RAYLEIGH TRAFFIC STUDY

(Church Street Junction)

FINAL REPORT

Assessment of network performance

14 October 2003

Produced for
TRANSPORT STUDIES GROUP

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1 Introduction

1.1 Project client

The project was commissioned by Essex County Council, South Area Office, as a follow up to an original traffic study which was completed by Mouchel Consulting Ltd in March 2003. The objective of the study was to assess the performance of Church Street junction with some improvements.

1.1.1 History of the project

A traffic study was conducted involving the assessment of the performance of the road network in Rayleigh town centre under various traffic management options. A report on the study was delivered to Members of Rochford District Council and officers of Essex County Council in March 2003. The current project was a follow up to this original study and sought to assess the performance of the Church Street junction with a right turn lane on High Street and fully signalising the whole junction.

Under the existing layout three approaches namely, Hockley Road, Webster's Way and High Street were controlled by traffic signals. Church Street was a give way approach with traffic giving way to traffic on High Street.

1.1.2 The need for the proposed works

Members of Rochford District Council considered that traffic approaching from London Hill into Church Street experienced undue delay, as it had to give way to traffic on High Street. The delays were particularly bad during the evening peak period when a substantial amount of traffic approached from the direction of the Weir along High Street.

1.1.3 Description of the proposed works

In order to ease the problems being experienced at the junction, and in particular Church Street, the following suggestions were made:

i) to provide a right turn lane on High Street for traffic turning into Webster's Way, so that straight through traffic could proceed unhindered; and

ii) to signalise all approach arms including Church Street.

The study was therefore commissioned to assess what the effects of the proposed junction alterations would be on the flow of traffic on the town centre network, particularly on London Hill.

Junction alterations would be limited to the immediate vicinity of the Church Street/ High Street/ Hockley Road/ Webster's Way junction. Provision of a separate right turn lane on High Street would be achieved by reducing the pedestrian buildout opposite Church Street to provide sufficient width for a lane (see Figure 1 below).

The study utilised as much traffic count data and modelling from the original study as possible and considered other possible cost effective improvements that could be

made without significantly altering the existing traffic signal layout, but including the additional dedicated right turn lane.

Figure 1: Right turn lane on High Street

1.2 Status of the proposal

Junction assessment was done with TRANSYT11 using traffic count data from the original study. Assessment was confined to existing traffic flows; no future increase or decrease in traffic was considered.

Origin-destination surveys were conducted on Tuesday 16th September 2003 in Webster's Way car park for a period of six hours covering the AM and PM peak periods only.

2 Project description

2.1 Description of the proposed project

The study was commissioned:

i) to assess the effects of the proposed junction alterations on London Hill traffic in particular and on the town centre network in general;

ii) to discuss the general effects on road users and emergency vehicles in the new layout;

iii) to prepare a Paramics visualisation of the effects of junction alteration;

iv) to estimate the cost of implementing the proposed junction alterations; and

v) to conduct origin-destination surveys in order to determine origins and destinations of traffic that visits Rayleigh and the precise routes followed.

The core of Rayleigh Town Centre is defined by the 'A' road system made up of High Street, Webster's Way and part of Eastwood Road and a series of key junctions as shown in Figure 2. These key junctions are fed by major roads leading into and out of Rayleigh, namely, London Road/Crown Hill, Hockely Road, Eastwood Road and High Road. The main focus of the study was Church Street Junction whose performance was tested under three different traffic management schemes. Table 1 shows the approaches at each of the key junctions.

