dec 2005	0	5	22.7%	17	22
01 Jan 2006 - 31 Dec 2006	1	4	38.5%	8	13
01 Jan 2007 - 31 Dec 2007	1	3	28.6%	10	14
Total	**2**	**12**	**28.6%**	**35**	**49**
Annual Average	**0.66**	**4**		**11.7**	**16.3**

Table 4.2: Annual change in pedestrian collisions by severity (From January 2005 to December 2007)

Year	Severity				Total
	Fatal	Serious	%KSI	Slight	
01 Jan 2005 - 31 Dec 2005	0	3	37.5%	5	8
01 Jan 2006 - 31 Dec 2006	1	2	42.8%	4	7
01 Jan 2007 - 31 Dec 2007	1	0	50%	1	2
Total	2	5	41.2%	10	17
Annual Average	**0.66**	**1.7**		**3.3**	**5.7**

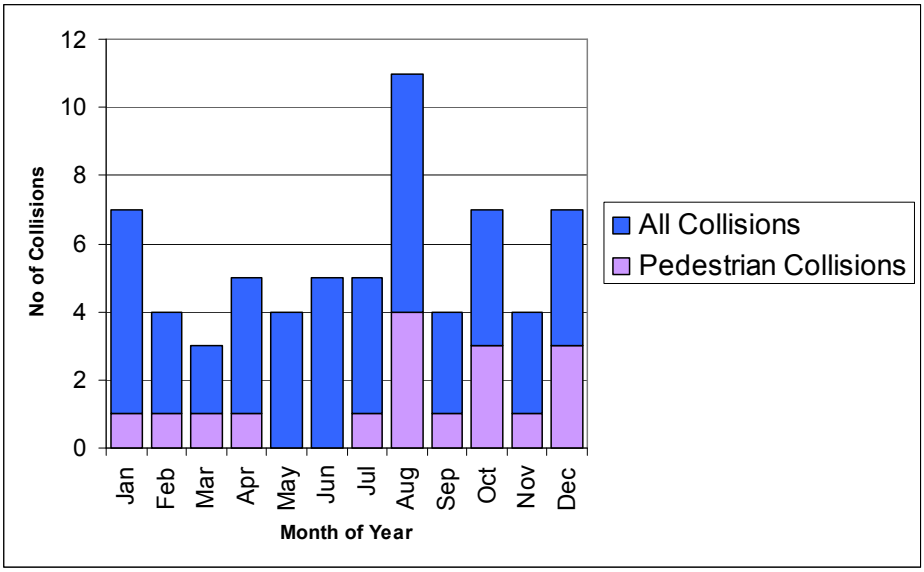
4.4.4 From the tables, it was noted that whilst the number of pedestrian-involved collisions has been decreasing year on year within the study period, the percentage of KSIs among pedestrians has been increasing. This is a worrying trend.

4.4.5 On average there have been approximately 6 collisions involving pedestrians per annum within the study area, and it has already been identified that the percentage of pedestrian-involved collisions is higher than would be expected at average sites on the TLRN.

4.5 When and where collisions occur

4.5.1 An analysis of the time of day, day of week, and month of the year in which all, and pedestrian-involved, collisions took place was undertaken, with the results summarised in the graphs which follow.

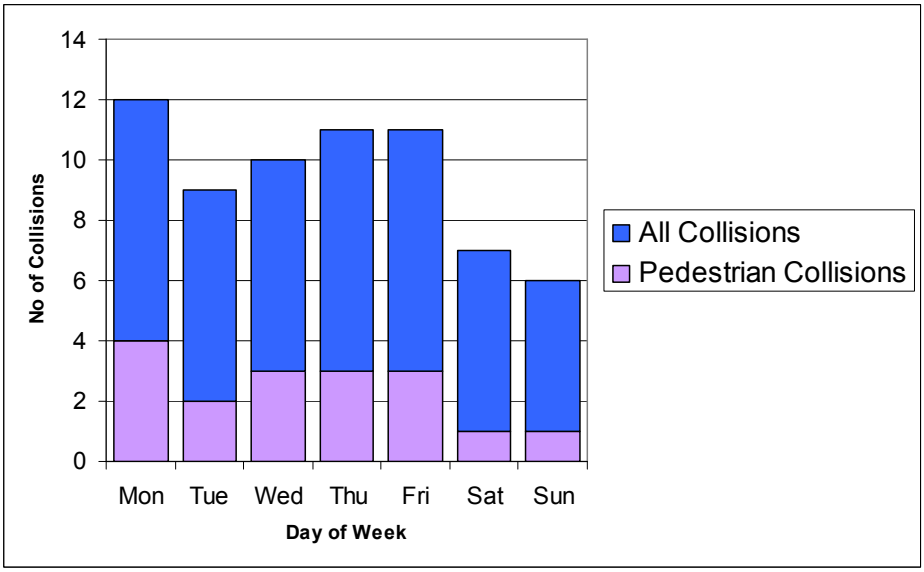
Figure 4.1: Collisions by month of the year



36 months to 31 December 2007

4.5.2 From Figure 4.1, it was noted that the highest number of collisions (and pedestrian collisions) occurred during the month of August. Furthermore, although there were no pedestrian involved collisions during the May and June almost half of all collisions during October and December involved pedestrians.

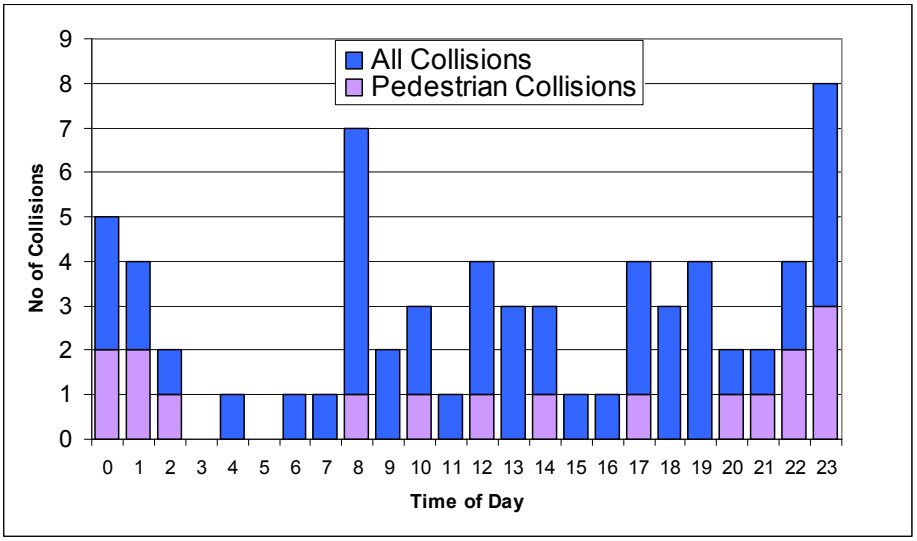
Figure 4.2: Collisions by day of the week



36 months to 31 December 2007

4.5.3 From Figure 4.2, all road users (including pedestrians) are most likely to be injured on Monday, and least likely to be involved in a collision at weekends.

Figure 4.3: Collisions by time of day



36 months to 31 December 2007

4.5.4 From Figure 4.3, the most likely time to be involved in a collision is between 11pm and midnight, and although the total numbers drop after this time, the level of pedestrian involvement remains proportionally high until 2am. The morning peak hour (8am -9am) shows a peak in collisions, but pedestrian involvement is no higher than at other times of the day.

4.6 Characteristics of collisions

4.6.1 The number of collisions (overall, and those involving pedestrians) which occurred during wet or dark conditions, or where turning manoeuvres were involved, have been summarised in Table 4.3.

Table 4.3: Characteristics of Collisions

Collision Type	All Collisions		TLRN Average %	Pedestrian Collisions	
	No.	%		All	%
Dark	22	55.1	31.8	12	70.6
Wet	7	14.3	15.8	3	17.6
Right Turn	1	2.04	15.1	1	5.9
Left Turn	11	22.4	-	7	41.2

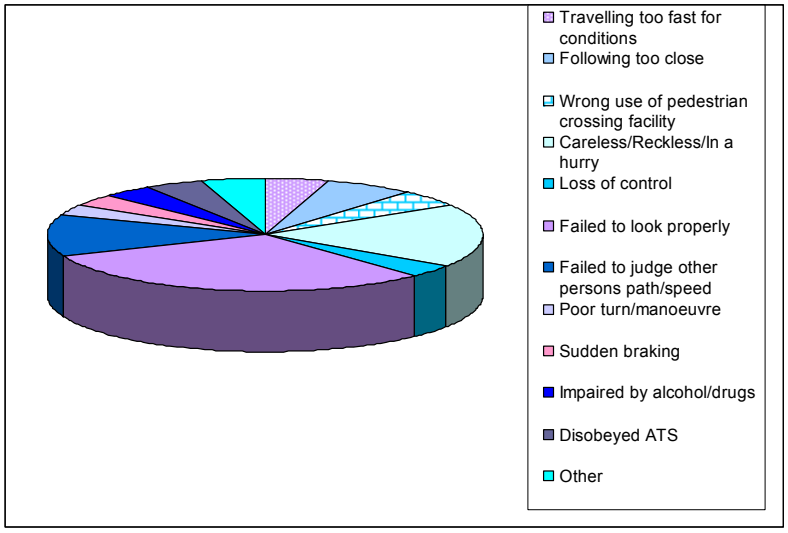
4.6.2 From the table, it is apparent that pedestrian collisions which occur during the hours of darkness are a particular problem at this site, with over 70% of all pedestrian-involved collisions occurring during the hours of darkness.

4.6.3 Although no comparative figures were available for TLRN roads, it was considered worthwhile to include statistics for left-turn collisions, as left turning traffic were involved in 44% of all collisions which resulted in injury to pedestrians.

4.7 Contributory Factors

4.7.1 The contributory factors attributed to collisions was plotted for both all, and pedestrian-involved collisions.

Figure 4.4: Contributory Factors

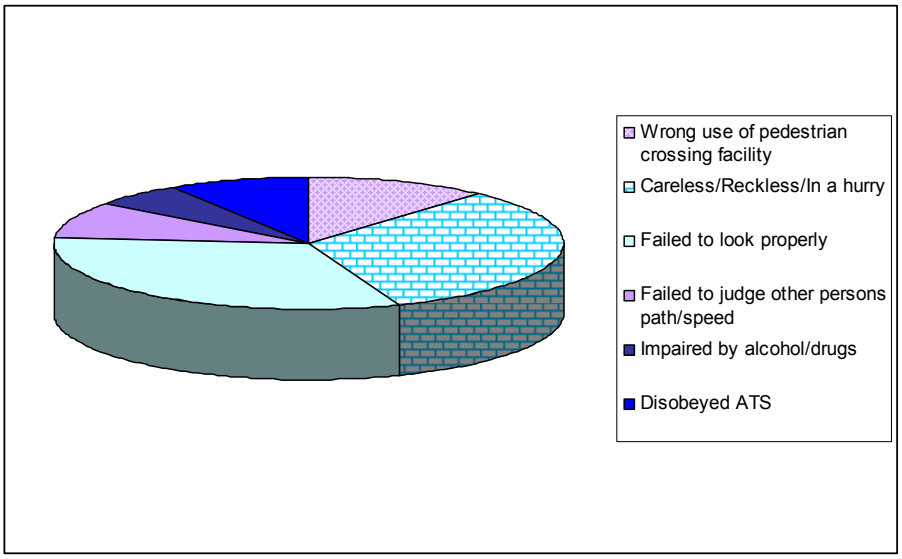


36 months to 31 December 2007

4.7.2 From Figure 4.4 it can be seen that the most frequently applied contributory factor[3] to the collisions within the study area was 'Failed to look properly'. This factor applies to all modes of transport, not only pedestrians. Motorists driving carelessly or recklessly also contributed to a high number of collisions.

[3] in three or more collisions

Figure 4.5: Contributory Factors in Pedestrian Collisions



36 months to 31 December 2007

4.7.3 From Figure 4.5, it can be seen that the main contributory factors[4] to collisions involving pedestrians were careless or reckless behaviour and failing to look properly. In these collisions both the driver and/or the pedestrian may have been at fault. Another common factor contributing to the collisions was the incorrect use of the crossings by pedestrians. Pedestrians impaired by drugs or alcohol formed 12% of the pedestrian casualties.

4.8 Casualties

4.8.1 A summary was made of the road user types involved in collisions in the study area.

Table 4.4: Number of casualties by mode

Casualty	Fatal		Serious		Slight		Total
	No	%	No	%	No	%	
Vehicle driver	0	0	3	42.9	4	57.1	**7 (14%)**
Passenger	0	0	0	0	8	100	**8 (16%)**
P2W	0	0	2	25	6	75	**8 (16%)**
Cyclist	0	0	2	20	8	80	**10 (20%)**
Pedestrian	2	11.8	5	29.4	10	58.8	**17 (34%)**
Total	**2**	**-**	**12**	**-**	**36**	**-**	**50**

36 months to 31 December 2007

4.8.2 From Table 4.4 it can be seen that the highest percentage of casualties within the study area were pedestrians (34%) and pedestrians were also casualties in the two fatal collisions which have occurred within the 36 month study period. Pedal Cyclist casualties made up 20% of the total casualties.

[4] all contributory factors are included in pedestrian collisions, as the numbers were so low

4.8.3 Within the different casualty types, the highest percentage of serious collisions involved injuries to vehicle drivers (42.9%) and pedestrians (29.4%). Passengers of vehicles and cyclists were more likely to suffer slight injuries.

4.8.4 From the accident plot in Appendix A of the interim report it can be noted that three of the 49 collisions involved injuries to bus passengers falling on buses.

4.9 Collisions by junction

4.9.1 In focussing on the four junctions of particular interest, the number of collisions occurring at each, and the breakdown of pedestrian-involved collisions has been summarised below. Link collisions have been included for completeness only.

Table 4.5: Collisions by severity and junction/link

Junction/Link	Fatal (K)	Serious (SI)	KSI Total	KSI %age	TLRN KSI Average[5]	Slight	Total
Gray's Inn Road/Pentonville Road/York Way	1	5	6	30%	14.2%	14	20
Pentonville Road/Caledonian Road	0	2	2	33.4%	14.2%	7	9
Euston Road/Pancras Road	1	1	2	33.4%	14.2%	4	6
York Way/Wharfdale Road	0	0	0	22.2%	14.2%	2	2
Collisions along Links	0	4	4	33.3%	14.0%[6]	8	12
TOTAL	2	12	14			35	49

36 months to 31 December 2007

4.9.2 From Table 4.5, the junction of Gray's Inn Road/Pentonville Road/Euston Road had the highest number of collisions within the 36 month study period (40.8% of the total).

4.9.3 It can be seen from the table that the total percentage of fatal and serious collisions at all but one junction within the study area (York Way/Wharfdale Road) exceeds that of the TLRN average for fatal/serious collisions at ATS junctions.

4.9.4 The percentage of fatal and serious collisions occurring along links within the study area (33.3%) also exceeds the TLRN average for collisions occurring not within 20m of a junction, with 12 collisions (24.5%)occurring along the links.

4.9.5 The number and proportion of these collisions which involved pedestrians is summarised in Table 4.6.

[5] Taken from Levels of Collision Risk in Greater London (Issue 11) December 2006 Table 2.3.1, for ATS junctions
[6] rate for 'not within 20m of a junction'

Table 4.6: Pedestrian Collisions by severity and junction/link

Junction/Link	KSI	Slight	TOTAL	% of all collisions at the junction	TLRN Pedestrian Average
Gray's Inn Road/Pentonville Road/York Way	4	6	10	50%	21.8%
Pentonville Road/Caledonian Road	1	2	3	33.3%	21.8%
Euston Road/Pancras Road	1	1	2	33.3%	21.8%
York Way/Wharfdale Road	0	1	1	50%	21.8%
Collisions along Links	1	0	1	8.3%	24.7%
TOTAL	7	10	17		-

36 months to 31 December 2007

4.9.6 From the table, of greatest concern is the junction of Gray's Inn Road/ Pentonville Road, where pedestrians have been involved in half of all collisions at the junction in the past three years. Overall numbers are also high, and so this junction should be a high priority for intervention.

4.9.7 The remaining three junctions within the study area also exceed the TLRN average for collisions at ATS junctions.

4.9.8 Although half of all collisions at the junction of Gray's Inn Road/Pentonville Road/Euston Road involved pedestrians, and greatly exceeds the TLRN average for pedestrian collisions at an ATS junction, overall numbers are low, and so this should be a lower priority for intervention.

4.9.9 Each of the junctions has been considered in more detail below, in order of priority.

Euston Road/Gray's Inn Road/Pentonville Road/York Way

4.9.10 A breakdown of the collisions (and the percentage of the total for the junction) which occurred at this junction has been summarised below.

Table 4.7: Gray's Inn Road/Pentonville Road/Caledonian Road Collisions

	Pedestrian		All collisions	
	No.	%	No.	%
KSI	4	40	5	25
Pedal Cycle	0	0	2	10
Wet	1	5	3	15
Dark	7	70	11	55
Right Turn	2	20	4	20
Left Turn	3	30	4	20

36 months to 31 December 2007

4.9.11 From the collision analysis, a number of specific issues of concern were identified for this junction,

- 70% (7 out of 10) of the pedestrian collisions at this junction occurred during the hours of darkness indicating that the street lighting at the junction may be inadequate
- Two (20%) of the pedestrian collisions at the junction involved left-turning vehicles bound for York Way from Euston Road disobeying the traffic signals and colliding with eastbound pedestrians who were using the crossing facility. Both of these collisions occurred during the hours of darkness
- Contributory factors to the collisions involving pedestrians at this junction include incorrect use of the crossing facilities and stepping out in front of vehicles
- 60% (6 out of 10) of the collisions involved east or westbound pedestrians whilst the remaining 40% (4 out of 10) involved north or southbound pedestrians

4.9.12 Other issues noted:

- 10% (2 out of 20) of the collisions involved pedal cyclists. One of these collisions occurred when a goods vehicle clipped a south-westbound cyclist on the left hand bend. The other collision involved a pedal cyclists colliding with the rear of a bus as it turned left at the junction
- 10% (2 out of 20) of the collisions at the junction involved vehicles skidding, one of which resulted in loss of control
- The percentage of wet collisions at this junction is similar to that of the TLRN average for ATS junctions whilst the percentage of right turning collisions falls below the TLRN average of 20.5%
- The percentage of right turning collisions at this junction (15%) is lower than the average percentage of right turning collisions TLRN ATS junctions (20.5%)

Pentonville Road/Caledonian Road

4.9.13 A breakdown of the collisions (and the percentage of the total for the junction) which occurred at this junction has been summarised below.