Figure 2: Key junctions in Rayleigh

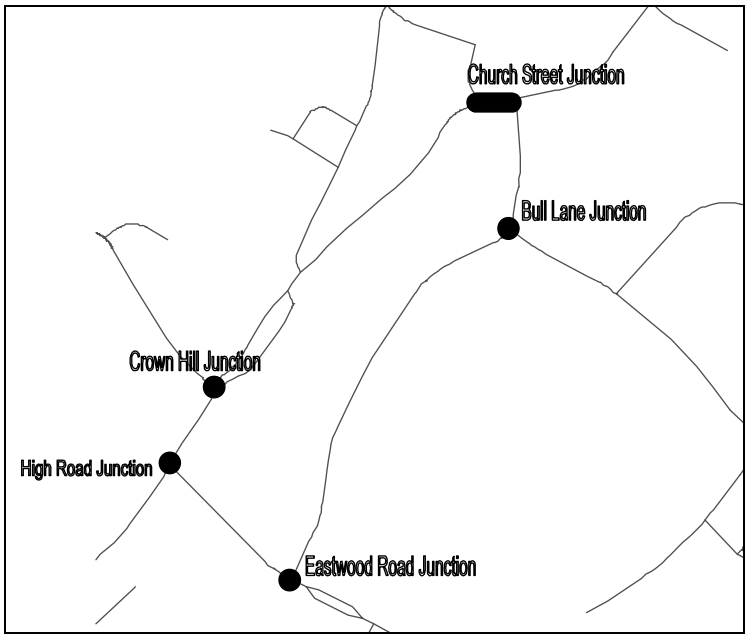


Table 1: Key junctions and their associated approach roads

JUNCTION	APPROACH ROADS
Crown Hill Junction (a mini-roundabout):	Crown Hill and High Street
High Road Junction (a mini-roundabout):	High Road, Eastwood Road and High Street
Eastwood Road Junction (a mini-roundabout):	Eastwood Road and Webster's Way
Bull Lane Junction (a T-junction):	Webster's Way and Bull Lane
Church Street Junction (a part-signals, part give-way staggered junction):	Church Street, High Street, Webster's Way and Hockley Road

Figure 3 below shows the main roads leading into and out of Rayleigh Town Centre, as well as the study sites, namely:

i) Church Street junction where proposed junction alterations and full signalisation would be made; and

ii) the origin-destination survey site (situated in Webster's Way car park).

2.2 Study approach

The study was carried out in two stages. The first stage involved assessment, using TRANSYT11, of the operation of the junction as part of the Rayleigh Town Centre road network, under three traffic management schemes:

a) the existing system in which part of the staggered junction was controlled by traffic signals and the other part was a give-way;

b) the existing system with a right turn lane provided on High Street for traffic turning into Webster's Way; and

c) the whole junction controlled by traffic signals.

Figure 4 below shows sketches of the three traffic management schemes considered in the study.

The second stage of the study involved conducting origin-destination (O-D) surveys by interviewing motorists who were visiting Webster's Way car park. A questionnaire, administered by an enumerator, was used to obtain information on the origins and/or destinations of traffic that passed through Rayleigh town centre, purpose of the trip and the precise routes taken. Processing of the O-D survey data was handled in an MS Access database, with some of the calculations done in MS Excel.