Table 4.8: Pentonville Road/Caledonian Road Collisions

	Pedestrian		All collisions	
	No.	%	No.	%
KSI	1	33.3	2	22.2
Pedal Cycle	0	0	3	33.3
Wet	1	33.3	1	11.1
Dark	3	100	4	44.4
Right Turn	0	0	0	0
Left Turn	3	100	3	33.3

36 months to 31 December 2007

4.9.14 From Table 4.8:

- 44.4% (4 out of 9) of the collisions at this junction occurred during the hours of darkness. This exceeds the average for the percentage of dark collisions occurring at an ATS junction on a TLRN road (34.7%)
- The percentage of collisions at this junction involving pedestrians and/or cyclists (33.3% in both cases) is also higher than the TLRN average (21.8% and 13.3% respectively)
- All three of the collisions at this junction involving pedestrians occurred when vehicles on the eastern arm of the junction (Pentonville Road) turned left into Kings Cross Bridge as pedestrians were crossing the southern arm of the junction. All of these pedestrian collisions occurred during the hours of darkness and they all

involved buses colliding with pedestrians. One resulted in serious injury to the pedestrian

4.9.15 Other issues noted:

- Two out of the three collisions which involved pedal cyclists at this junction were rear-shunt type accidents, one of which occurred when a bus collided with the rear of a cyclist on Pentonville Road and the other occurred when a cyclist with defective brakes collided with the rear of a vehicle ahead. The third of these collisions resulted in injury to a motorcyclist and occurred when a southbound cyclist pulled out into the path of the eastbound powered-two wheeler

Euston Road/Pancras Road

4.9.16 A breakdown of the collisions (and the percentage of the total for the junction) which occurred at this junction has been summarised below.

Table 4.9: Collision Type at Euston Road/Pancras Road

	Pedestrian		All collisions	
	No.	%	No.	%
KSI	1	50	2	33.3
Pedal Cycle	0	0	1	16.7
Wet	1	50	1	16.7
Dark	1	50	1	16.7
Right Turn	0	0	0	0
Left Turn	1	50	2	33.3

36 months to 31 December 2007

4.9.17 From Table 4.9:

- Although 33.3% (2 out of 6) of the collisions at the junction of Euston Road Pancras Road involved pedestrians, there were no common factors. One of these collisions resulted in a fatality which occurred when a pedestrian crossed the road into the path of a south-westbound vehicle on Euston Road. The second of the pedestrian collisions at this junction occurred when a goods vehicle turned left into Belgrove Street and collided with a south-westbound pedestrian

4.9.18 Other issues identified:

- The only collision at this junction involving a cyclist took place when a goods vehicle turned left into Belgrove Street and collided with a south-westbound cyclist
- 33.3% (2 out of 6) of the collisions at the junction were rear-shunt accidents involving motor vehicles. One of these collisions involved eastbound vehicles whilst the other involved northbound vehicles
- The percentage of collisions at Euston Road/Pancras Road during wet or dark collisions is not cause for concern as only one collision occurred under each condition

York Way/Wharfdale Road

4.9.19 A breakdown of the collisions (and the percentage of the total for the junction) which occurred at this junction has been summarised below.

Table 4.10: Collision type at York Way/Wharfdale Road

	Pedestrian		All collisions	
	No.	%	No.	%
KSI	0	0	0	0
Pedal Cycle	0	0	1	50
Wet	0	0	0	0
Dark	0	0	1	50
Right Turn	0	0	0	0
Left Turn	0	0	1	50

36 months to 31 December 2007

4.9.20 Only two personal injury collisions occurred at this junction during the 36 month study period. One of these collisions involved a pedestrian in the road who was hit by a bus as a result of failing to look properly when crossing the road, and resulted in slight injury[7], and the only other collision at this junction involved a pedal cyclist colliding with the rear of a vehicle at the junction as they both turned left and occurred during hours of darkness. The contributory factors to this collision were that the cyclist was 'impaired by alcohol' and the bicycle had 'defective brakes'.

4.9.21 There is therefore little which can be concluded from so few collision records, other than that the junction would not be a high priority in the area at this time.

[7] which occurred during daylight when the road surface was dry and did not involve a turning vehicle

5 Fruin Analysis

5.1.1 A Fruin analysis as undertaken on the key pedestrian locations within the study area. Full details of this analysis can be found in the Interim Report.

5.1.2 Pedestrian flows were counted Thursday 5th June 2008 in the following time periods:

- AM peak 07:00 – 10:00
- Inter peak 12:00 – 14:00
- PM peak 16:00 – 19:00

5.1.3 The Fruin analysis has been conducted in order to identify the pedestrian Level of Service encountered at the crossings as well as at key entry /exit points to St Pancras International and the key conclusions from this analysis are summarised in the following paragraphs.

5.2 Poor crossing geometry

5.2.1 The major junctions all have a layout that is oppressive to pedestrian movement. The major areas of concern are:

- Pentonville Road /Caledonian Road – no crossing on arm of Pentonville Road east
- Pancras Road/Euston Road – no crossing on arm of Euston Road east
- A very illegible crossing layout for pedestrians trying to orientate themselves outside King's Cross Station
- Very staggered crossings causing deviation from the desire line at the junctions of Euston Road with Pancras Road and Midland Road

5.3 Congested footways and crossings

5.3.1 There are a number of points where pedestrian movement is inhibited by congestion:

- Pentonville Road/Caledonian Road - the major problem at this junction is the lack of space for pedestrians waiting to cross Caledonian Road in both directions
- Pentonville Road/York Way – severe congestion occurs on the York Way crossing, on the York Way crossing island, and the waiting area on the corner outside McDonalds
- Euston Road/Pancras Road – the staggered crossings are characterised by congestion, high levels of informal crossing and crossing at red (in particular at locations hidden from the vehicle sightlines)
- Euston Road/Midland Road – severe congestion occurs on the Euston Road east crossing island. Crowding can also occur for pedestrians crossing Midland Road as well as Judd Street

5.3.2 Most of these issues could be addressed by the provision of wider crossings, more waiting space where required, the removal of large staggers and improving sightlines (e.g. through the removal of guard rail).

5.4 St Pancras International exits

5.4.1 The stairs from the LUL ticket hall to King's Cross forecourt are extremely congested, and regularly reach Level of Service (LoS) E (See Table 4.1 of the Interim Report for LoS definitions). Following the opening of the Western ticket hall some of this congestion may be relieved but it is worrying in the short-term. The peak time congestion at this exit is of

particular concern since it does not allow for significant employment growth in the area immediately to the east of King's Cross.

6 Traffic Analysis

6.1.1 Traffic surveys have been carried out on 3 June 2008 capturing both turning counts and queue length measurements at key sites in the study area. The detailed traffic analysis can be found in the Interim Report.

6.1.2 The traffic surveys were conducted in the following time periods:

- AM peak 07:00 – 10:00
- Inter peak 12:00 – 14:00
- PM peak 16:00 – 19:00

6.1.3 Traffic analysis has been carried out to assess the accuracy of traffic flow predictions made in preparation for the opening of St Pancras International Station in November 2007. The SALT-C model was used to predict flows for the Kings Cross area.

6.1.4 In addition, the traffic analysis has been used to identify existing traffic (including cyclists) movements through the Kings Cross area and also to identify the pattern of traffic queuing at sites identified above.

6.1.5 The comparison of predicted flows with observed flows indicates that predicted flows for the main movements (Euston Road both directions) are approximately 5% and 15% higher than observed flows.

6.1.6 Junctions, such as York Way/Goods Way and Goods Way/ Midland Road, are much lower with observed flows being about 50% lower for some of the movements.

6.1.7 For queue lengths, it has been found that following key junctions have queuing issues with average queues higher than 75 m for some of the movements:

- Grays Inn Road/Euston Road Junction - the Grays Inn Road approach is extremely congested in both AM and PM (typically in excess of 75m)
- York Way/Goods Way Junction – the York Way Northbound approach has long queues in the AM
- Caledonian Road/Pentonville Road Junction –the Caledonian Road Southbound approach has long queues in the AM
- Euston Road/Pancras Road Junction – a long queue occurs in the AM on the Euston Road Westbound approach to Pancras Road
- Euston Road (both sides) –congestion has been observed in both the AM and PM on the main Euston Road approaches

6.1.8 From survey results, it has been found that the percentage of cyclists compared to other traffic is not very high although there are still quite a lot of cyclists on the network, particularly on Euston Road (both directions).

7 Base Models

7.1 The Peak Hours

7.1.1 Base models for the study area have been developed in LINSIG, TRANSYT and VISSIM for the AM peak, the inter peak and the PM peak. The time periods were selected by CB following the analysis of traffic volumes along the network throughout the day. The analysis determined that the AM peak hour is between 8am and 9am, inter peak hour is between 12.45pm and 13.45pm, and the PM peak hour is between 6pm and 7pm.

7.2 Signal Timings

7.2.1 Currently, the area of Kings Cross is divided into three regions with regard to SCOOT signal control. These are regions 008, 418 and 506. Region 506 operates an 80 seconds cycle time all day while region 008 operates 88 seconds during the AM peak and 96 seconds during the Off peak and PM peaks, and region 418 operates 88 seconds during the AM peak, 80 seconds during the Off Peak and 72 during the PM peak.

7.2.2 To gather signal timings from the SCOOT system, M16 messages were used to estimate stage lengths and offsets. The average SCOOT stage points for the peak hours were obtained and converted to UTC pulse points. It is necessary to choose the mode average cycle time for the region and then manually intervene at each node to take the mean average SCOOT stage points for those timings using that mode cycle time.

7.2.3 It will then require manual intervention to solve the pulse point wraparound time issue (i.e. where the pulse point is either at the beginning of the cycle (close to zero) or at the end of the cycle (close to the maximum cycle time) and to resolve any differences between the UTC stage and SCOOT stage in order to derive the correct UTC pulse points for any base modelling.

7.2.4 After this calculation, all the signal timings were extracted from the M16 sheet. The fixed timings were used in the LINSIG. Further analysis was carried out using the ACHK data to investigate demand dependent stages. These demand dependent stages were modelled in VISSIM using the VISVAP Program.

7.2.5 A spreadsheet can be provided to explain the full process, and is available on request.

7.3 LINSIG Base Models

7.3.1 LINSIG V2 was selected to assess the impact of implementing options at individual junctions. LINSIG is specifically designed to model isolated signalised junctions, so it was used to assess the capacity of the junctions and provide the method of control for use in other software packages, for example VISSIM.

7.3.2 To test the proposals, four LINSIG models were created:

- 02/017 Euston Road/Midland Road Junction
- 02/018 Euston Road/Pancras Road Junction
- 02/021 & 02/193 Euston Road/York Way/Gray's Inn Road Junction
- 02/049 Caledonian Road/Pentonville Road Junction

7.3.3 The base models were built using the existing junction layout and method of control and observed flows which were described in Chapter 3 of this report. As LINSIG lacks the

capability to model variable signal timings, fixed cycle times and stage sequences were adopted in the models.

7.3.4 LINSIG has some limitations. The software assumes all traffic arrives uniformly and it does not take into account the random nature of driver behaviour. Therefore VISSIM was used in tandem with LINSIG in this study to examine the effects in more detail. VISSIM models are described in Section 7.5 VISSIM Modelling.

7.3.5 The modelling layout for 02/017 Euston Road/Midland Road Junction is illustrated in Figure 7.1 below.

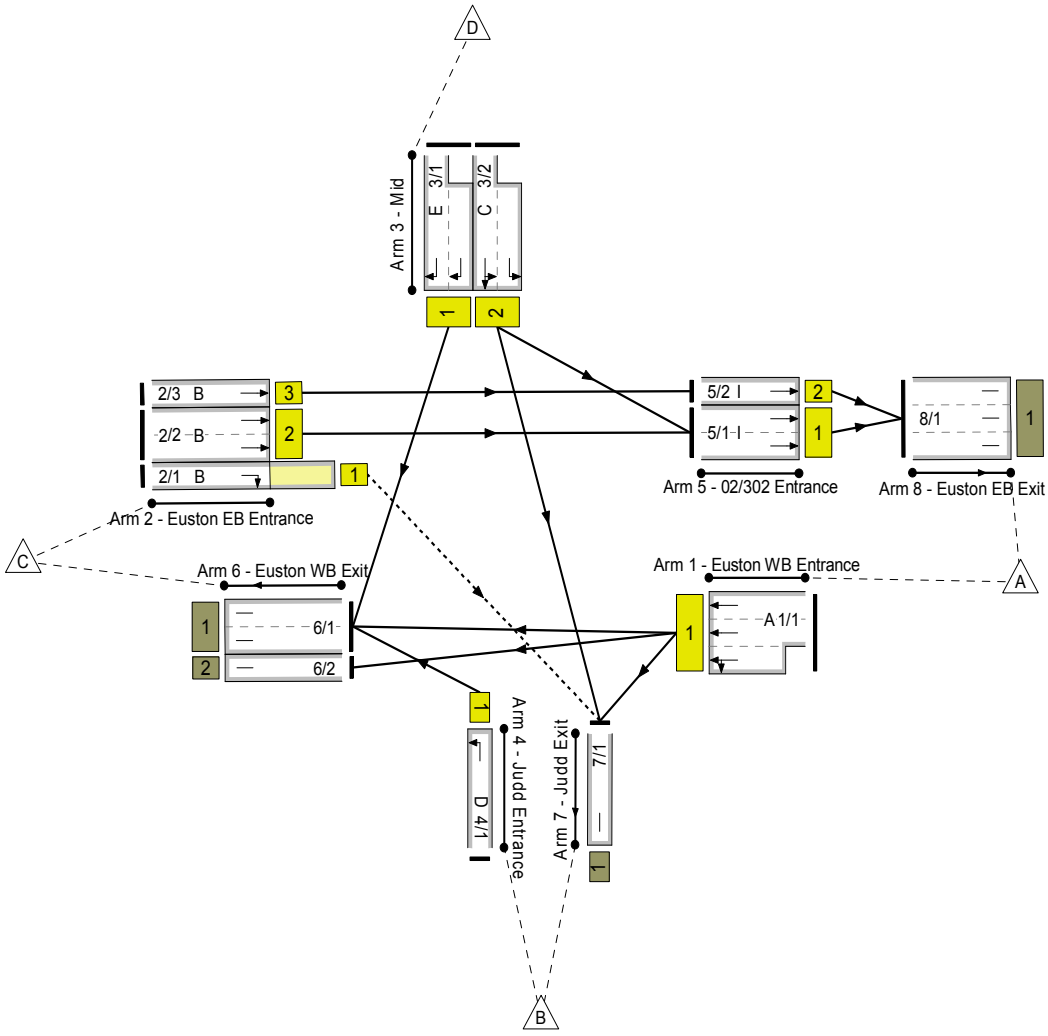


Figure 7.1: 02/017 Euston Road/Midland Road Junction LINSIG Layout

7.3.6 Further details about this base model have been included in the Kings Cross Traffic Modelling Technical Note, in Appendix B.

7.3.7 The modelling layout for 02/018 Euston Road/Pancras Road Junction is illustrated in Figure 7.2.

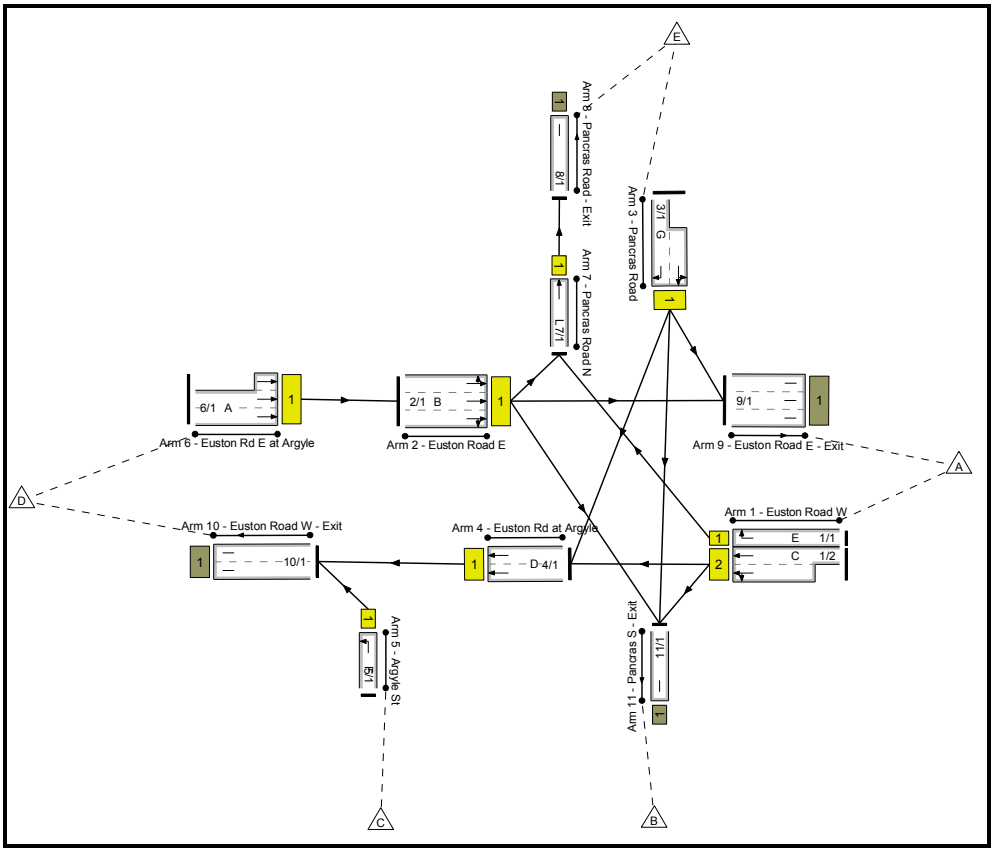


Figure 7.2: 02/018 Euston Road/Pancras Road Junction LINSIG Layout

7.3.8 Further details about this base model have been included in The Modelling Technical Note in Appendix B.

7.3.9 The modelling layout for 02/021 & 02/193 Euston Road/York Way/Gray's Inn Road Junction has been included in Figure 7.3.