Figure 3: Rayleigh study sites

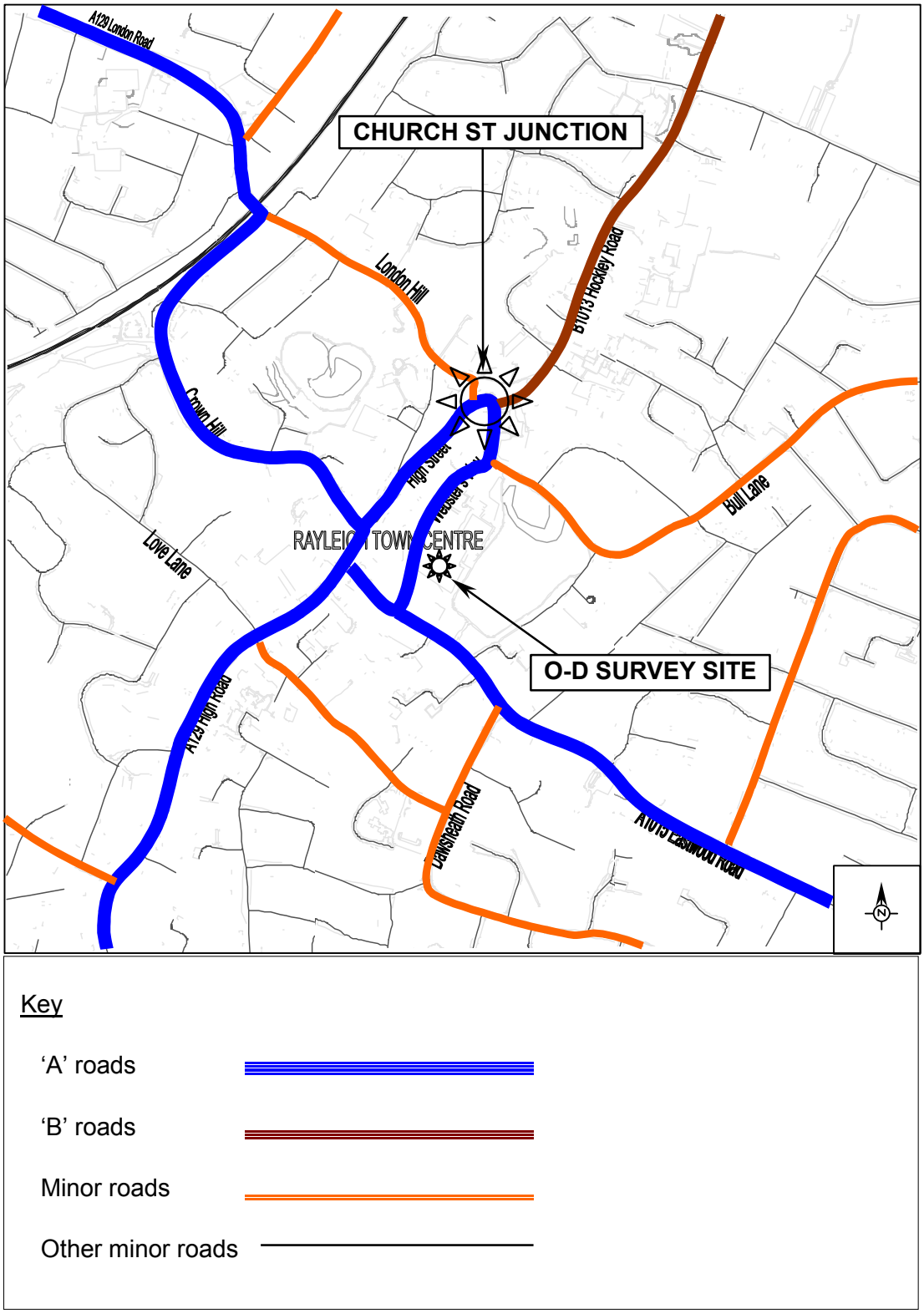
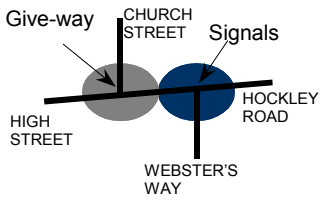
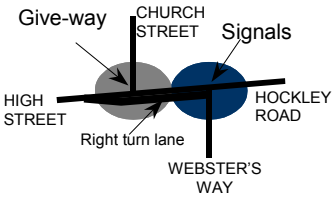


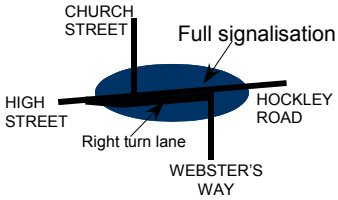
Figure 4: traffic management schemes at Church Street Junction



a) Existing situation



b) Existing situation with right turn lane on High Street



c) Full signals with right turn lane on High Street

3 Study results

3.1 Junction assessment

3.1.1 Network performance

The primary aim of the assessment was to determine how Church Street Junction would operate under different traffic management schemes and hence to establish how the rest of the town centre network would respond to any alterations made at Church Street Junction. TRANSYT11, a traffic network study tool, was used in the junction assessment in order to be able to determine the performance at Church Street Junction as well as at other key junctions. Two sets of tests representing the AM and the PM peak periods were run for each of the schemes.

Criteria used to measure the performance of the network were:

- degree of saturation on each junction approach;
- delay per car (pcu[1]) and total delay at each junction; and
- queue length (in pcu).

The performance of the network can be summarised as follows:

- With regard to degree of saturation, all approach roads at the three mini-roundabouts (at Crown Hill, High Road and Eastwood Road) operated very close to capacity[2] during both AM and PM peak periods under the existing situation. However, Church Street junction operated well within capacity in the AM peak but very close to capacity during the PM peak.
- Alterations to Church Street junction (i.e. the introduction of a right turn lane on High Street and full signalisation) would have little effect on saturation at the three mini-roundabouts; though there would be a decrease in saturation at Church Street junction.
- Under the existing situation delays of over 30 seconds were experienced at all external approach roads to the town centre, particularly on Webster's Way and Eastwood in the AM peak and on Church Street, High Road and Hockley Road in the PM peak. Alterations to Church Street junction would result in reduced delays on Webster's Way associated with an increase on Eastwood Road. There would be a decrease in delays on Church Street and Hockley Road associated with an increase on High Street. Alterations would result in slightly less overall network delays than under the existing situation.

[1] pcu refers to passenger car unit

[2] capacity is taken to be 100%, anything above 100% represents over-capacity.

- With regard to queues, alterations at Church Street junction would have limited effects at all the junctions; noticeable changes would be an increase on Eastwood Road during the AM peak and decreases on Church Street and Hockley Road in the PM peak.

- **The proposed alterations at Church Street junction would result in some changes particularly at this junction but would have limited effect on the operation of the mini-roundabouts, although there would be slightly less overall network delays than under the existing situation.**

Snapshots of the performance of the network are shown as bar charts in Figure 5 to Figure 10 below and are also presented in Table 2 to Table 4 below. Additional detailed TRANSYT results are situated in the Appendix.

Figure 5: average degree of saturation on main approach roads in the AM peak

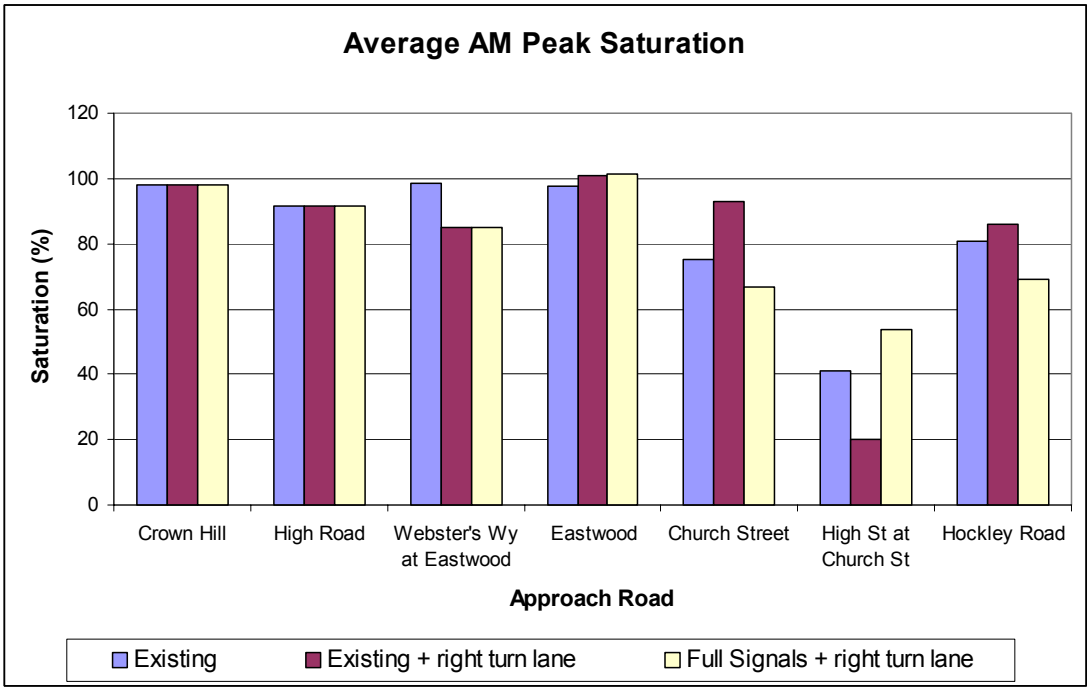