7.3.10 More information about this diagram can be found in Appendix B.

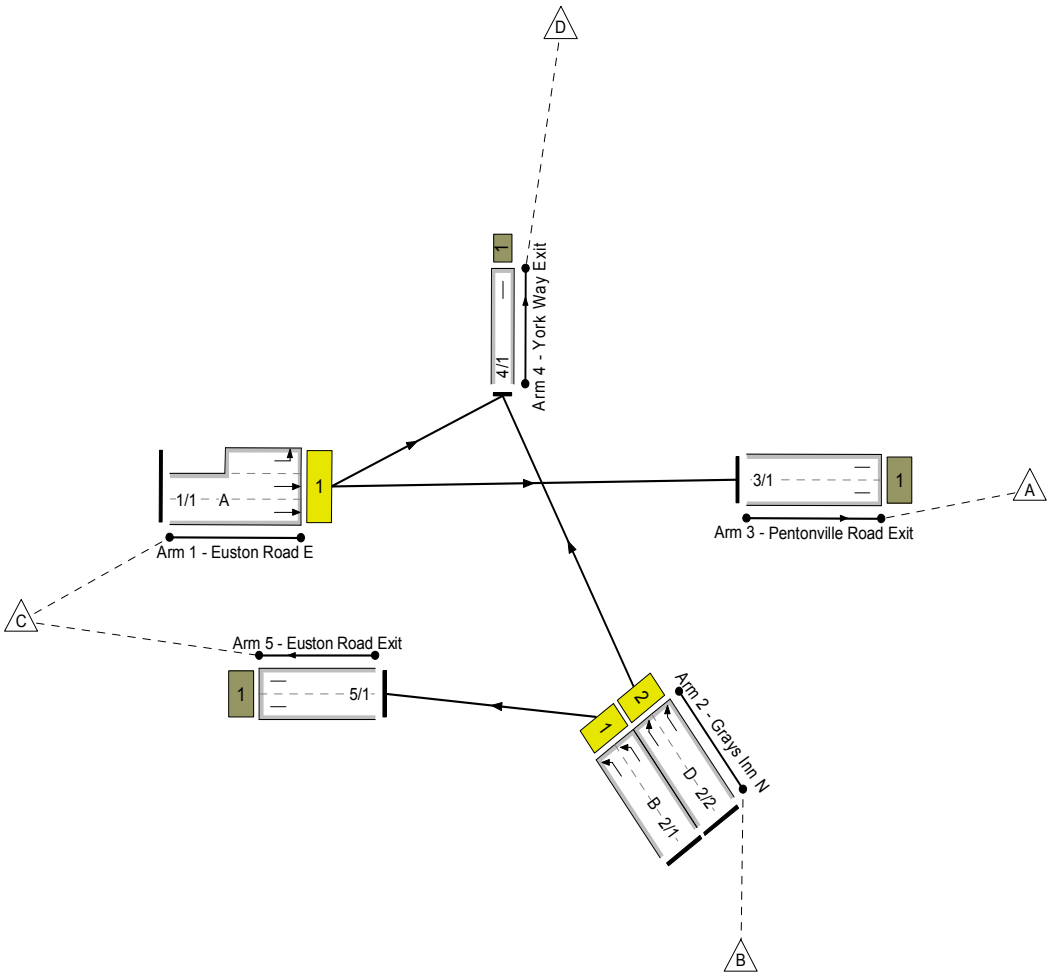


Figure 7.3: 02/021 & 02/193 York Way / Gray' Inn Road Junction LINSIG Layout

7.3.11 The modelling layout for 02/049 Caledonian Road/Pentonville Road Junction is included in Figure 7.4.

7.3.12 Further details about this have been included in Appendix B.

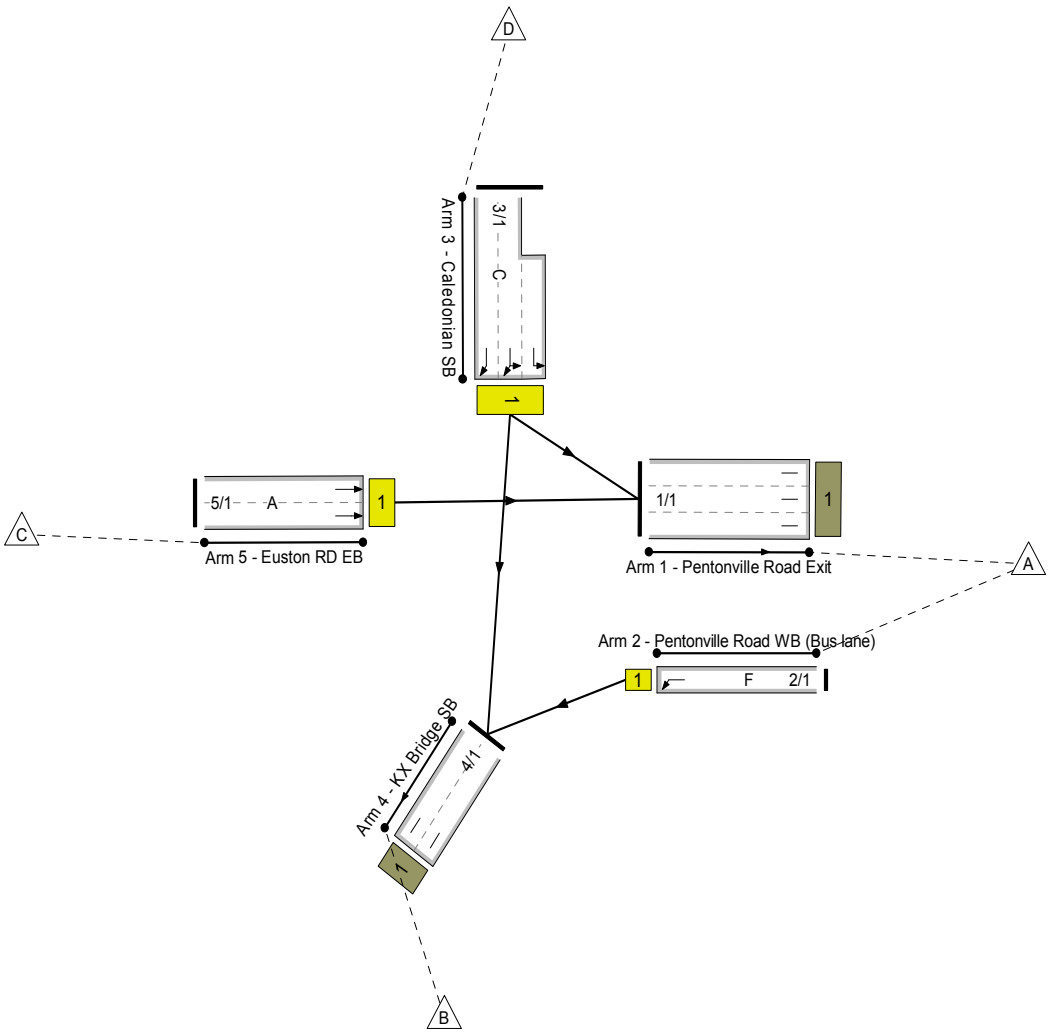


Figure 7.4: 02/049 Caledonian Road/Pentonville Road Junction LINSIG Layout

7.4 Queue Lengths

7.4.1 As seen from Table 5.1 to 5.4 in Appendix B, the LINSIG base models for the four junctions showed a good representation of measured queue lengths. Therefore the base models can be used to test the options in VISSIM.

7.5 VISSIM Modelling

Background

7.5.2 VISSIM is a general-purpose traffic simulation software package that can be used to analyse signal controlled intersections, roundabouts, priority junctions and advanced traffic control management measures in a single network and to a high level of detail. The simulated driver behaviour is based on lane changing and vehicle following models and provides an accurate reflection of actual driver behaviour. It was a requirement of TfL that the model be undertaken using VISSIM 4.3.

Model Definition

7.5.3 The model runs in three distinct time periods, the AM peak, the inter peak and the PM peak. For the purposes of reporting, each period is defined as being one hour in duration.

7.5.4 In addition to the time periods defined above, the model also has a fifteen minute warm-up and a 15 minute cool-down period. This ensures that when the reporting period begins there is sufficient traffic in the model for there to be realistic junction and link delays from the outset. Hence the model runs for a total of 5,400 seconds in each time period.

7.5.5 The model runs at 5 time steps per simulation second in accordance with TfL Modelling Guidelines. This means that drivers are able to make behavioural decisions every 0.2 seconds within the simulation.

7.5.6 The model was built using the latest DTO VISSIM template, so that all the essential parameters were adjusted for central London driving behaviour.

Network

7.5.7 The traffic network for the VISSIM model is shown in Figure 7.5. The basic network was coded by using a detailed CAD plan of the study area. This provided a good level of initial accuracy which was supplemented by aerial photography and site visits.

Figure 7.5: Kings Cross Base VISSIM Model Network Layout

Model Assignment and Model Matrices

7.5.8 Following discussion with DTO, the method of static assignment was adopted in this VISSIM model. A zoning system has been developed for the area covered by the VISSIM model. The zoning system can be found in Figure 6.1, Appendix B.

7.5.9 To represent the taxi flow correctly, two separate routing decision systems were developed, one for taxi only, and one for all the other traffic. The basic vehicle types used in the model are cars, taxis, MGVs and HGVs.

7.5.10 Micro simulation models require detailed trip matrices in order to simulate individual vehicle movements through the network in each time period. 2008 survey data was used for all the junctions.

7.5.11 A special ME2 process was used to create flow matrices from the turning counts survey. This ME2 process has been approved for previous projects.

7.5.12 The individual routing decisions, flow inputs and traffic compositions were created for different time periods to ensure the accuracy of traffic.

Model Calibration and Validation Introduction

7.5.13 Transport for London (TfL) has set validation criteria to ensure a VISSIM model represents the base year conditions to an acceptable standard. These criteria are set out in the DTO Modelling Guidelines document. They should demonstrate:

- Good comparison between observed and modelled flows across the study area
- Good comparison between observed and modelled journey times through the study area

7.5.14 Modelled flows are required to have a GEH value of less than 5.0. The GEH value is a form of the CHI-squared statistic and shows the goodness of fit between modelled and observed data. It is defined as:

$$GEH = \sqrt{\frac{(M-C)2}{(M+C)/2}}$$

Where M is the modelled flows and C is the observed flows

7.5.15 TfL guidance further suggests that the modelled saturation flows should be within 10% of the observed values.

7.5.16 In addition to this the DMRB guidance on observed and modelled journey times requires that the journey time routes should have times within 15% of their observed values.

Model Calibration and Validation Results

7.5.17 Most of the saturation flow calculations from VISSIM matched observed measurements according to TfL guidance. All the details can be found in the Modelling Technical Note Appendix B. The calibration results indicate that both the flow volumes and the saturation flows in the model are acceptable and that the model can be taken forward to the validation stage.

7.5.18 The results of the flow validation are summarised for both time periods in Table 7.1.

Table 7.1: Traffic Flow Validation Results

Criteria	AM Peak	Inter peak	PM Peak
GEH < 5	100%	100%	99%

7.5.19 Table 7.1 shows that in all the peak periods the GEH criteria are met and exceeded by the model. The traffic flows were fully validated in the VISSIM base model.

7.5.20 For journey time validation, the process compares surveyed journey times through the network with equivalent modelled outputs. Tables 7.2 to 7.4 show the overall travel time results for each route and for each modelled time period.

Table 7.2: AM Journey Time Validation Results

Route	Measurement (s)	Base Model (s)	Difference (s)	Percentage	TFL Validate
Euston eastbound	148.9	141.8	-7.1	-5%	Yes
Kings Cross eastbound	60.9	63.1	2.2	4%	Yes
Kings Cross westbound	185.5	169.1	-16.4	-9%	Yes
Euston westbound	109.8	107.7	-2.1	-2%	Yes
York Way northbound	85.3	92.2	6.9	8%	Yes
Goods Way westbound	77.4	78.0	0.6	1%	Yes
Midland Road southbound	125.3	120.5	-4.8	-4%	Yes
Pancras Road northbound	96.5	95.5	-1.0	-1%	Yes

Table 7.3: IP Journey Time Validation Results

Route	Measurement (s)	Base Model (s)	Difference (s)	Percentage	TFL Validate
Euston eastbound	175.6	155.0	-20.6	-12%	Yes
Kings Cross eastbound	64.4	67.5	3.1	5%	Yes
Kings Cross westbound	142.9	128.9	-14.0	-10%	Yes
Euston westbound	93.8	91.1	-2.7	-3%	Yes
York Way northbound	72.0	80.4	8.4	12%	Yes
Goods Way westbound	76.6	76.0	-0.6	-1%	Yes
Midland Road southbound	123.1	122.6	-0.5	0%	Yes
Pancras Road northbound	88.5	93.7	5.2	6%	Yes

Table 7.4: PM Journey Time Validation Results

Route	Measurement (s)	Base Model (s)	Difference (s)	Percentage	TFL Validate
Euston eastbound	158.4	142.6	-15.8	-10%	Yes
Kings Cross eastbound	78.2	73.1	-5.1	-6%	Yes
Kings Cross westbound	133.1	146.3	13.2	10%	Yes

Euston westbound	80.2	86.9	6.7	8%	Yes
York Way northbound	76.2	79.1	2.9	4%	Yes
Goods Way westbound	76.4	81.3	4.9	6%	Yes
Midland Road southbound	107.8	122.4	14.6	14%	Yes
Pancras Road northbound	106.6	102.7	-3.9	-4%	Yes

7.5.21 All of the 24 datasets have been validated in accordance with TfL guidance and the journey time results are very good. Therefore, it can be assumed that the base VISSIM models were fully validated for the journey time criteria.

Conclusions

7.5.22 Finally, the calibration and validation results of the Kings Cross base model have shown that it provides a robust representation of the traffic situation in the study area. Consequently, base models can be used to test the proposed schemes.

8 Original Proposed Options

8.1 Junction of Euston Road/York Way/Pentonville Road/Gray's Inn Road

8.1.1 The accident analysis has identified the following issues of concern for this junction:

- 70% (7 out of 10) of the pedestrian collisions at this junction occurred during the hours of darkness indicating that the street lighting at the junction may be inadequate
- Two (20%) of the pedestrian collisions at the junction involved left-turning vehicles bound for York Way from Euston Road disobeying the traffic signals and colliding with eastbound pedestrians who were using the crossing facility. Both of these collisions occurred during the hours of darkness
- Contributory factors to the collisions involving pedestrians at this junction include incorrect use of the crossing facilities and stepping out in front of vehicles
- 60% (6 out of 10) of the collisions involved east or westbound pedestrians whilst the remaining 40% (4 out of 10) involved north or southbound pedestrians

8.1.2 The FRUIN analysis has identified that the northern crossing island can reach LoS Level E at which there is generally discomfort. This is one reason why the rates of informal crossing go up during the PM peak.

8.1.3 Pedestrians waiting to cross York Way westbound regularly block the footway area at the corner of Pentonville Road and York Way. This can occur very frequently at the peak of the cycle in the PM peak.

8.1.4 Taking into consideration the above concerns, two options were investigated for the junction of Euston Road/York Way/Pentonville Road/Gray's Inn Road. The first being an option to install a straight across crossing on the York Way arm on the junction and the second being an option to convert York Way to two-way traffic flow.

8.1.5 For both options at this junction it has been assumed that the widening of Euston Road on the south side of the road from Birkenhead Street to Pancras Road would be completed. This widening also requires the closure of Birkenhead Street at its junction with Euston Road.

8.1.6 The space gained from widening Euston Road will allow an additional lane westbound along Euston Road from Gray's Inn Road to Pancras Road. It will also allow the three Euston Road eastbound lanes to be widened to three metres. This has been reflected in the proposed designs and modelling for both options at this junction.

OPTION 1: York Way Straight Across Crossing

8.1.7 It has been identified that improvements to the layout of the pedestrian crossing on the north arm of the junction of York Way/Pentonville Road/Gray's Inn Road would have great benefits for pedestrians travelling around the junction.

8.1.8 Currently pedestrians wanting to cross to or from the northwest corner (where the entry to Kings Cross/Street Pancras stations is located) to any other point around the junction they must use the pedestrian island in the centre of the north arm of the junction. As there

are high pedestrian flows around this junction, due to its close proximity to the rail and underground stations, this island is too small to accommodate all of the waiting pedestrians during the peak periods.

8.1.9 Further to this, pedestrians wishing to cross between the southwest corner and the northwest corner of the junction are required to cross three separate staggered crossings. This is a long and time consuming crossing layout for pedestrians.

8.1.10 The FRUIN analysis undertaken in the pervious stage of this study has highlighted that the current footway space on the northeast corner of the junction is insufficient for the number of pedestrians that wait here in the peak periods.

8.1.11 With the aim to improve the crossing facilities for pedestrians, especially on the York Way approaches to the junction, the design parameters for Option 1 were set as:

- Convert the staggered pedestrian crossing on the north arm of junction to a straight across crossing
- Remove the existing central island on the north arm
- Retain York Way as one-way southbound
- Retain all existing permitted traffic movements
- Consideration should be given to the size of islands, width of crossing and other obstructions for pedestrians

8.1.12 Considering these design parameters, the following changes are recommended at the junction as part of our proposal for Option 1

York Way Approach	• Removal of central pedestrian island • Widening of the footway on the east side by 2m • Widening of the footway on the west side by 5m • Install a straight across crossing 10m in length
Gray's Inn Road Northbound Approach	• Straight ahead lanes shifted 2m to the west to allow the footway buildout on the northern arm
Euston Road westbound approach	• Change of signal control to a straight ahead filter to allow the removal of left turn lane • Relocation of the westbound bus stop east by approximately 10m to allow additional storage capacity at the junction
Junction	• Widening of all pedestrian crossings to 5m

8.1.13 These changes are illustrated in drawing 137971/OS/003 in Appendix C of this report.

8.1.14 The benefits of Option 1 are:

- Simplification of the pedestrian crossing facilities on the north arm of the junction including the removal of the central island to improve safety and the capacity of the crossing for pedestrians
- Simplification of the pedestrian crossing facilities for pedestrians crossing between the northeast and southeast corners from three crossings to two, which will reduce the time and distance for pedestrians to complete the crossing
- Widening of the pedestrian footway on the northeast corner of the junction to help with over crowding of waiting pedestrians crossing westbound

8.1.15 The following issues have been identified with Option 1:

- The eastbound bus stop on Euston Road just west of the junction will need to be relocated west of its current location by approximately ten metres. This will require consultation with appropriate bus stakeholders
- The use of a straight ahead filter on the Euston Road west approach to the junction can cause confusion for pedestrians if they attempt to cross when the nearside lane is held on red and the outside lanes have a green ahead arrow. It is not expected to cause safety concerns at this junction, however, it is recommended that a safety audit be carried out at the next stage of design to ensure that the approach is marked and signed correctly
- The proposal will require changes to the signal phasing at the junction which may impact on the capacity of the junction. This is investigated in the next section of the report
- A splitter island is required on Euston Road by DTO to separate left turning traffic from straight ahead traffic, or dispensation from these requirements needs to be obtained

Modelling Option 1

8.1.16 Option 1 has been modelled in both LINSIG and VISSIM to determine how the option will operate if implemented.

8.1.17 It should be noted that TRANSYT has not been used in the assessment of this option or any other option for any junction. This is due to the fact that base TRANSYT models were being audited at the time of carrying out the assessment of the proposals. It was decided to use LINSIG to get optimised signal timings. However, LINSIG can not provide Offset optimisation; therefore, existing offsets obtained from SCOOT data were used. This should be sufficient at this stage of the scheme development. TRANSYT will be used in the detailed design stage of the schemes and part of the information package if these schemes will be submitted to Network Assurance.