Figure 6: average degree of saturation on main approach roads in the PM peak

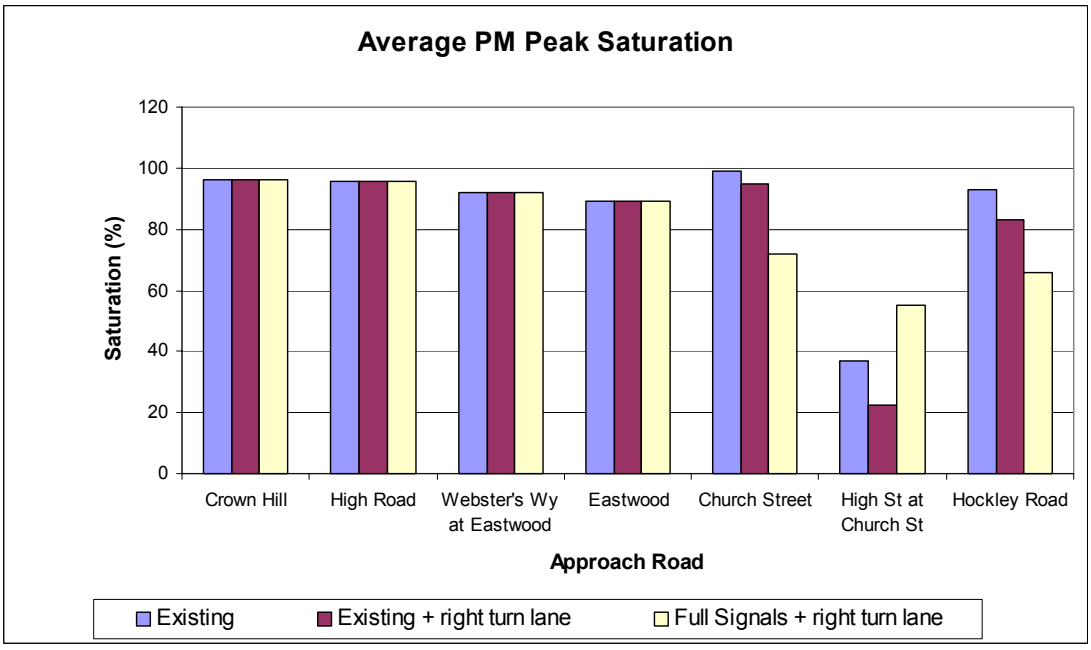


Figure 7: average delay per pcu on main approach roads in the AM peak

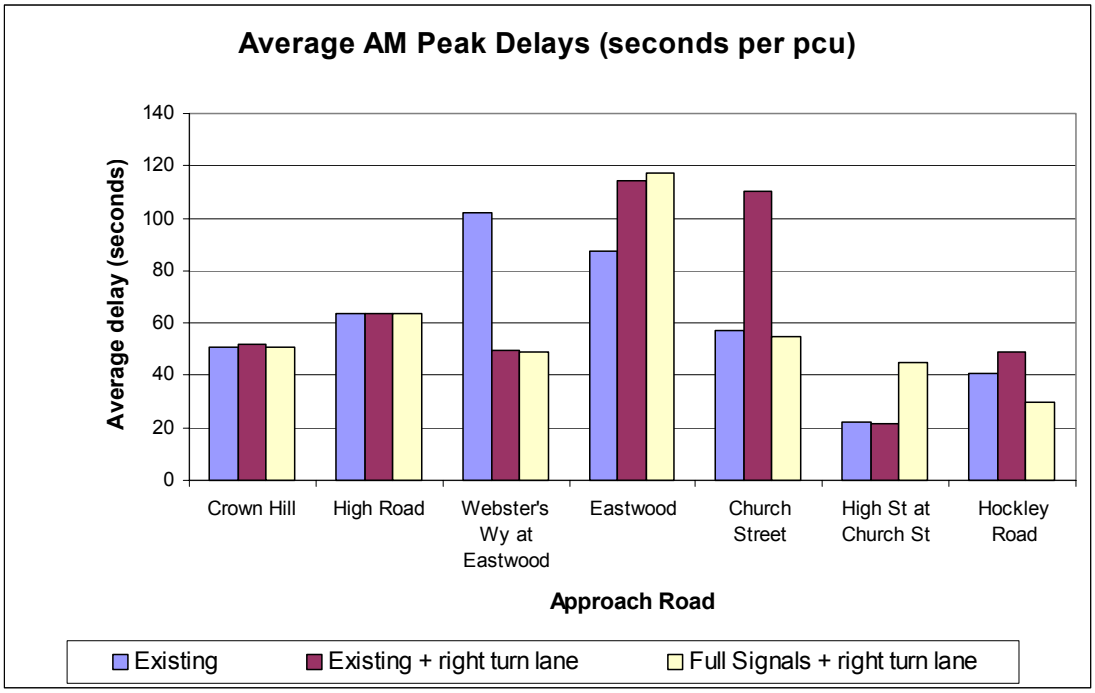


Figure 8: average delay per pcu on main approach roads in the PM peak

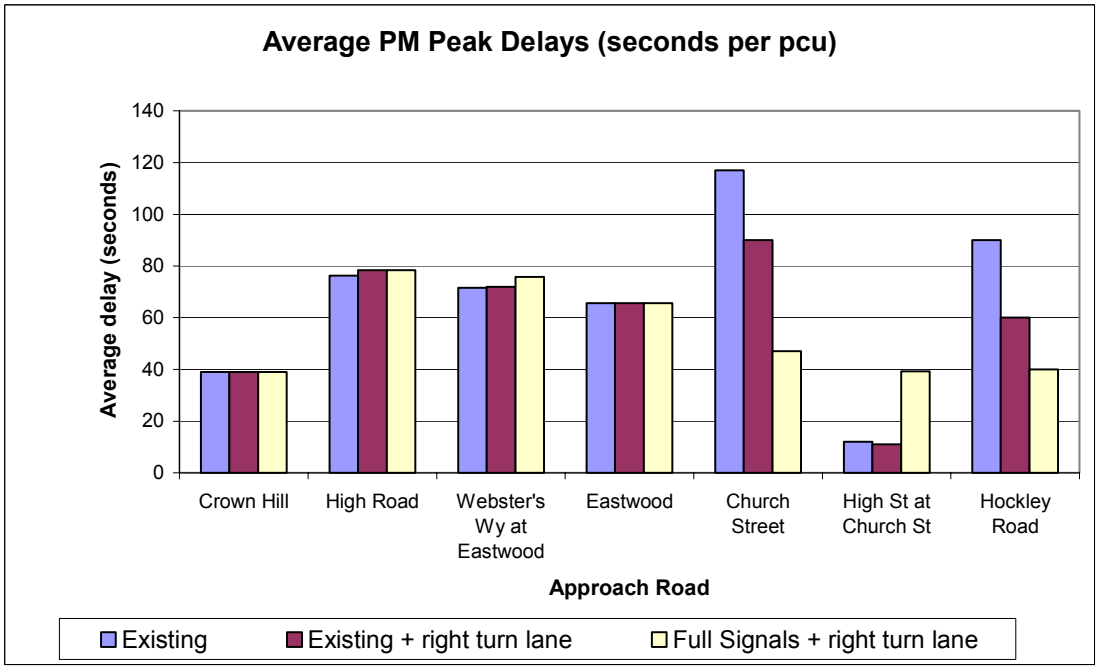


Figure 9: average queues on main approach roads in the AM peak

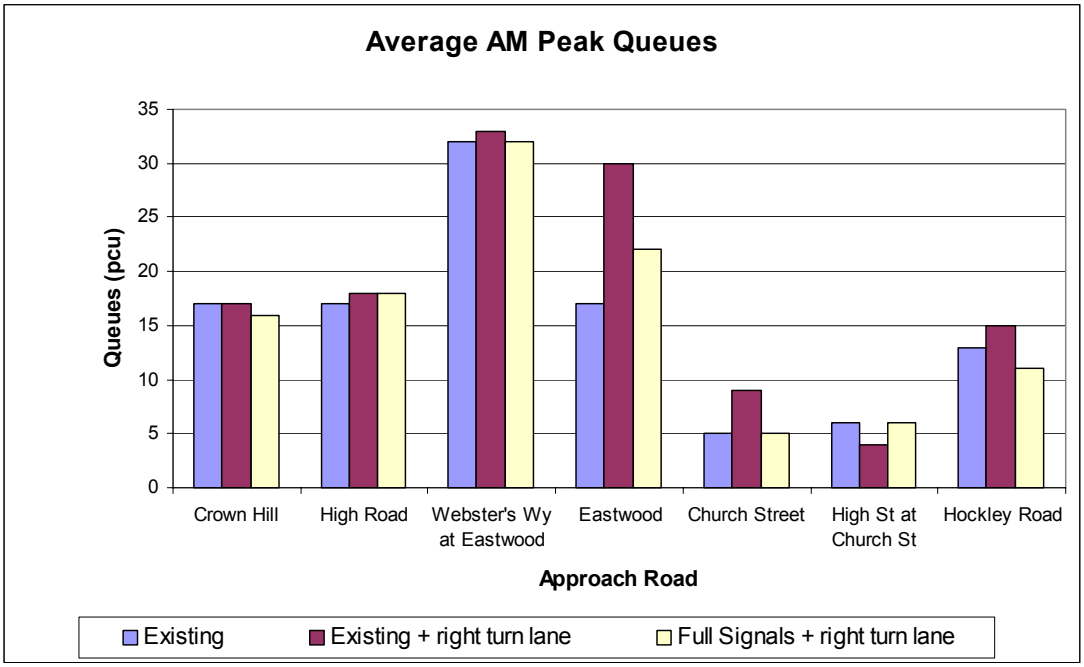


Figure 10: average queues on main approach roads in the PM peak

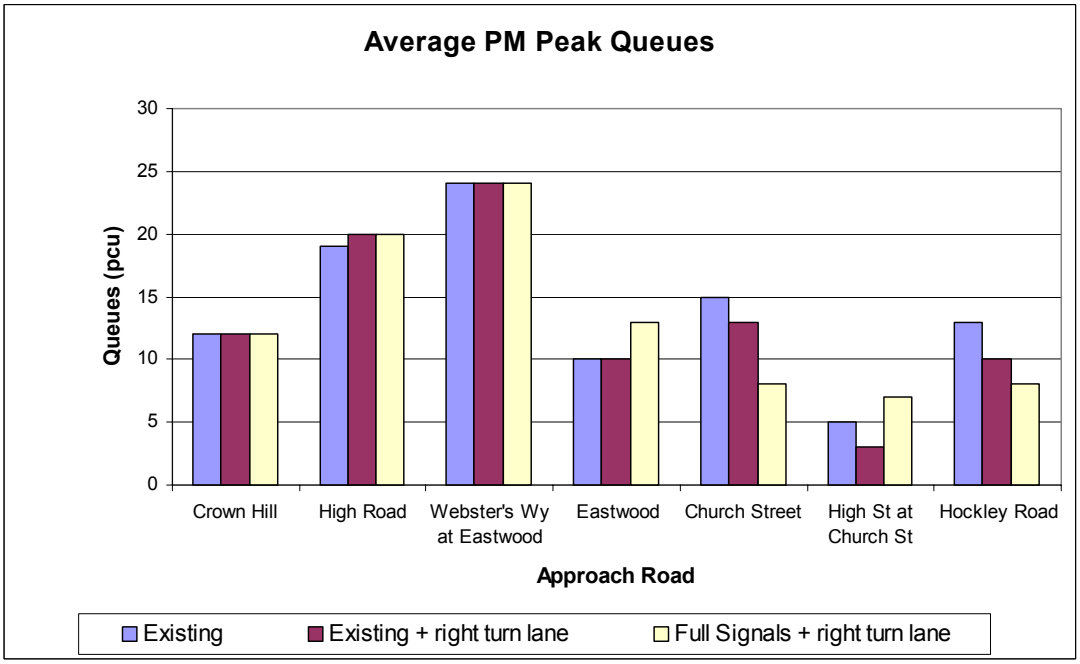


Table 2: Junction performance under the **Existing Situation**

AM PEAK

- Most of the approach roads experienced a high degree of saturation of over 90%: Crown Hill (98%), High Road (91%), Eastwood Road (98%) and Webster's Way (98%). All other links operated below 85% saturation.