8.1.18 All the intergreens have been re-calculated to match the standard SQA64. A new method of control of this junction was developed in the proposed model. The existing offsets between the main traffic streams were retained.

8.1.19 To give the straight crossing on York Way and keep the capacity for the junction, a filter arrow phase was added to the method of control. The filter is an ahead only filter, and the left turn traffic will be held to wait for the following full phase.

8.1.20 The modelling layout diagram for Option 1 is illustrated in Figure 8.1.

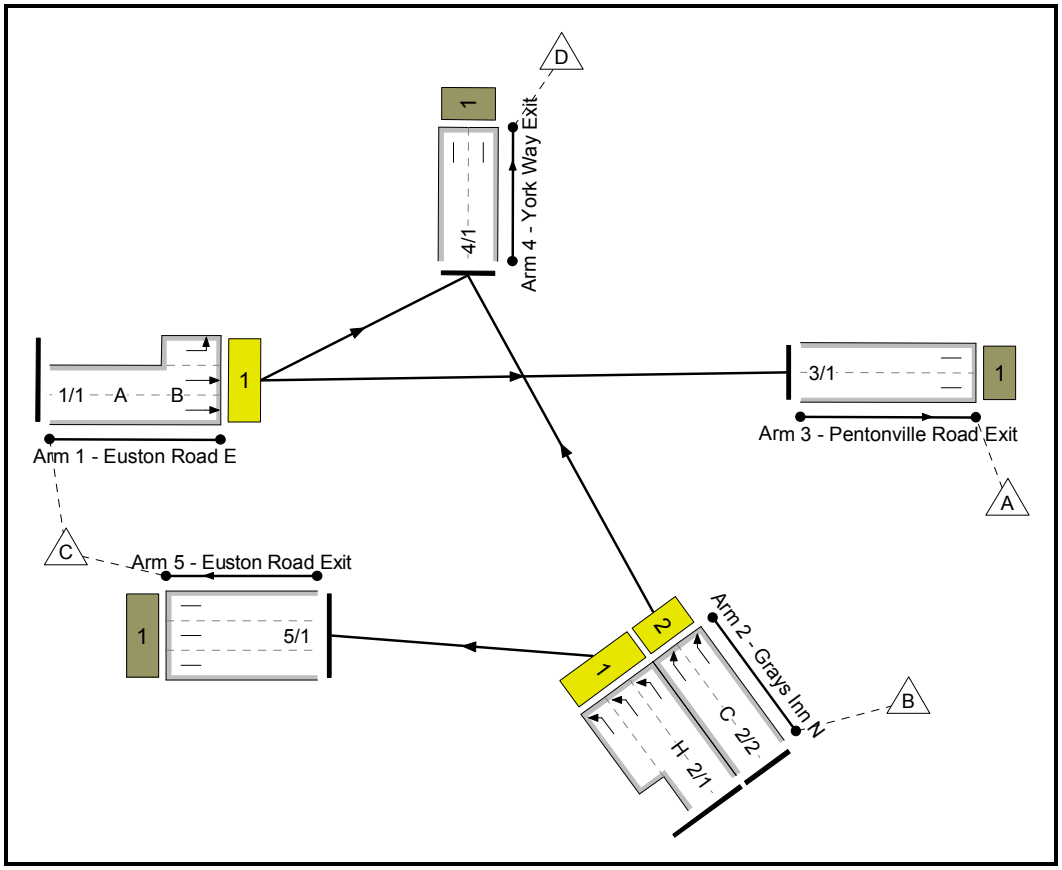


Figure 8.1: Junction 02/021 New Layout Diagram

8.1.21 The Phase Diagram for the new layout for Option 1 is shown in Figure 8.2.

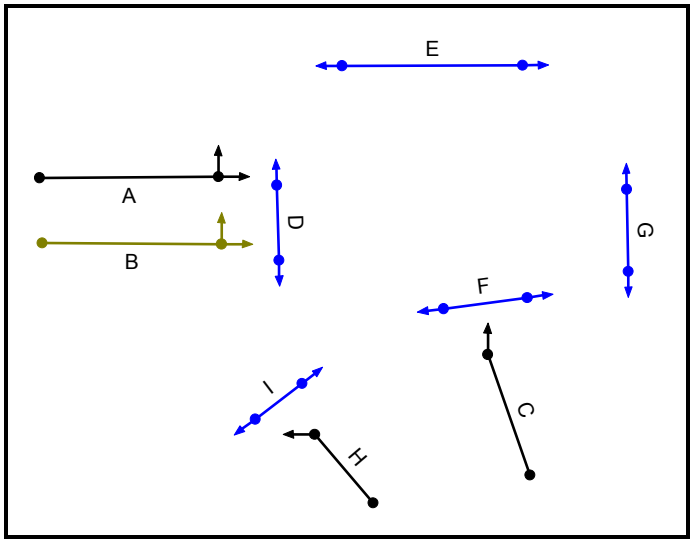


Figure 8.2: Phase Diagram for 02/021 new layout

8.1.22 The degree of saturation results from the LINSIG model have been summarised for the different links in Table 8.1 below.

Table 8.1: New 02/021 Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road east ahead left	A	64.5	69.9	73.7
Grays Inn north left	H	72.9	67.8	65.8
Grays Inn north ahead	C	64.1	66.7	72.5

8.1.23 The LINSIG results are very encouraging. Generally, there should not be any capacity issues as all the links are under a 75% degree of saturation

8.1.24 Option 1 was then modelled in VISSIM. A journey time comparison with the base model is shown in Table 8.2.

Table 8.2: Journey Time Comparison for Option 1

Route	AM		IP		PM	
	Difference (s)	Percentage	Difference (s)	Percentage	Difference (s)	Percentage
Euston eastbound	-1.6	-1%	2.1	1%	3.3	2%
Kings Cross eastbound	-0.9	-1%	-0.6	-1%	-0.2	0%
Kings Cross westbound	-65.1	-38%	-9.9	-8%	-34.9	-24%
Euston westbound	-4.6	-4%	-12.4	-14%	-0.4	0%
York Way northbound	6.3	7%	0.5	1%	-1.9	-2%
Goods Way westbound	-0.4	-1%	0.0	0%	-1.2	-1%
Midland Road southbound	-0.4	0%	-0.9	-1%	-0.8	-1%
Pancras Road northbound	-1.1	-1%	1.2	1%	0.7	1%

8.1.25 The VISSIM confirmed the positive results. The Euston EASTBOUNDtraffic had very similar journey times when compared with the base. Furthermore, the Kings Cross westbound and Euston westbound traffic benefits a lot from the extra third lane on Euston Road westbound and the two lanes exit on York Way, especially for Kings Cross westbound AM. (65 seconds (38%) saving). On the other hand, the York Way northbound has a slight delay caused by the shorter green time for the left turning traffic from Euston eastbound to York Way.

8.1.26 In summary, a straight crossing could be introduced without a significant impact to traffic.

OPTION 2: York Way Two-way Option

8.1.27 Currently vehicles travelling southbound along York Way must turn left down Wharfdale Road and then down Caledonian Road to reach Pentonville Road.

8.1.28 To allow direct access from York Way to Euston Road and Pentonville Road, Option 2 for the junction of York Way Euston Road/Pentonville Road converts York Way to two-way traffic flow from Wharfdale Road to Euston Road.

8.1.29 To achieve this, the design parameters for Option 2 have been outlined as:

- Convert York Way to two-way working from Wharfdale Road to Pentonville Road
- Investigate an option where all vehicles permitted and one with buses only
- Both left and right turns are to be allowed from York Way
- Gray's Inn Road approach to York Way to be reduced to a single traffic lane
- Retain controlled pedestrian facilities on all arms of the junction

8.1.30 The key changes made to the junction as part of our proposal for Option 2 are

Junction	• Removal of the island in the centre of the junction to facilitate the left and right turning movements from York Way • Widening of all pedestrian crossings to 5m
York Way Approach	• Create two-way traffic flow along York Way allowing both the left and right turns from York Way • Remove central pedestrian island • Install a straight across crossing 11m in length • Widening of the footway on the west side by 2m
Gray's Inn Road Northbound Approach	• Reduction of the northbound lanes from two to one • Realignment of the approach to ensure no safety conflicts with vehicles turning from York Way
Euston Road Arm	• Change of signal control to a straight ahead filter fro eastbound traffic to allow the removal of left turn lane • Relocation of the westbound bus stop east by approximately 10m to allow additional storage capacity at the junction • Install staggered pedestrian crossing • Widening of the median island along Euston Road to accommodate new staggered pedestrian crossing • Install internal stop line before the pedestrian crossing on the westbound lanes

8.1.31 These changes are illustrated in drawing 137971/OS/004 in Appendix C of this report.

8.1.32 The benefits of Option 2 are:

- Increased access from York Way due to the new two-way working arrangement with potential bus journey time savings for bus routes using this link
- Simplification of the pedestrian crossing facilities on the north arm of the junction including the removal of the central island to improve the safety and the capacity of the crossing for pedestrians
- The new staggered pedestrian crossing on the Euston Road arm of the junction will provide a more direct crossing route between the northwest and the southwest corners of the junction

8.1.33 The disadvantages of Option 2 are:

- Gray's Inn Road is reduced to a single lane northbound which will reduce the capacity of this arm of the junction
- The eastbound bus stop on Euston Road just west of the junction will need to be relocated west of its current location by approximately 10m. This will require consultation with appropriate bus stakeholders
- The westbound bus stop on Gray's Inn Road just east of the junction will need to be relocated further eastwards. This may not be achievable as the bus stop will need to be located a suitable distance northwest from junction with Kings Cross Bridge to ensure that the buses turning right from Kings Cross Bridge into Gray's Inn Road can stop at this bus stop.
- To incorporate the two-way traffic movement on York Way the signal phasing at the junction will need to be modified to include an additional phase. This additional phase is likely to reduce the capacity of the junction. This is investigated in the next section of this report
- A splitter island is required on Euston Road by DTO to separate left turning traffic from straight ahead traffic, or dispensation from these requirements needs to be obtained
- The widening of Euston Road westbound would be required to maintain three lanes and allow enough road space for the installation of the staggered pedestrian crossing on Euston Road (eastern arm)

8.1.34 In the design of this junction CB were asked to consider two options one with all vehicles allowed southbound along York Way and another where it is buses only. Both these options have been modelled and discussed in the next chapter of this report. However the modelling has shown that both options have the same results as the volume of vehicles is so low that the stage for the southbound traffic runs on green and intergreen minimums in both scenarios. Therefore it will make no impact on the operation of the capacity of the junction if York Way southbound is all vehicles or restricted to buses only.

Modelling Option 2

8.1.35 Option 2 has been modelled in LINSIG to determine if the changes proposed will operate at a satisfactory level.

8.1.36 All the intergreens have been re-calculated to match the standard SQA64. A new method of control at this junction was developed in the proposed model. The existing offsetts between the main traffic streams were retained.

8.1.37 To provide a straight crossing on York Way and maintain capacity at the junction, a filter arrow phase was added to the method of control. The filter is an ahead only filter, and the right turn traffic will be held for the following full phase.

8.1.38 A traffic phase for York Way southbound was introduced in the method of control, and an assumption was made to assign a 100PCU flow for the York Way southbound during the peak period. (50PCU for left turn and 50PCU for right turn). The Gray's Inn road northbound was reduced from two lanes to one lane.

8.1.39 The modelling layout diagram from LINSIG for the two way option has been included in Figure 8.3.

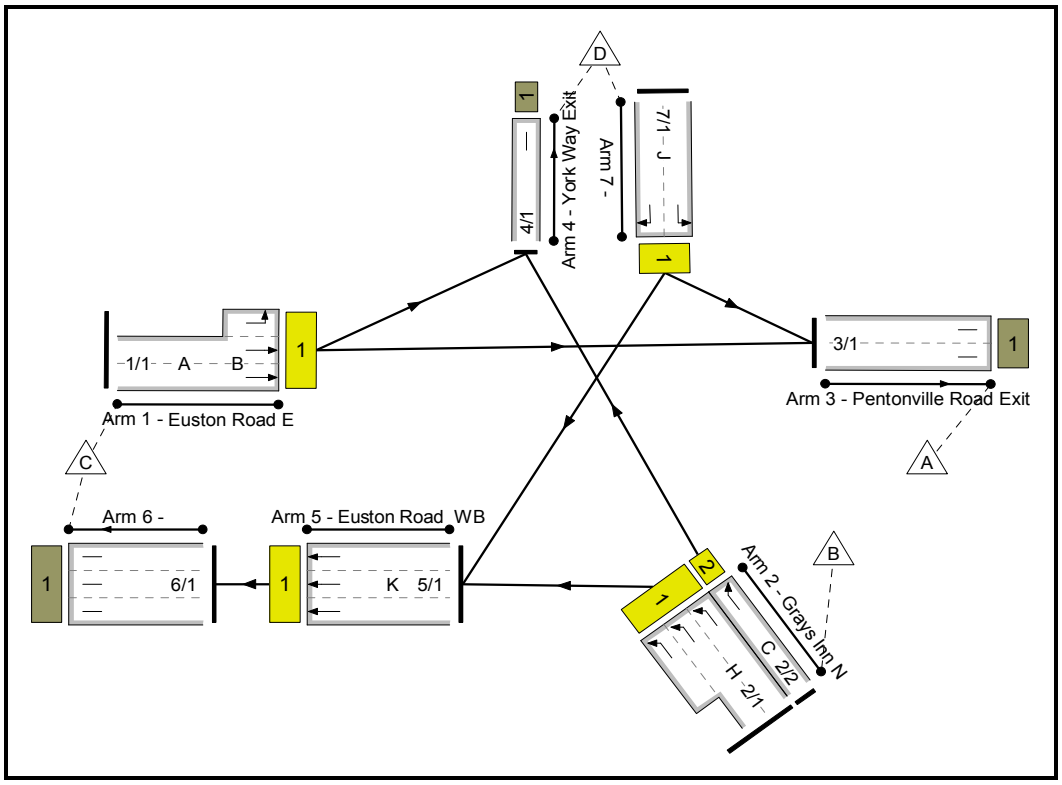


Figure 8.3: Junction 02/021 Two Way New Layout Diagram

8.1.40 The new phase diagram for Option 2 has been included in Figure 8.4.

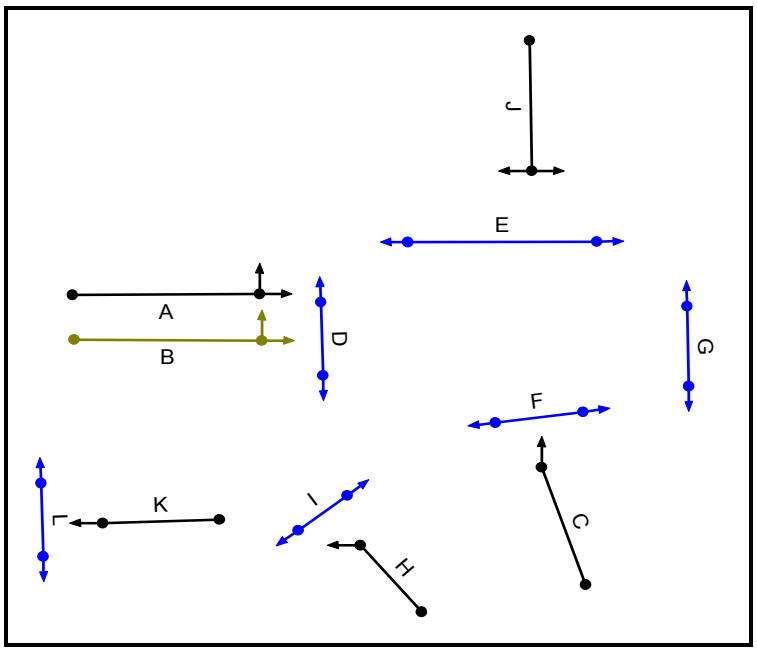


Figure 8.4: Phase Diagram for 02/021 two way new layout

8.1.41 From the LINSIG results, a summary of the degree of saturation from the results has been included in Table 8.3.

Table 8.3: New 02/021 Two Way Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road east ahead left	A	92.1	97.4	107.0
Grays Inn north left	H	57.7	56.8	55.1
Grays Inn north ahead	C	89.8	97.3	104.6
York Way southbound left right	J	22.9	24.9	24.9

8.1.42 Generally, the junction does not operate satisfactorily under the proposed conditions. From the LINSIG results, it is obvious to see that both the Euston Road eastbound and Gray's Inn Road northbound are over saturated. This is as a result of only one lane remaining for the Gray's Inn Road northbound coupled with the new York Way southbound phase taking green time from other movements.

8.1.43 The model above reflects the design changes discussed in an earlier section of this report which were based on the design parameters provided. However, it was noted that if the lane designation for York Way and the Gray's Inn Road were changed then this junction may operate at a reasonable level of service.

8.1.44 Option 2A would require Gray's Inn Road northbound to remain as 2 lanes, not reduced to 1. To achieve this, York Way southbound would be modified from 2 lanes, a separate left and right turn lane, to one combined lane.

8.1.45 CB did some preliminary modelling for Option 2A in LINSIG where all the conditions are the same as they were in the model for the York Way Two way one lane option. The only exceptions were the Gray's Inn Road northbound kept two lanes entrance and York Way southbound was reduced to one lane only.

8.1.46 The new junction layout diagram from LINSIG for Option 2A is included in Figure 8.5.

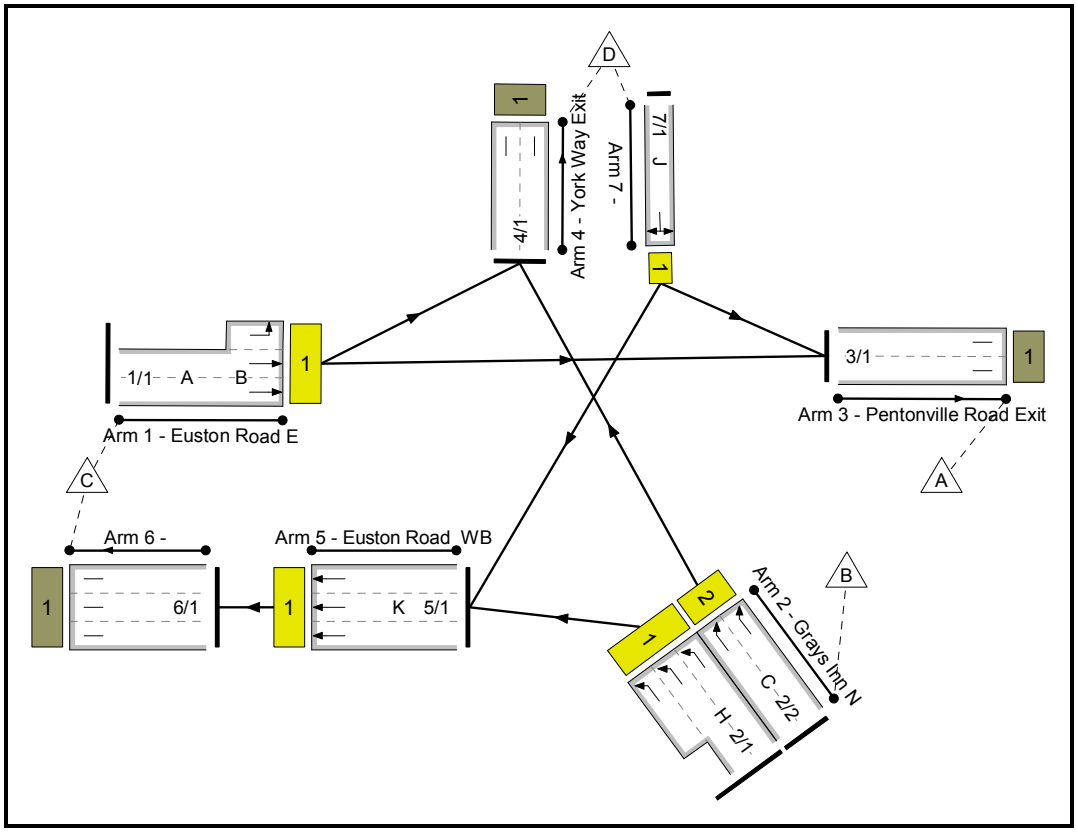


Figure 8.5: Junction 02/021 Option 2A Layout Diagram

The degrees of saturation from LINSIG for the links in Option 2A have been summarised in Table 8.4.

Table 8.4: New 02/021 Two Way Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road east ahead left	A	78.0	80.7	85.7
Grays Inn north left	H	56.9	56.1	54.4
Grays Inn north ahead	C	72.1	81.6	86.3
York Way southbound left right	J	51.8	56.5	56.5

8.1.47 From the LINSIG results, it is evident that Option 2A could work. For the AM and IP, there are no capacity issues. For the PM, Euston Road eastbound and Gray's Inn northbound there is just over an 85% degree of saturation. However, as these options were not part of the original design parameters it has not been taken any further. More detailed design and modelling would need to be undertaken for this option if it was being considered for implementation.

8.2 Junction of Pancras Road/Euston Road

8.2.1 The accident analysis has identified the following issues of concern for this junction:

33.3% (2 out of 6) of the collisions at the junction of Euston Road Pancras Road involved pedestrians. One of these collisions resulted in a fatality which occurred when a pedestrian crossed the road into the path of a south westbound vehicle on Euston Road.

The second of the pedestrian collisions at this junction occurred when a goods vehicle turned left into Belgrove Street and collided with a south-westbound pedestrian.

8.2.2 Other issues identified:

- The only collision at this junction involving a cyclist took place when a goods vehicle turned left into Belgrove Street and collided with a south-westbound cyclist
- 33.3% (2 out of 6) of the collisions at the junction were rear-shunt accidents involving motor vehicles. One of these collisions involved eastbound vehicles whilst the other involved northbound vehicles

8.2.3 The FRUIN analysis has shown that the staggered crossings at this junction are characterised by congestion, high levels of informal crossing and crossing at red (in particular at locations hidden from the vehicle sightlines).

8.2.4 Although there is no pattern of accidents involving pedestrians at this junction, the perceived problem and level of risk in crossing Pancras Road has been highlighted as part of the FRUIN analysis. Taking this into consideration, it has been identified that improvements are required to the pedestrian crossing on the Pancras Road arm of the junction. Currently there is a staggered crossing on this arm and as there is a high volume of pedestrians during the peak periods there is a high incidence of pedestrians not using the facilities correctly. The tendency is for pedestrians to cross straight across rather than use the formal staggered facilities.

8.2.5 Based on these observations the design parameters for the junction of Pancras Road/Euston Road were given as:

- Create a proposal where the controlled pedestrian crossing on the north arm of the junction is straight across
- Retain the centre pedestrian island
- Retain the existing phasing where this crossing operates in two separate phases as in the existing situation

8.2.6 The design parameters were reviewed in context with the existing junction design and it was determined that this was not a feasible option as it would not comply with the standards regarding staggered crossings. The Design of Pedestrian Crossings Local Transport Note 2/95 states that for pedestrian crossings over 15m in length, a staggered crossing must be provided and that the stagger needs to be off set by a minimum of three metres.

8.2.7 If this standard can not be met then a request for a departure from the standards should be made to TfL as the Highway Authority. However, the approval of a design outside the standard at this location is very unlikely due to the safety implications of a crossing of this type.

8.2.8 Therefore CB do not think that it is a suitable option to retain the pedestrian island and existing phasing. An option for this junction was investigated where the island on the northern arm is removed and a straight across pedestrian crossing is provided.

8.2.9 The key changes recommended to the junction to improve the pedestrian crossing on the north arm of the junction are:

Euston Road eastbound approach	• Relocation of the westbound bus stop approximately 10m west to allow for additional storage space at the junction

	• Install a straight ahead filter on the eastbound approach due to the removal of the internal stop line on the Pancras Road northbound pedestrian crossing
Pancras Road	• Widening of the pedestrian crossing to 5m width • Removing the central island • Install a straight across crossing of 11m in length • Widening of the footway at the junction to facilitate a straight across crossing • Removal of the existing internal stop line at the northbound pedestrian crossing

8.2.10 These changes are illustrated in drawing 137971/OS/005 in Appendix C of this report.

8.2.11 The benefits of the changes recommended for this junction are:

- Straight across crossing for pedestrians on the Pancras Road arm which will help reduce informal crossing, the associated safety risk, and congestion as highlighted in 8.2.3 as well as reducing the time for pedestrians to cross at the junction
- Widened footways within the vicinity of the pedestrian crossing on Pancras Road

8.2.12 The issues identified with this proposal are:

- The eastbound bus stop on Euston Road just west of the junction will need to be relocated west of its current location by approximately ten metres. This will require consultation with appropriate bus stakeholders.
- The use of a straight ahead filter on the Euston Road west approach to the junction can cause confusion for pedestrians if they attempt to cross when the nearside lane is held on red and the outside lanes have a green ahead arrow. It is not expected to cause safety concerns at this junction, however, it is recommended that a safety audit be carried out at the next stage of design to ensure that the approach is marked and signed correctly
- A splitter island is required on Euston Road (eastbound) by DTO to separate left turning traffic from straight ahead traffic, or dispensation from these requirements needs to be obtained

Modelling

8.2.13 The proposed option was modelled in LINSIG and VISSIM using the base models outlined in the previous section of this report.

8.2.14 All the intergreens have been re-calculated to match the SQA64 standard. The existing offsets between the main traffic stream were retained.

8.2.15 To provide the straight across crossing on Pancras Road and maintain the capacity at the junction, a filter arrow phase was added to the method of control. The filter is an ahead only filter, and the left turn traffic must wait for the following full phase.

8.2.16 The modelling layout diagram from LINSIG in indicated in Figure 8.6.

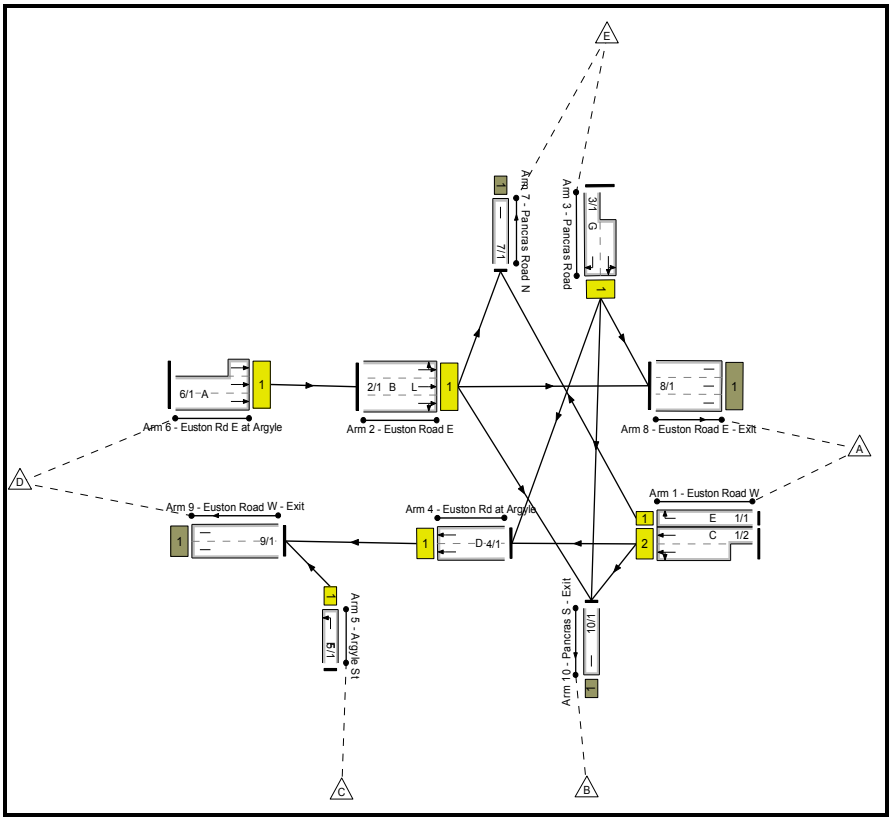


Figure 8.6: Junction 02/018 New Layout Diagram

8.2.17 The Phase Diagram from LINSIG for the new layout has been shown in Figure 8.7.

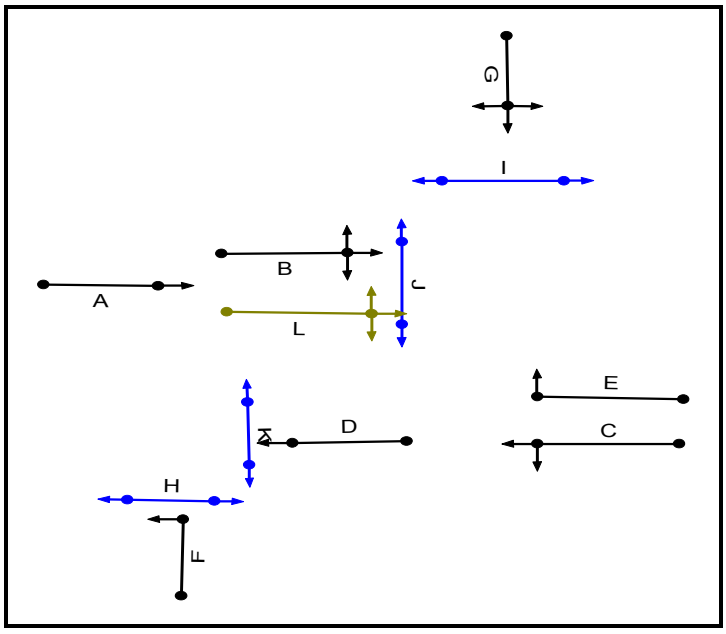


Figure 8.7: Phase Diagram for 02/018 new layout

8.2.18 Table 8.5 summarises the Degree of Saturation for the links from the LINSIG output.

Table 8.5: New 02/018 Link Results

Link Description	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road west right	E	89.3	96.5	95.8
Euston Road west ahead left	C	74.8	72.7	71.4
Euston Road east left ahead right	B	63.7	66.9	66.2
Pancras Road right left ahead	G	61.4	43.5	55.8
Euston Road at Argyle ahead	D	47.2	43.5	43.2

8.2.19 The LINSIG results are quite positive. However, one capacity issue remains, and that is the Euston Road westbound right turn to Pancras Road: it is almost over saturated for all time periods. However, this situation exists in the base model. In addition, if the Euston Road westbound is going to be extended to 3 lanes in the future, the queue for right turning vehicles will not impact the ahead traffic.

8.2.20 The option was then modelled using VISSIM and a journey time comparison between the proposed model and the base model is summarised in Table 8.6 below.

Table 8.6: Journey Time Comparison for Pancras Road / Euston Road

Route	AM		IP		PM	
	Difference (s)	Percentage	Difference (s)	Percentage	Difference (s)	Percentage
Euston eastbound	0.2	0%	-12.7	-8%	11.3	8%
Kings Cross eastbound	1.1	2%	2.6	4%	-1.5	-2%
Kings Cross westbound	-6.9	-4%	1.4	1%	-3.3	-2%
Euston westbound	-12.5	-12%	-9.1	-10%	-2.0	-2%
York Way northbound	0.8	1%	0.1	0%	1.3	2%
Goods Way westbound	-0.4	-1%	0.0	0%	-0.8	-1%
Midland Road southbound	-0.4	0%	-0.7	-1%	-0.8	-1%
Pancras Road northbound	9.1	10%	9.5	10%	8.2	8%

8.2.21 From the VISSIM results, the Euston Road eastbound movement suffers delays (11s) in the PM peak period, some benefits (12s) in the IP peak period, and no significant change in the AM peak period. This varying performance comes from the different traffic flows during the peak hours. If there is a large amount of traffic turning left from Euston Road to Pancras Road, vehicles get stuck in the middle lane during the green time. This is as a result of the limited storage of the left turn flare. This will also cause delay for the straight ahead traffic.

8.2.22 For the other movements, Euston Road westbound could benefit from the proposal. In general, the straight across crossing could be introduced without significant impact on traffic.

8.3 Junction of Midland Road/Euston Road/Judd Street

8.3.1 There is currently a left turn only turn from Judd Street into Euston Road for all traffic at the junction.

8.3.2 It has been identified that there might be potential to provide an additional north-south cycle route from Judd Street by installing a contraflow cycle lane along Midland Road from Euston Road to Brill Place.

8.3.3 The design parameters to achieve the cycle improvements at this junction are

- Install a contraflow cycle lane on Midland Road from Euston Road to Brill Place
- Allow for the loss of a southbound cycle lane on Midland Road

8.3.4 To facilitate the contraflow cycle lane the following changes are required at the junction:

Midland Road Approach	• Remove far side right turning lane and install a contraflow cycle facility from the Euston Road to Brill Place • Modify signage at the entry to the approach to indicate that cyclists are able to travel straight ahead
Judd Street Approach	• Install a central lead in lane for cyclists travelling north • Install signage to indicate that cyclists may travel straight and left and all other vehicles left only

8.3.5 These changes are illustrated in drawing 137971/OS/006 in Appendix C of this report.

8.3.6 The benefit of this proposal would be providing an alternative north-south cycle route from Euston Road to Brill Place.

8.3.7 There are several disadvantages of this proposal:

- The contraflow cycle lane is offset from the Judd Street approach which will mean that cyclists will need to make a left hook manoeuvre through the junction. This could have safety implications and should be assessed as part of a safety audit
- There would need to be appropriate signage on the Judd Street approach to fully inform cyclists to reinforce that they cannot turn right at the junction
- There are alternative north-south cycle links within the vicinity of this junction which are more suitable alternative routes to this contraflow cycle lane
- There will be a loss of capacity of the Midland Road approach due to the loss of the southbound lane
- The changes to the layout will necessitate a small modification to the signal phasing at the junction which may slightly impact on its capacity. This is investigated in the next section of the report

Modelling

8.3.8 The proposed option has been modelled in both LINSIG and VISSIM using the base options outlined earlier in this report.

8.3.9 All the intergreens have been re-calculated to match the standard SQA64. The signal timings were slightly adjusted in the proposed model. The existing offsets between the main traffic streams were maintained.

8.3.10 The modelling layout from the LINSIG model has been included in Figure 8.8.

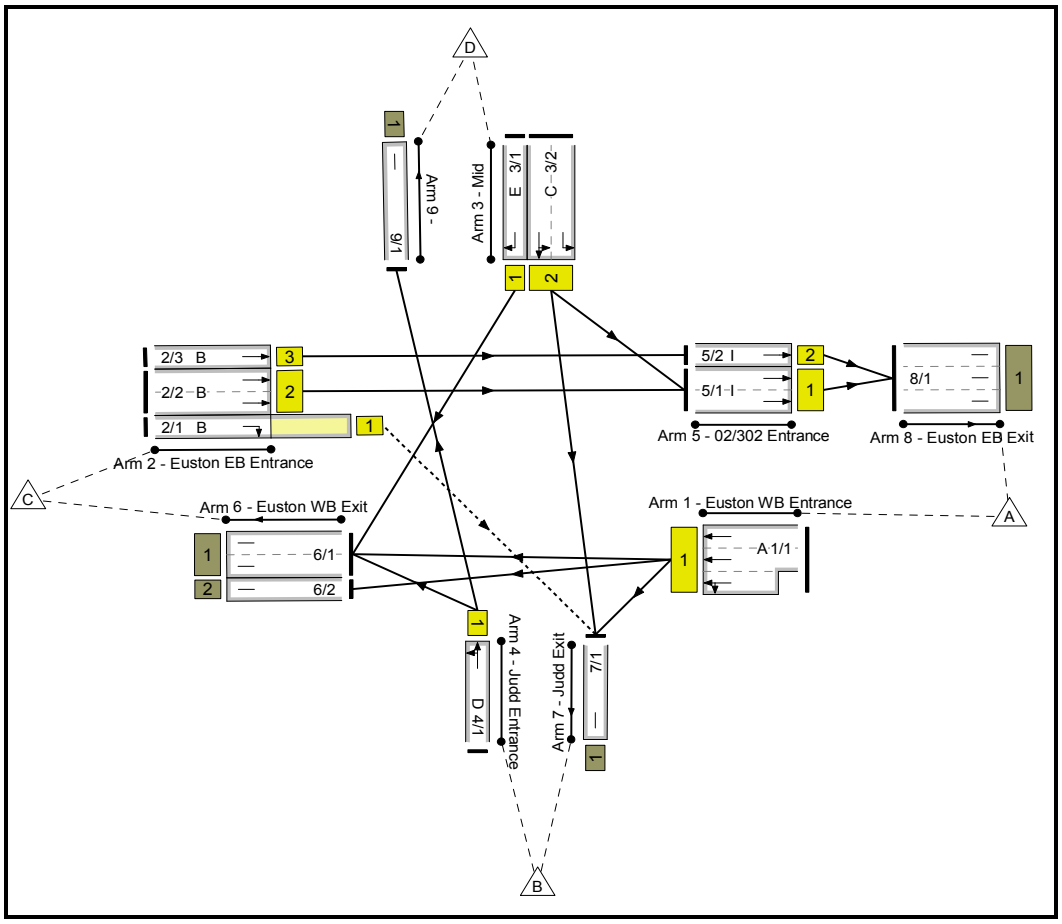


Figure 8.8: Junction 02/017 New Layout Diagram

8.3.11 From LINSIG the Phase Diagram for the new layout has been shown below in Figure 8.9.

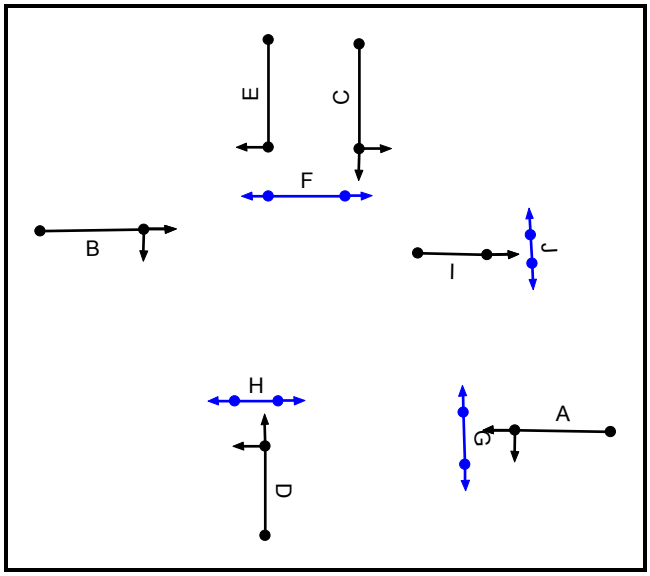


Figure 8.9: Phase Diagram for 02/017 new layout

8.3.12 From the LINSIG model the Degree of Saturation for the links has been summarised in Table 8.7.

Table 8.7: New 02/017 Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston westbound entrance ahead left	A	73.2	66.6	67.7
Euston eastbound entrance right	B	95.3	101.3	70.7
Euston eastbound entrance ahead	B	79.8	84.2	82.5
Midland southbound right	E	86.1	88.6	79.4
Midland southbound left ahead	C	84.1	81.8	83.7

8.3.13 From the LINSIG results, there are no obvious capacity issues. Euston Road eastbound right turn into Judd Street is a give way movement, and the over-saturated results do not impact the network to any large extent.