- Delays of over 30sec/pcu were experienced at all external approach roads – 51sec/pcu at Crown Hill, 64sec/pcu at High Road, 102sec/pcu at Webster's Way (southbound), 87sec/pcu at Eastwood Road, 41sec/pcu at Hockley Road and 57sec/pcu at Church Street. The overall delay for the network was 75.6 pcu-h/h.
- All approach roads had queues longer than 10pcu: Crown Hill 17pcu, High Road 17pcu, Webster's Way 32pcu, Eastwood 17pcu and Hockley Road 13pcu.

PM PEAK

- During the PM peak period all the external approach roads operated at above 90% saturation: Crown Hill 96%, High Road 96%, Webster's Way 92%, Eastwood Road 89%, Hockley Road 93% and Church Street 99%.
- Long delays were evident on external approach roads: 39sec/pcu at Crown Hill, up to 76sec/pcu at High Road, 72sec/pcu at Webster's Way (southbound) and 46sec/pcu (northbound), 66sec/pcu at Eastwood Road, 90sec/pcu at Hockley Road and 117sec/pcu at Church Street. Overall delay for the network was 75.2pcu-h/h.
- Queues were longer than 10pcu at Crown Hill (12pcu), High Road (19pcu), Webster's Way (24pcu), Church Street (15pcu) and Hockley Road (13pcu).

Table 3: Performance under the Existing Situation with a **right turn lane**

AM PEAK

- Most of the approach roads experienced a high degree of saturation of over 90%: Crown Hill (98%), High Road (92%), Eastwood Road (101%) and Church Street (93%).
- Delays of over 30sec/pcu were experienced at all external approach roads – 52sec/pcu at Crown Hill, 64sec/pcu at High Road, 50sec/pcu at Webster's Way (southbound), 114sec/pcu at Eastwood Road, 49sec/pcu at Hockley Road and 110sec/pcu at Church Street. The overall delay for the network was 74.7 pcu-h/h.
- All approach roads had queues longer than 10pcu: Crown Hill 17pcu, High Road 18pcu, Webster's Way 33pcu, Eastwood 30pcu and Hockley Road 15pcu.