8.3.14 The proposed option has also been modelled in VISSIM and a journey time comparison with the base model has been summarised in Table 8.8.

Table 8.8: Journey Time Comparison For Midland Road

Route	AM		IP		PM	
	Difference (s)	Percentage	Difference (s)	Percentage	Difference (s)	Percentage
Euston eastbound	-3.2	-2%	0.4	0%	1.9	1%
Kings Cross eastbound	-0.3	-1%	0.3	0%	-0.5	-1%
Kings Cross westbound	2.0	1%	1.8	1%	-2.5	-2%
Euston westbound	-4.2	-4%	-1.1	-1%	0.1	0%
York Way northbound	0.7	1%	-1.2	-1%	-0.2	0%
Goods Way westbound	0.0	0%	-0.7	-1%	-0.9	-1%
Midland Road southbound	25.3	21%	15.5	13%	16.3	13%
Pancras Road northbound	-0.7	-1%	-0.2	0%	-0.2	0%

8.3.15 From the VISSIM results, with the exception of the Midland Road southbound movement, all the movements have similar journey times in the proposed model when compared to the base. In the AM peak, the traffic was delayed by 25s (20%) from Goods Way/Midland Road junction to Midland Road/Euston Road junction, and about 16s for the IP and PM. With the reduction of a lane for the Midland Road southbound movement, results are reasonable and acceptable.

8.4 Junction of Pentonville Road/Caledonian Road/Kings Cross Bridge

8.4.1 It has been identified that the existing pedestrian crossing on the north arm of the junction of Pentonville Road/Caledonian Road/Kings Cross Bridge is located too close to the eastbound carriageway. There is also no ASL provided for cyclists on this approach.

8.4.2 The brief requested the following changes:

- Relocate the controlled pedestrian crossing on the north arm of this junction further north as the existing crossing is too close to the eastbound traffic lane
- The crossing also allows pedestrians to cross Pentonville Road at the uncontrolled crossing point

8.4.3 The following changes have been included in drawing 137971/OS/007 (Appendix C):

Caledonian Road north approach	• Relocate the pedestrian crossing approximately 3m northward • Set the stop line back 3m from the pedestrian crossing

- Include an ASL at the approach for cyclists
- Modify the intergreen for this approach to allow for the relocated stop line

8.4.4 The benefit of relocating the crossing is that pedestrians will be provided with a safer crossing facility away from the eastbound traffic carriageway. Cyclists will also benefit from the ASL.

8.4.5 The disadvantages of these changes are

- The pedestrian crossing is going to be relocated further away from the pedestrian desire line which may discourage pedestrians from using the formal facilities
- There will be a change to the phasing of the junction due to the relocation of the stop line on the north approach of the junction by approximately 11 metres. These changes to the signal phasing at the junction which may impact on the capacity of the junction and this is investigated in the next section of the report

Modelling

8.4.6 As the changes recommended for this junction are minor, the layout and phase diagram are the same as the base scenario.

8.4.7 However, all the intergreens have been re-calculated to match the standard SQA64 and the relocated stoplines. The existing offsets between the main traffic streams were retained .

8.4.8 The results from the LINSIG are summarised in Table 6.9.

Table 8.9: Proposed 02/049 Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Pentonville Road westbound (bus lane) left	F	16.4	12.2	12.8
Caledonian southbound left ahead	C	63.5	63.5	62.8
Euston Road eastbound ahead	A	63.6	63.8	62.7

8.4.9 From the LINSIG results it is evident that there are no capacity issues for this option.

8.5 Options Combined Model

8.5.1 As discussed in the sections above, each junction and the associated proposals were tested against a base model in turn.

8.5.2 For this option, however, all junction designs were tested concurrently. This model combined the proposals for York Way Option 1, Pancras Road and Midland Road together in one option.

8.5.3 This was modelled in VISSIM and the journey times were compared between the base model for this network and the proposed model. This is summarised in Table 8.10.

Table 8.10: Journey Time Comparison for Network Model

Route	AM		IP		PM	
	Difference (s)	Percentage	Difference (s)	Percentage	Difference (s)	Percentage
Euston eastbound	-5.2	-4%	-10.3	-7%	16.8	12%
Kings Cross eastbound	-0.5	-1%	2.6	4%	-0.5	-1%
Kings Cross westbound	-64.4	-38%	-8.5	-7%	-35.5	-24%
Euston westbound	-17.8	-17%	-17.1	-19%	-1.3	-2%
York Way northbound	7.1	8%	-0.6	-1%	-1.5	-2%
Goods Way westbound	-0.2	0%	-0.3	0%	-0.8	-1%
Midland Road southbound	26.6	22%	15.3	13%	17.6	14%
Pancras Road northbound	10.3	11%	10.5	11%	12.4	12%

8.5.4 From the summary table it is evident that the options for the three junctions combined together in one model produced results that were as expected considering the results of the single junction models.

8.5.5 The Kings Cross westbound movement is expected to experience dramatically less journey times through the study area. Euston Road westbound is also likely to experience slightly less journey times.

8.5.6 With the filter arrow, Euston Road eastbound journey times are slightly faster in AM and IP. However during the PM the model shows the journey time to be 17 seconds slower due to the introduction of the straight across crossing for York Way and Pancras Road.

8.5.7 At the junction of Midland Road/Euston Road the Midland Road southbound traffic was delayed due to the removal of one southbound lane.

8.5.8 At the junction of Pancras Road/Euston Road the shorter green time caused longer journey times for vehicles travelling to Pancras Road northbound traffic from Euston eastbound.

9 Stakeholder Consultation

9.1 Introduction

9.1.1 Stakeholders from TfL, London Borough of Camden, London Borough of Islington and Metropolitan Police were presented with the findings of the analysis and modelling for the proposed options for the Kings Cross area at a presentation held at TfL in September 2008. Following that presentation, a copy of the draft report on the findings was sent to stakeholders.

9.1.2 TfL stakeholders were also invited to discuss their comments on the proposed options at a meeting held in December 2008. Minutes of the meeting can be found in Appendix D.

9.1.3 Following the submission of the revised draft report (Issue 2, January 2009) a further meeting with TfL stakeholders was held on 10 February 2009.

9.1.4 Table 9.1 presents a list of stakeholders and their key comments raised at the three meetings (September 2008, December 2008 and February 2009).

9.2 Stakeholder Comments

Table 9.1: Stakeholder Responses

Stakeholder Name	Organisation	Comments
John Lee	TfL - Cycle	▪ The safety of the Midland Road contra-flow is likely to be dependant on the detailed design ▪ An offside bus lane in York Way may cause problems for cyclists
Nina Webster	TfL – Walking/Disability and Discrimination Act (DDA)	▪ No specific comments received
Caroline Wells	TfL- Safety	▪ It would have been useful to see some collision savings associated with the analysis carried out and the proposals put forward ▪ Safety Audit should be carried out on all the proposals and not just where recommended ▪ The report should include recommendations to investigate or improve street lighting in the area
Phil Bant	TfL- Bus	▪ Stated that proposed options should cater for buses turning into Pancras Road
John Clark	TfL – Congestion Charging	▪ No specific comments received
Robin Gillis	TfL- Public Carriage Office (PCO)	Two concerns related to taxi movements: ▪ the position remaining for setting down taxis in York Way at the southern end on the west side if two way working were to be introduced under the Option 2 proposal for the York Way/Pentonville Road/Grays Inn Road junction ▪ Reducing Midland Road right turn to one lane at the junction with Euston Road to cater for the contra-flow cycle lane may not work in the futures as taxi movements are expected to increase due to the introduction of rail services

		such as the fast Kent Services (December 2009) and the Cambridge/Kings Lynn services (2015)
Andy Ulph/Edwin Basiime	TfL – Directorate of Traffic Operation (DTO)	▪ DTO would require a traffic island to segregate the left turning traffic from the ahead traffic for the proposed options for Euston Road/York Way junction
Helen Beaumont/ Chris Maddocks/ Tony Wilson	TfL - Interchange	▪ Interchange would support proposals that improve good public realm and desire lines for pedestrians ▪ Modelling was based on 2008 traffic flows. However, traffic, mainly taxis, is expected to increase along Pancras Road by 2020 when the Kent domestic services, LU Northern Ticket Hall and NR Western Concourse open. Also, when the King's Cross Central development begins to be occupied, and especially when the Boulevard opens, flows will increase again and will include around 30 buses per hour which do not currently use this Road ▪ Modelling results may not give accurate estimation of capacity for the eastbound approach of Euston Road / Pancras Road junction with the proposed option
Laurie Baker/Sam Monck/Gavin Sexton	London Borough of Camden	▪ Very keen on the pedestrian improvements to the Euston Road junction with Pancras Road and York Way ▪ Not supportive of shifting the Pentonville Road crossing 3m off the desire line
Martijn Cooijmans	London Borough of Islington	▪ Very keen on the two working proposal for York Way
Spyridoula Vitouladiti	TfL – Policy and Planning Analysis (formally Planning Road User Charging)	▪ No specific comments received
Geoffrey Maunder	TfL – London Underground Limited (LUL)	▪ No specific comments received
Neil Davies	Metropolitan Police	▪ No specific comments received

9.3 Consultation Summary

9.3.1 It was agreed with TfL to modify proposals taking into consideration comments highlighted above in Table 9.1. These modifications to the proposed options are discussed in Chapter 10 of this report.

10 Revised Proposed Options

10.1 Junction of Euston Road / York Way / Pentonville Road / Gray's Inn Road

Revised Option 1

10.1.1 Following the stakeholders consultation, TfL requested CB to amend proposed designs for this junction to reflect the current alignment for Euston Road with two lanes westbound. It is understood that no planning application had been submitted to Camden Council. There is a possibility that Euston Road will not be widened between Birkenhead Street and Crestfield Street.

10.1.2 These revised changes to Option 1 are illustrated in drawing 137971/OS/003 Rev A in Appendix C of this report.

10.1.3 LINSIG and VISSIM models have been run with the above changes.

10.1.4 Table 10.1 summarises the degree of saturation results from the LINSIG model.

Table 10.1: New 02/021 Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road east ahead left	A	64.5	69.9	73.7
Grays Inn north left	H	87.6	81.9	79.5
Grays Inn north ahead	C	64.1	66.7	72.5

10.1.5 The LINSIG results for the revised Option 1 show no capacity issues for all time periods. In addition, the degree of saturation results for Grays Inn Road left turn movement is close to those obtained from the base model.

10.1.6 Revised Option 1 was then modelled in VISSIM. Table 10.2 shows a journey time comparison with the base model.

Table 10.2: Journey Time Comparison for Revised Option 1 with two lanes on Euston Road Westbound

Route	AM		IP		PM	
	Difference (s)	Percentage	Difference (s)	Percentage	Difference (s)	Percentage
Euston eastbound	1.3	1%	-1.3	-1%	7.3	5%
Kings Cross eastbound	-0.7	-1%	0.5	1%	-0.5	-1%
Kings Cross westbound	-25.4	-15%	-2.9	-2%	-25.1	-17%
Euston westbound	0.7	1%	0.1	0%	0.3	0%
York Way northbound	7.9	9%	0.9	1%	-1.3	-2%
Goods Way westbound	-0.1	0%	0.6	1%	-0.7	-1%
Midland Road southbound	-1.2	-1%	0.5	0%	-2.0	-2%
Pancras Road northbound	1.1	1%	0.5	1%	-0.4	0%

10.1.7 The VISSIM confirmed the positive results obtained from LINSIG. Table 10.2 shows that Euston eastbound traffic had very similar journey time as the base.

10.1.8 The LINSIG and VISSSIM modelling results indicate that the straight across crossing would work even if Euston Road westbound remained as two lanes.

Revised Option 2

The results in section 8.1.41 show that Option 2 is not feasible. This is as a result of only one lane remaining for the Gray's Inn Road northbound coupled with the new York Way southbound phase taking green time from other movements. It follows therefore that the adjustment of Euston Road from three lanes to two will worsen the results and therefore this option (revised Option 2) has not been taken any further.

Revised Option 2A

10.1.9 To assess the option without the extra lane on Euston Road Westbound, a revised Option 2A was tested in the LINSIG model.

10.1.10 These revised changes to Option 2A are illustrated in drawing 137971/OS/004 Rev A in Appendix C of this report. Note that the footway outside 1 – 11 Euston Road has been reduced to 2.7m in order to accommodate two westbound traffic lanes and a central island for the staggered crossing arrangement on the eastern arm of the junction.

10.1.11 The degrees of saturation from LINSIG for the links in the revised Option 2A have been summarised in Table 10.3.

Table 10.3: New 02/021 Two Way Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road east ahead left	A	78.0	80.7	85.7
Grays Inn north left	H	61.8	60.4	58.6
Grays Inn north ahead	C	72.1	81.6	86.3
York Way southbound left right	J	51.8	56.5	56.5

10.1.12 From the LINSIG results, it is evident that the revised Option 2A could work. For the AM and IP, there are no capacity issues. For the PM, Euston Road eastbound and Gray's Inn northbound there is just over an 85% degree of saturation. More detailed design and modelling would need to be undertaken for this option if it was being considered for implementation however, as the narrowing of the footway outside 1–11 Euston Road may prove impossible due to statutory utility apparatus diversions.

10.2 Junction of Euston Road / Pancras Road

10.2.1 Following stakeholder consultation, TfL requested CB to model reversing the stagger for the existing crossing arrangements at Pancras Road. These revised changes are illustrated in drawing 137971/OS/008 in Appendix C of this report. In addition, TfL also requested swept path analysis for articulated vehicles and 15m coaches for the straight crossing option along Pancras Road. Drawing 137971/TR/005 (Appendix C) illustrates the swept path analysis.

10.2.2 For the reversed staggered crossing option, Stream 2 of Node 02/018 was removed and an extra pedestrian phase was added to Stream 1. All the intergreens related to the Pedestrian crossing on Pancras Road have been re-calculated to match the standard SQA64,

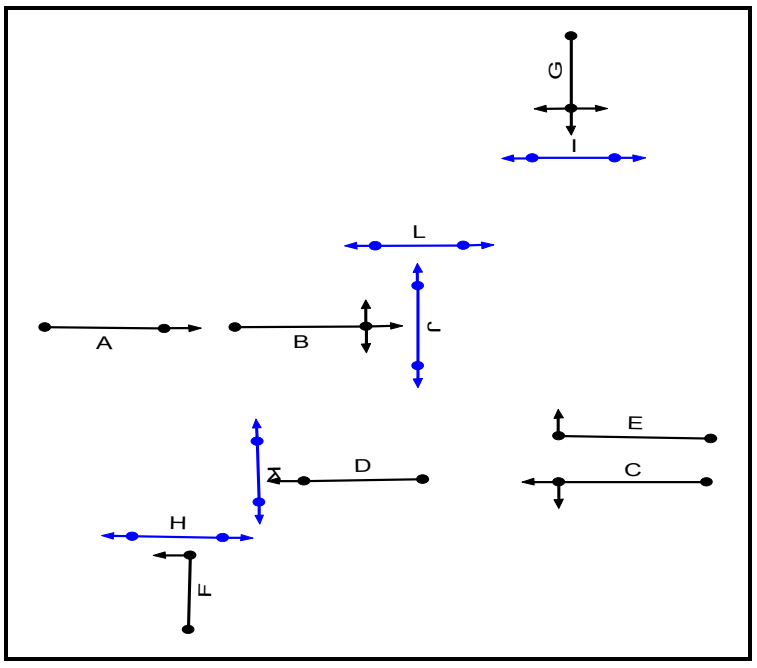


Figure 10.1: Phase Diagram for 02/018 reversed staggered pedestrian crossing layout

10.2.3 Table 10.3 summarises the Degree of Saturation for the links from the LINSIG output.

Table 10.4: Reversed staggered pedestrian crossing 02/018 Link Results

Link Desc	Full Phase	Deg Sat (%) AM	Deg Sat (%) IP	Deg Sat (%) PM
Euston Road west right	E	96.7	83.6	95.8
Euston Road west ahead left	C	85.1	81.7	80.3
Euston Road east left ahead right	B	70.4	70.0	70.0
Pancras Road right left ahead	G	47.7	33.8	43.4
Euston Road at Argyle ahead	D	45.8	42.4	42.1

10.2.4 The LINSIG results are very similar to those obtained from the base models, which indicates that there are no significant impacts on capacity at this junction.

Euston Road Westbound Widening

10.2.5 TfL requested CB to model the benefits of the proposed additional westbound lane between Birkenhead Street and Crestfield Street. This was part of the brief, however, results of assessing this proposal independently were not shown in the draft report issued to TfL in November 2007.

10.2.6 To assess the impact of the third lane extension of Euston Road westbound from Birkenhead Street to Crestfield Street, the proposed layout change was tested in the VISSIM. The journey time comparison between the proposed model and the base model is summarised in Table 10.5 below:

Table 10.5: Journey Time Comparison for Pancras Road / Euston Road

Route	AM		IP		PM	
	Difference (s)	Percentage	Difference (s)	Percentage	Difference (s)	Percentage
Kings Cross westbound	-8.6	-5%	1.9	1%	2.9	2%
Euston Road westbound	-2.2	-2%	-3.0	-3%	-1.3	-2%

10.2.7 From Table 10.5, it can be seen that there are benefits for Euston Road westbound movements. Journey times are reduced by 11 seconds in total in the AM. However, there are no significant changes in the IP and PM. This is because traffic flow profiles in the AM peak differ from those traffic profiles in the IP and PM peaks.

10.2.8 In general, due to the existing two lane exit at Gray's Inn Road to Euston Road westbound, it is expected that the extension of the third lane on Euston Road would not reduce journey times for traffic.

10.3 Junction of Euston Road/Midland Road

10.3.1 No specific modifications have been requested by TfL for this junction. However, TfL requested that the drawing for the contra-flow cycle lane proposal should show how the remainder of the contra-flow cycle lane proceeds to Brill Place. A revised drawing (137971/OS/006 Rev A) can be found in Appendix C.

10.3.2 A shared use facility would be required just before the Puffin crossing south of the Midland Road/Brill Place junction. This is because of the bus lane north of the Puffin

crossing. The traffic lane north of the Puffin crossing is not wide enough to introduce a cycle lane.

10.3.3 Additionally, TfL requested an estimate of the number of cyclists likely to use the contra-flow cycle lane. Cycle counts obtained from traffic surveys would give an indication of the likely use of the cycle lane. The June 2008 cycle counts were collected for the peak periods only. However, in March and October of 2006, London Borough of Camden carried out traffic surveys which included cyclists. About 536 cyclists were observed in Judd Street northbound between 07.00 and 19.00 in a working day. On Pancras Road northbound (north of the Midland Road/Pancras Road/Goods Way junction), 287 cyclists were observed between 07.00 and 19.00 in a working day. It is expected that the 287 cyclists would use the contra-flow facilities. In addition, the number of cyclists is expected to grow in the future, particularly, if a contra-flow facility were introduced along Midland Road. However, as discussed in Chapter 8, this proposal could have safety implications and should be assessed as part of a safety audit.

10.4 Junction of Wharfdale Road/York Way

10.4.1 TfL requested CB to include the assessment results of the southbound bus lane in York Way from Crinan Street to Wharfdale Road.

10.4.2 Two options (2A and 2B) have been assessed as part of a number of other bus priority measures for TfL.

Option 2A - Southbound Nearside Bus Lane

10.4.3 Proposed Measures (Drawing 148121-OS-002 Appendix C)

- Southbound, nearside bus lane (4m wide) between Crinan Street and Wharfdale Road
- Carriageway widening to accommodate 4m wide bus lane
- Local widening (southwest corner, Goods Way junction)
- ASL - 5m deep, at the approaches to Wharfdale and Goods Way junctions
- Green surfacing of existing cycle lanes
- Removal of existing large traffic island at Wharfdale junction
- Controlled straight-ahead pedestrian crossings on all arms of Wharfdale junction
- No entry to lower York Way for all traffic

10.4.4 Benefits

- A southbound bus lane would improve access to Wharfdale Road for buses. Buses and general traffic are presently being delayed as a result of congestion between Crinan Street and Wharfdale Road
- Carriageway widening (eastern footway) would better enable two-lane access to the junction
- Although an existing southbound cycle lane has been removed, cyclists would be able to travel in a proposed 4m wide bus lane

- The use of green surfacing in cycle lanes will improve awareness of cyclists along York Way
- 5m deep ASLs will improve safety and access to stop lines for cyclists
- Although proposed carriageway widening will reduce the width of the footway to approximately 3m, this is considered to be adequate for pedestrians
- Controlled straight-across crossings at Wharfdale junction will simplify crossing movements for pedestrians

10.4.5 Disbenefits/Constraints

- The benefits of implementing bus lanes are usually felt over relatively long sections of a road. The limited benefit of such a short length of bus lane may not justify the implementation cost
- Congestion between Crinan Street and Wharfdale Road is caused largely by vehicles waiting to patronise a car wash facility at No 68 York Way. These vehicles were observed forming a queue on the nearside lane thereby reducing road capacity as traffic are forced to approach the junction in a single queue on the offside lane. Cyclists are also prevented from using an existing cycle lane. CB enquiries have revealed that there is a pending planning application to change the use of the car wash facility and this would subsequently eliminate the queue of waiting vehicles. It could therefore not be required to introduce a southbound bus lane
- A southbound bus lane could cause general traffic to form queues that would block back to Goods Way junction
- A southbound bus lane on York Way conflicts with the London Borough of Camden's aspirations to widen footway on the western footway of York Way

Option 2B - Southbound Offside Bus Lane

10.4.6 Proposed Measures (Drawing 148121-OS-003 Appendix C)

- Southbound, offside bus lane (4m wide) between Crinan Street and Wharfdale Road
- Carriageway widening to accommodate 4m wide bus lane
- Local widening (southwest corner, Goods Way junction)
- ASL - 5m deep, at the approaches to Wharfdale and Goods Way junctions
- Green surfacing of existing cycle lanes
- Removal of existing large traffic island at Wharfdale junction
- Controlled straight-ahead pedestrian crossings on all arms of Wharfdale junction
- No entry to lower York Way for all traffic

10.4.7 Benefits

- A southbound bus lane would improve access to Wharfdale Road for buses. Buses and general traffic are presently being delayed as a result of congestion between Crinan Street and Wharfdale Road
- Carriageway widening (eastern footway) would better enable two-lane access to the junction
- The use of green surfacing in cycle lanes will improve awareness of cyclists along York Way
- 5m deep ASLs will improve safety and access to stop lines for cyclists
- Although proposed carriageway widening will reduce the width of the footway to approximately 3m, this is considered to be adequate for pedestrians
- Controlled straight-across crossings at Wharfdale junction will simplify crossing movements for pedestrians

10.4.8 Disbenefits/Constraints

- The benefits of implementing bus lanes are usually felt over relatively long sections of a road. The limited benefit of such a short length of bus lane may not justify the associated costs
- Congestion between Crinan Street and Wharfdale Road is caused largely by vehicles waiting to patronise a car wash facility at No 68 York Way. These vehicles were observed forming a queue on the nearside lane thereby reducing road capacity as traffic are forced to approach the junction in a single queue on the offside lane. Cyclists are also prevented from using an existing cycle lane. CB enquiries have revealed that there is a planning application(s) to change the use of the car wash facility and this could eliminate the queue of waiting vehicles. It may therefore not be required to introduce a southbound bus lane at the location
- A southbound bus lane could cause general traffic to form queues that would block back to Goods Way junction
- There is an existing bus stop immediately after the left turn from York Way to Wharfdale Road. The location of the bus stop would affect the practicality of an offside bus lane as a result of potential conflict between buses intending to use the bus stop and general traffic on the nearside lane
- A southbound bus lane on York Way conflicts with Camden's aspirations to widen footway on the western footway of York Way

10.4.9 Modelling of the two options have shown that the junction would operate within capacity with the two options. For further details on the modelling of the two options, please refer to Colin Buchanan report "York Way Bus Priority Measures Technical Note" issued September 2008.

10.4.10 In addition, Topographical surveys were carried out on York Way between Wharfdale Road and Goods Way. The surveys reveal that there are a large number of buried services in the study area. These services include communication cables, cable television cables, BT cables, electricity cables, water pipes, gas pipes and unknown services. The depth of the services and the costs of relocating them will need to be ascertained.

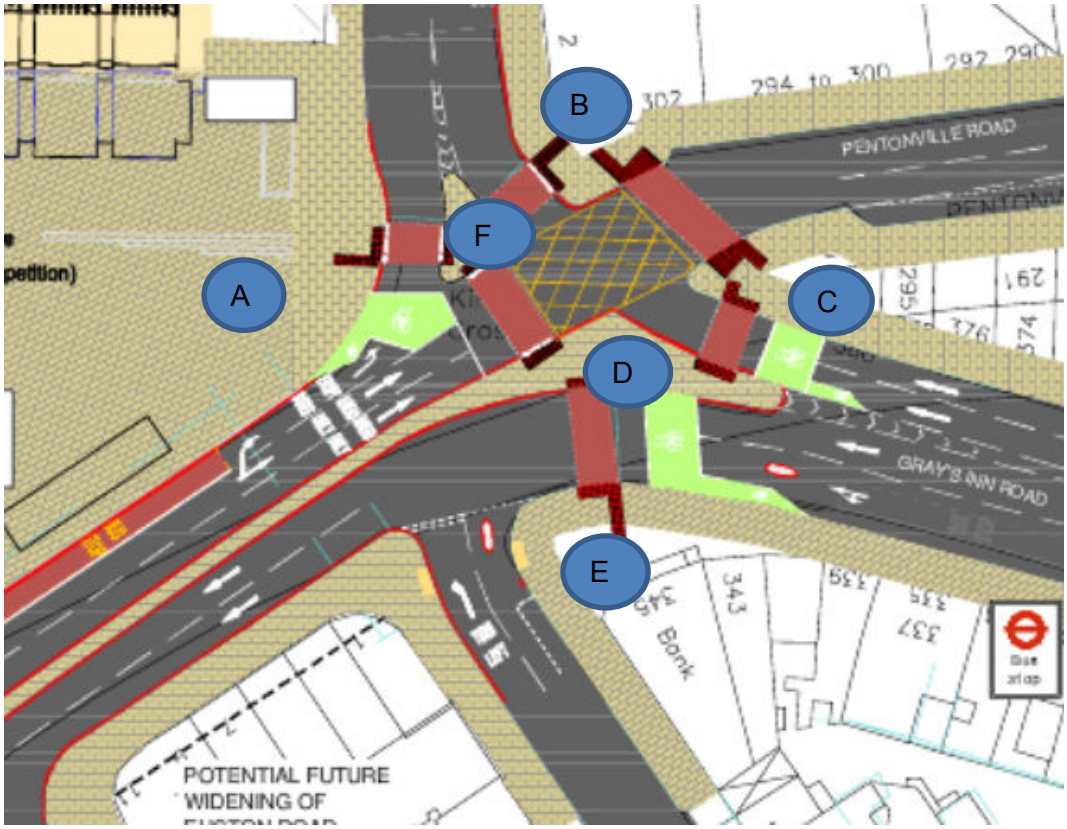
11 Pedestrian Journey Time Comparison

11.1 York Way Average Pedestrian Journey Time Comparison

11.1.1 A manual analysis using LINSIG has been undertaken to show any pedestrian journey time savings as a result of the new proposals (revised options 1 and 2A). The critical PM peak period was chosen for this analysis and the busiest movements have been considered.

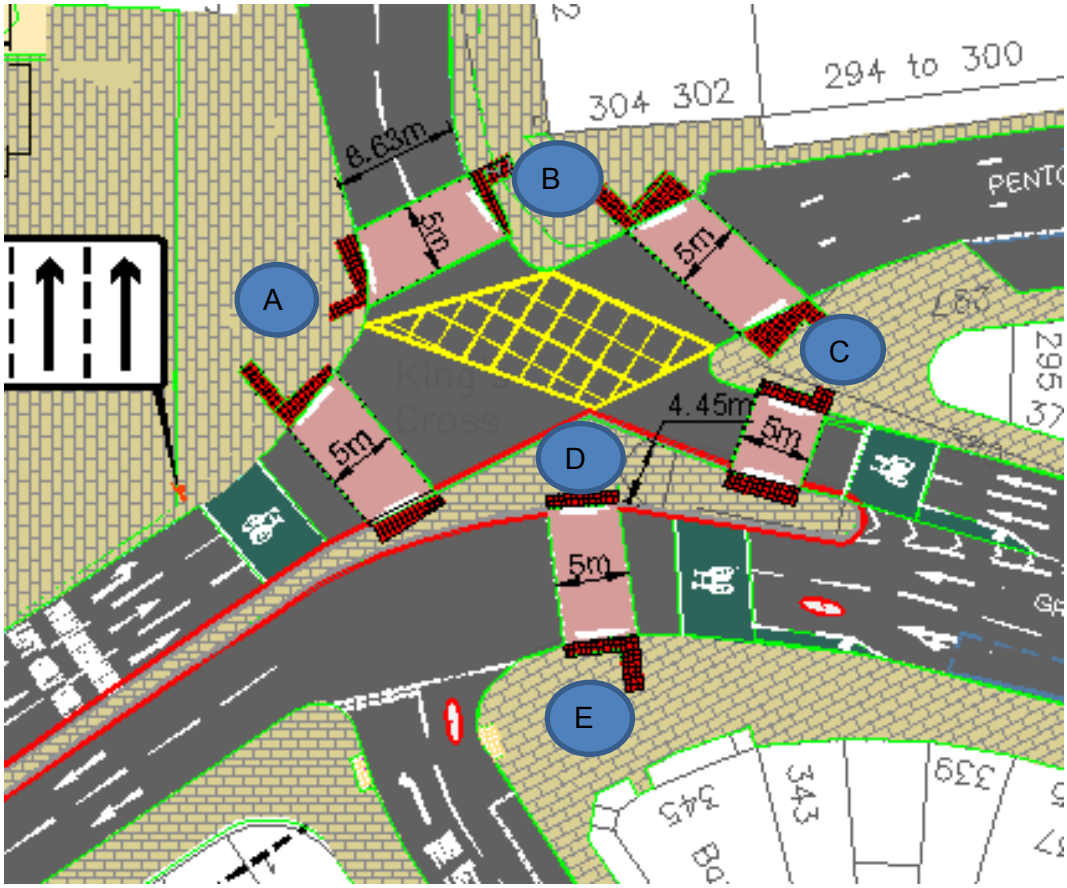
11.1.2 Figure 11.1 below shows the existing two stage crossing layout from A to B (through F) and the three stage crossing layout from A to E (through F and D).

Figure 11.1: Existing Crossings



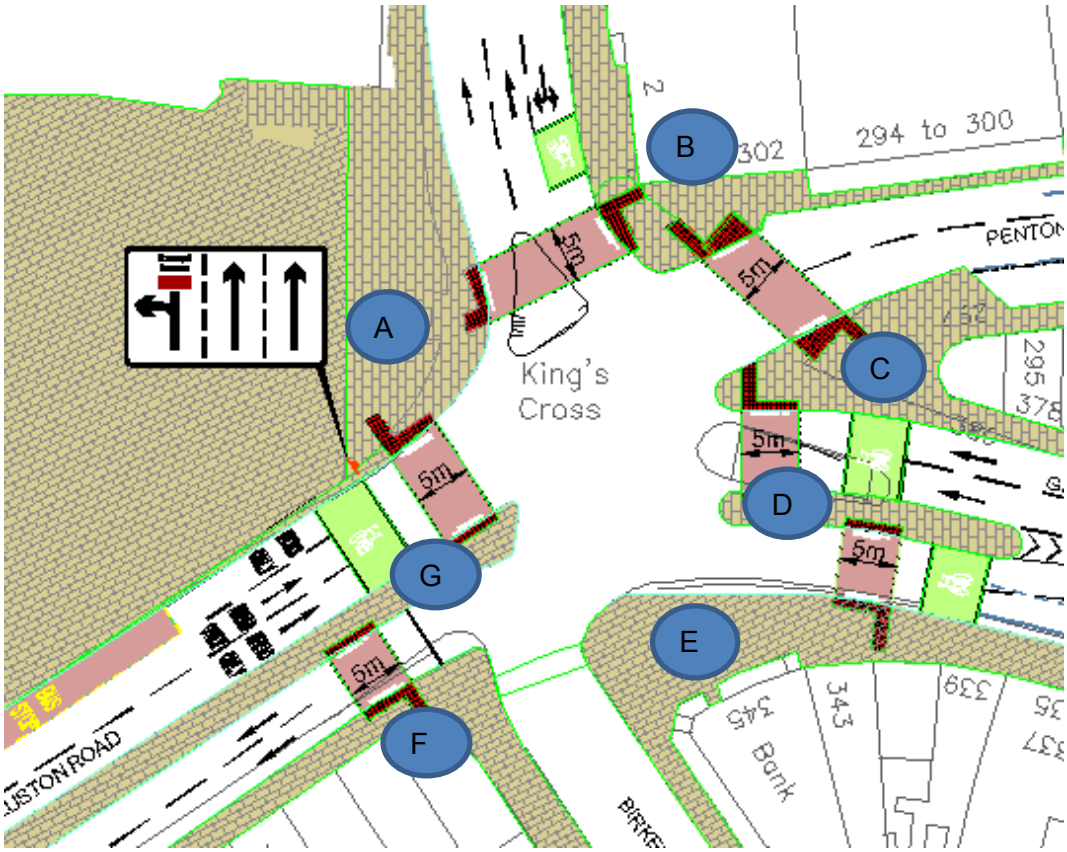
11.1.3 Figure 11.2 below shows the revised option 1 direct crossing layout on York Way (A to B) and the new proposed two stage crossing layout A to E (through D) on Euston Road:

Figure 11.2: Proposed Crossings (Revised Option 1)



11.1.4 Figure 11.3 below shows the revised option 2A (York Way two way option) direct crossing layout on York Way (A to B) and the new proposed two stage crossing layout A to E (through G and F) on Euston Road:

Figure 11.3: Proposed Crossings (Revised Option 2A)



11.1.5 Table 11.1 and table 11.2 below compare the journey times between the most frequently used existing and proposed crossing movements at the York Way/Euston Road/Grays Inn Road junction:

Table 11.1: York Way/Euston Road/Grays Inn Road Average Journey Time Comparison between Existing and Proposed Revised Option 1– PM Peak

Movement	Existing (s)	Proposed (s)	Benefits (s)
A-B	61	53	8
A-C (through B)	131	119	12
A-E (through D)	72	73	-1

11.1.6 As can be seen from the table above, A-B and A-C (Through B) have shown anything up to 13% reduction to pedestrian journey times while movement A-E (through D) has a negligible increase in journey time.

Table 11.2: York Way/Euston Road/Grays Inn Road Average Journey Time Comparison Between Existing and Proposed Revised Option 2A – PM Peak

Movement	Existing (s)	Proposed Revised 2A Option(s)	Benefits (s)
A-B	61	53	8
A-C (through B)	131	120	11
A-E (through G F)	72	153	-81

11.1.7 As can be seen from the table above, A-B and A-C (through B) have shown anything up to 13% reduction to pedestrian journey times while movement A-E (through D) has a dramatic increase in journey time (81s longer). This significant delay was caused by the long waiting time from G to F due to the offset of the signal timings. The reason is that the York Way southbound and the pedestrian crossing (G-F) are designed to run at the same time to give more capacity to the Gray's Inn Road westbound.

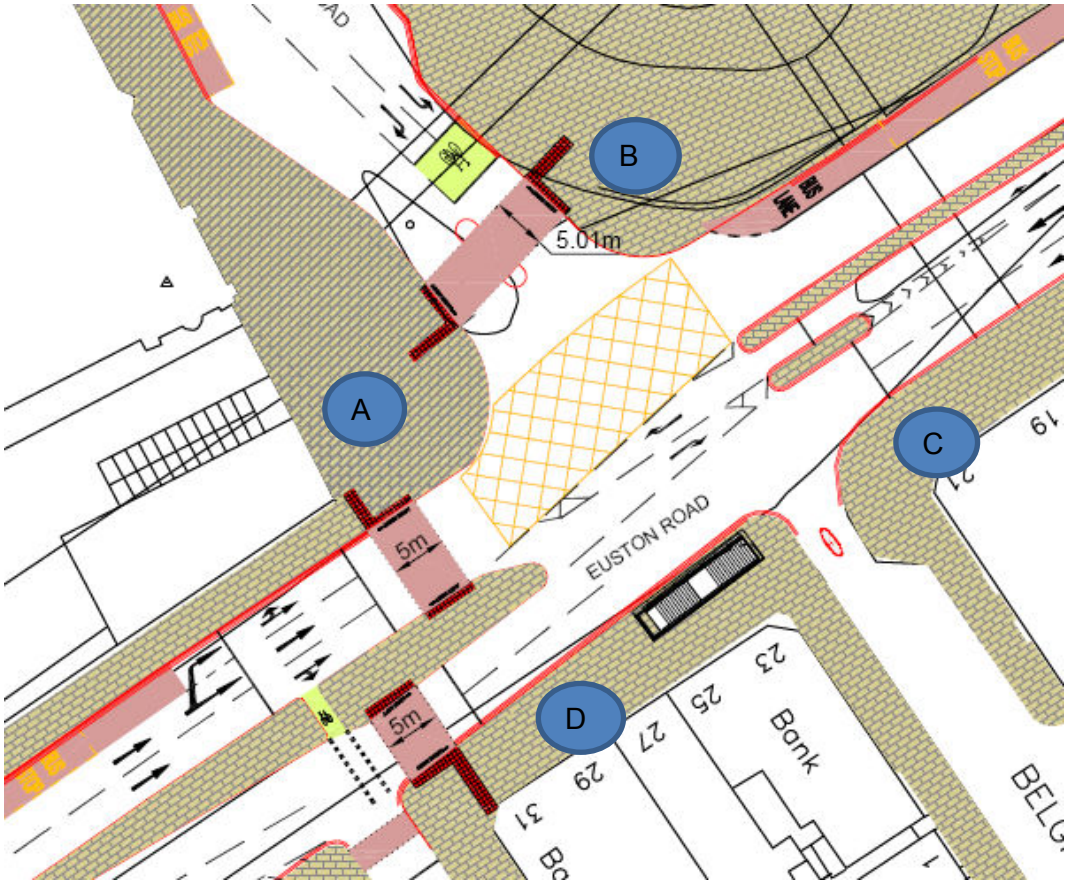
11.2 Pancras Road Average Pedestrian Journey Time Comparison

11.2.1 Figure 11.3 below shows the existing crossing layout arrangements for pedestrians.

Figure 11.4: Existing Crossings

11.2.2 Figure 11.4 below shows the proposed direct crossing layout, A to B on Pancras Road along with the existing crossing arrangements on Euston Road (A to D).

Figure 11.5: Proposed Crossings



11.2.3 Table 11.2 below compares the journey times of the most frequently used existing and proposed crossing movements at the Pancras Road junction.

Table 11.3: Pancras /Euston Road Average Journey Time Comparison

Movement	Existing (s)	Proposed (s)	Benefits (s)
A-B	71	39	32

11.2.4 Table 11.2 above shows that by removing the staggered crossing, pedestrian journey times from A to B have improved by over half a minute.

11.2.5 The layout of the staggered crossing on Euston Road (western arm) has remained unchanged in terms of geometric layout. The overall green time given to pedestrians is roughly the same in the existing and proposed signal timings and therefore a decision was taken not to form a comparison of journey times.

11.2.6 Similarly, geometric changes at the other junctions of Caledonian Road with Pentonville Road and Midland Road with Euston Road are negligible in terms of the impact to pedestrians and therefore a decision was taken not to form a comparison of journey times.

12 Conclusions and Recommendations

12.1 Conclusions

12.1.1 The Kings Cross Traffic and Pedestrian Study has given the chance to investigate the following in the Kings Cross area:

- to test various traffic management proposals using traffic modelling
- to assess the accuracy of traffic flow assumptions made for St Pancras International Station;
- to assess the pedestrian impact of St Pancras International Station on Borough Roads and the TLRN
- to carry out an accident analysis and
- to consider pedestrian facilities using the FRUIN analysis technique

12.1.2 The main causes for concern derived from the collision analysis for the study area as a whole are as follows:

- number (17 accidents) and percentage (34.7%) of collisions involving pedestrians through the study site as a whole and during the hours of darkness (12 accidents) (particularly between the hours of 10pm and 2am)
- the high percentage of collisions resulting in fatal and serious injury (29%)
- the high percentage of collisions which occurred as a result of pedestrians (11 accidents or 32 %) and drivers (27 accidents or 32%) failing to look properly and pedestrians careless or reckless behaviour (11 accidents or 32%)

The main causes for concern at individual sites within the study area are as follows:

Gray's Inn Road/Pentonville Road/York Way

- Pedestrians may be confused about the operation of the pedestrian crossing facilities, and are at particular risk during the hours of darkness. One of the important contributory factors identified at this junction was the tendency for vehicles to disobey the ATS
- Street lighting, pedestrian crossing improvements, and enforcement should be considered

Pentonville Road/Caledonian Road

- The collision records identify issues with pedestrians during the hours of darkness, and involving left turning vehicles. Cyclists were also noted to be at increased risk here
- Improved street lighting and cycle facilities should be considered here

12.1.3 Due to the low number of accidents for the Euston Road / Pancras Road junction (6 Accidents) and the York Way / Wharfdale Road junction (2 Accidents), little can be concluded other than these junctions are not a high priority in the area at this time.

12.1.4 The pedestrian movement analysis (FRUIN) has concluded that existing pedestrian facilities result in congested footways and crossings resulted in high levels of informal crossing and crossing at red. The analysis has identified junctions of Euston Road with Pancras Road and York Way where most of the informal crossing and crossing at red occur.

12.1.5 Most of the pedestrian related issues could be addressed by the provision of wider crossings, more waiting space where required, the removal of large staggers and improving sightlines (e.g. through the removal of guard rail).

12.1.6 The traffic movement analysis has concluded that the 2007 Predicted flows are within 15% of the 2008 observed flows for the main movements (Euston Road both directions). The observed flows were 15% lower than the predicted flows which were used in the highway assessment for St Pancras International Station prior to its opening in November 2007. In addition, the analysis found that there are queuing issues at the following junctions:

- Grays Inn Road/ Euston Road Junction
- York Way/Goods Way Junction
- Caledonian Road / Pentonville Road Junction
- Euston Road / Pancras Road Junction

12.1.7 Additionally, from survey results, it has been found that the percentage of cyclists compared to other traffic is not very high although there is still large numbers of cyclists on the network, particularly on Euston Road (in both directions).

12.1.8 The impact of the traffic management proposals on the entire network has been assessed using traffic modelling. LINSIG and VISSIM have been used to carry out the assessment.

12.1.9 In order to assess the traffic management proposals, valid base models are required. The LINSIG and VISSIM models have been validated against observed saturation flow measurements, turning counts and journey times according to the latest TfL-DTO modelling guidelines. The validation results of the base models have shown that it provides a robust representation of the traffic situation in the study area. Consequently, base models can be regarded as valid models and can be used to test the proposed schemes.

12.1.10 These base models have been used to assess proposals at the following junctions:

Euston Road/Grays Inn Road/Pentonville Road/York Way

12.1.11 The modelling results for Option 1 (York Way One-Way with straight crossing on York Way) have shown that the straight crossing could be introduced without a significant impact to the traffic. The straight across crossing will not affect journey times significantly. Euston westbound traffic could benefit from the extra third lane on Euston Road westbound and two lanes exit on York Way. However, the York Way northbound could have slight delay from the shorter green time for the left turn traffic from Euston eastbound to York Way. Furthermore, the bus stop on Euston Road eastbound to the west of the junction will need to be relocated further west.

12.1.12 Following the stakeholder consultation, it was understood that no planning application had been submitted to Camden Council regarding the widening of Euston Road. As a result, further traffic modelling runs were carried out. The modelling results indicate that the straight across crossing would work even if Euston Road westbound remained as two lanes (Revised Option 1).

12.1.13 For Option 2 (York Way Two- Way), the modelling results have shown that the junction does not operate satisfactorily under the proposed conditions. LINSIG results predict that both the Euston Road eastbound and Gray's Inn Road northbound could be over saturated because only one lane is left for the Gray's Inn Road northbound. The new York Way southbound phase also takes some green time from other movements. Furthermore, traffic would not be expected to use York Way southbound between

Wharfdale Road and Euston Road. To avoid delays, traffic would be expected to continue using Wharfdale Road instead of using the junction of York Way/Euston Road to go eastbound on Euston Road. Traffic travelling along Euston Road westbound would use Good Way, Midland Road then Euston Road instead of turning right at York Way/Euston Road.

12.1.14 As mentioned above, the results show that Option 2 is not feasible. It follows therefore that the adjustment of Euston Road from three lanes to two will worsen the results and therefore this option has not been taken any further.

12.1.15 For Option 2A (York Way Two- Way with Grays Inn Road kept as two lanes and York Way southbound reduced to one lane), the preliminary modelling results from LINSIG indicate that the junction could work. However, this will depend on the widening of Euston Road as the two-way working option would only work if Euston Road is widened to accommodate a staggered crossing arrangement on the eastbound approach of Euston Road to York Way.

12.1.16 The preliminary LINSIG results indicate that the revised Option 2A (with the existing 2 lanes westbound on Euston Road) could work. More detailed design and modelling would need to be undertaken for this option if it was being considered for implementation, as the narrowing of the footway outside 1 – 11 Euston Road may prove impossible due to statutory utility apparatus diversions.

12.1.17 TfL DTO indicated that a traffic island would be required, for safety reasons, to segregate the left turning traffic from the ahead traffic if Options 1 or 2/2A were to be introduced at the junction of Euston Road with York Way. This means that the eastbound carriageway of Euston Road needs to be widened to allow for this traffic island. Therefore, further investigations would be required to see if this is feasible in terms of highway boundary constraints, statutory utility plant and traffic modelling results. If it is found to be not feasible, it should be investigated whether a dispensation can be obtained from these requirements. Eastbound buses will be captured by the left turn lane. A traffic order will be required exempting buses which travel straight ahead into Pentonville Road.

Euston Road/ Pancras Road

12.1.18 The proposal of modifying the pedestrian crossing on Pancras Road from staggered to straight crossing running in 2 phases as existing was not feasible as it would not comply with the standards regarding staggered crossings.

12.1.19 An alternative option (narrowing the approach of Pancras Road to the junction with Euston Road and the introduction of a straight crossing on Pancras Road) was assessed.

12.1.20 The modelling results indicate that this alternative option would not significantly affect the operation and capacity of the junction. However, Euston Road westbound right turn to Pancras Road, could have capacity issues. The same problem exists in the base model. In addition, if the Euston Road westbound is going to be extended to 3 lanes in the future, the queue for the right turn will not impact the ahead traffic at all.

12.1.21 In addition to the above, the modelling results have also shown that journey times along Euston Road eastbound are expected to increase as a result of modifying the junction. This may increase bus journey times on Euston Road eastbound. Furthermore, the eastbound bus stop on Euston Road just west of the junction will need to be relocated west of its current location by approximately ten metres. This will require consultation with appropriate bus stakeholders. Additionally, the use of a straight ahead filter on the Euston Road west approach to the junction can cause confusion for pedestrians if they attempt to cross when the nearside lane is held on red and the outside lanes have a

green ahead arrow. It is not expected to cause safety concerns at this junction, however, it is recommended that a safety audit be carried out at the next stage of design to ensure that the approach is marked and signed correctly.

12.1.22 Following the stakeholder consultation, TfL requested to assess the option of reversing the existing staggered crossing on Pancras Road. The modelling results indicate that there will be no significant impacts on the capacity of this junction if this alternative option is introduced.

12.1.23 In addition, further tests were carried out to assess the impact of increasing taxi flows and buses on Pancras Road. It was highlighted that flows on Pancras Road are expected to increase due to the proposed additional train services and the trips generated by the Kings Cross central development. Taxi flows were increased by 100 PCUs and bus flows were increased by 30 buses. The modelling results showed that the junction would operate within capacity with the proposed options for Euston Road/Pancras Road junction.

12.1.24 It should be noted that TfL DTO also indicated that a traffic island would be required, for safety reasons, to segregate the left turning traffic from the ahead traffic if the straight crossing option was to be introduced at the junction of Euston Road with Pancras Road. This means that eastbound carriageway of Euston Road needs to be widened to allow for this traffic island. Therefore, further investigations would be required to see if this is feasible in terms of highway boundary constraints, statutory utility plant and traffic modelling results. If it is found to be not feasible, it should be investigated whether a dispensation can be obtained from these requirements. Eastbound buses will be captured by the left turn lane. A traffic order will be required exempting buses which travel straight ahead into Pentonville Road.

Euston Road Westbound Widening

12.1.25 The modelling results indicate that there will be benefits for the Euston Road westbound movement. The results indicate that journey times would be reduced in the AM. However, there will be no significant changes in journey times in the IP and PM periods.

12.1.26 In general, due to the existing exit at Gray's Inn Road to Euston Road westbound which is two lanes only, it is expected that the extension of the third lane on Euston Road would not reduce journey times for traffic.

Euston Road/Midland Road/Judd Street

12.1.27 The modelling results indicate that there will be no capacity issues as a result of the introduction of the contraflow cycle lane on Midland Road. However, journey times along Midland Road southbound are expected to increase as a result of removing one of the southbound lanes. Consequently, bus journey times may increase. Furthermore, the contraflow cycle lane is offset from the Judd Street approach which will mean that cyclists will need to make a left hook manoeuvre through the junction. This could have safety implications and should be assessed as part of a safety audit.

Pentonville Road/Caledonian Road

12.1.28 Modelling results indicate that there will be no capacity issues with the relocation of the controlled pedestrian crossing on the north arm of this junction further north. However,

the FRUIN analysis has emphasized that the proposal to move this crossing northwards will not solve the problem of crowding, and might risk aggravating it.

York Way/Wharfdale Road

12.1.29 Modelling of the two options have shown that the introduction of a southbound bus lane between Crinan Street and Wharfdale Road would not have impact on the junction of York Way/Wharfdale Road. The junction would operate within capacity with the proposed options. In addition, the proposed options include straight across pedestrian crossings on all arms of the junction. This would simplify the movement of pedestrians at this junction.

12.1.30 In addition, topographical surveys were carried out on York Way between Wharfdale Road and Good Ways. The surveys reveal that there are a large number of buried services in the study area. These services include communication cables, cable television cables, BT cables, electricity cables, water pipes, gas pipes and other unknown services. The depth of the services and the costs of relocating them will need to be ascertained.

Options Combined

12.1.31 Modelling results of combining options for junctions of Euston Road with York Way, Pancras Road and Midland Road have shown that the three options can work together without causing significant impact on the junction operation and capacity in the Kings Cross area. However, increases in journey times are expected along Euston Road eastbound, Pancras Road northbound and Midland Road southbound. Consequently, bus journey times will increase along these roads.

Pedestrian Journey Time Comparison

12.1.32 A manual comparison was undertaken of pedestrian journey times where proposals were thought to affect crossing widths. The busiest existing crossings were compared to the proposed crossings at the York Way (revised Options 1 and 2A) and Pancras Road junctions with Euston Road respectively.

12.1.33 In all but one crossing movement, the proposed crossing arrangements showed a marked reduction in journey times.

12.2 Recommendations

12.2.1 As a result of the findings from this study, it is recommended that:

York Way/Euston Road/Grays Inn Road junction

- A business case is prepared to take Revised Option 1 (York Way One-Way with straight crossing on York Way, Euston Road 2 lanes westbound) or Revised Option 2A (York Way Two Way, Euston Road 2 lanes westbound – subject to further modelling) to the preliminary design stage of scheme development. Revised Options 1 and 2A are subject to further investigations regarding the traffic island on the approach of Euston Road with York Way

Euston Road/Pancras Road

- A business case is prepared to take the straight across crossing option (subject to consultation with Bus Priority Team and to further investigations regarding the traffic

island on the approach of Euston Road with Pancras Road) or the reversed staggered crossing option to the preliminary design stage

Euston Road/Midland Road

- A safety audit is carried out to investigate the safety implications of introducing the contraflow cycle lane along Midland Road

Pentonville Road/Caledonian Road

- The crossing on the north arm is widened. It is not recommend to move the crossing northwards as there is not enough space for pedestrians to wait to cross the road

York Way/Wharfdale Road

- Feasibility design and modelling indicate that implementing southbound bus lanes on York Way would deliver benefits to buses. In addition, there are benefits for pedestrians by simplifying the movement of pedestrians on all arms of the junctions. The benefits are to be considered in the light of the associated costs. Over such a short section of road, the benefits may be limited and therefore may not justify the cost. It is recommended that a detailed cost benefit analysis of the proposals be carried out before any further consideration is given to their development.

In addition to the above, safety audits should be carried out for all proposals. A review on the removal of guard railing for the above junctions is also recommended. Furthermore, the accident analysis has shown that high percentage pedestrian collisions occurred during the hours of darkness indicating that the street lighting at the junction may be inadequate. Therefore, it is recommended to investigate street lighting in the Kings Cross area.

Appendix A – Data Source

Appendix B – Modelling Technical Note

Appendix C – Option Drawings

Appendix D – Minutes of Stakeholders Review Meeting