PM PEAK

- During the PM peak period all the external approach roads operated at above 90% saturation: Crown Hill 96%, High Road 96%, Webster's Way 92% and Church Street 95%.
- Long delays were evident on external approach roads: 39sec/pcu at Crown Hill, 78sec/pcu at High Road, 72sec/pcu at Webster's Way (southbound) and 46sec/pcu (northbound), 66sec/pcu at Eastwood Road, 60sec/pcu at Hockley Road and 90sec/pcu at Church Street. Overall delay for the network was 70.3pcu-h/h.
- Queues were longer than 10pcu at Crown Hill (12pcu), High Road (20pcu), Webster's Way (24pcu) and Church Street (13pcu).

Table 4: Performance with **full signalisation** and **a right turn lane**

AM PEAK

- Most of the approach roads experienced a high degree of saturation of over 90%: Crown Hill (98%), High Road (92%) and Eastwood Road (101%).
- Delays of over 30sec/pcu were experienced at all external approach roads – 51sec/pcu at Crown Hill, 64sec/pcu at High Road, 49sec/pcu at Webster's Way (southbound), 118sec/pcu at Eastwood Road, 45sec/pcu at High Street and 55sec/pcu at Church Street. The overall delay for the network was 70.8 pcu-h/h.
- Most approach roads had queues longer than 10pcu: Crown Hill 16pcu, High Road 18pcu, Webster's Way 32pcu, Eastwood 22pcu and Hockley Road 11pcu.

PM PEAK

- During the PM peak period most of the external approach roads operated at above 90% saturation: Crown Hill 96%, High Road 96% and Webster's Way 92%.
- Long delays were evident on external approach roads: 39sec/pcu at Crown Hill, 78sec/pcu at High Road, 76sec/pcu at Webster's Way (southbound) and 34sec/pcu (northbound), 66sec/pcu at Eastwood Road, 40sec/pcu at Hockley Road, and 47sec/pcu at Church Street. Overall delay for the network was 70.3pcu-h/h.
- Queues were longer than 10pcu at Crown Hill (12pcu), High Road (20pcu), Webster's Way (24pcu) and Eastwood Road (13pcu).

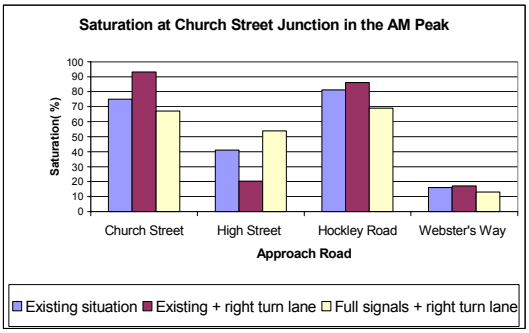
3.1.2 Performance of Church Street Junction

The main focus of this study was to assess the performance of the network with some alterations at Church Street junction. Below is a summary of the assessment of the performance of Church Street junction with alterations.

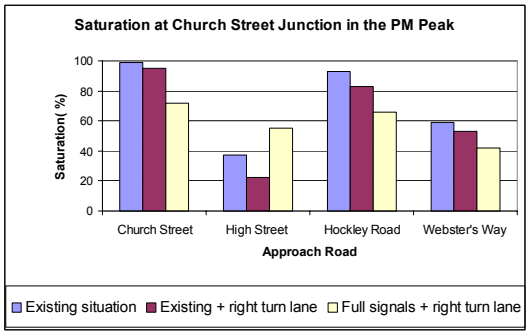
- The PM peak was worse than the AM peak in terms of saturation.
- Alterations, especially full signalisation, would result in reduced saturation on three approaches, except High Street which would experience an increase.
- With regard to delays, alterations would result in reduced delays on three approaches, except High Street which would experience an increase.
- The introduction of a right turn lane on High Street would result in an increase in the lengths of queues on Church Street and Hockley Road during the AM peak. However, in the PM peak there would be shorter queues on all approaches. Full signalisation would generally result in shorter queues.
- **Alterations to Church Street junctions would result in some improvement in operating conditions, particularly in the PM peak.**

Snapshots of the performance of Church Street junction are shown in Figure 11 to Figure 13 below. The detailed results are presented in Table 5: to Table 7 below.

Figure 11: saturation at Church Street junction

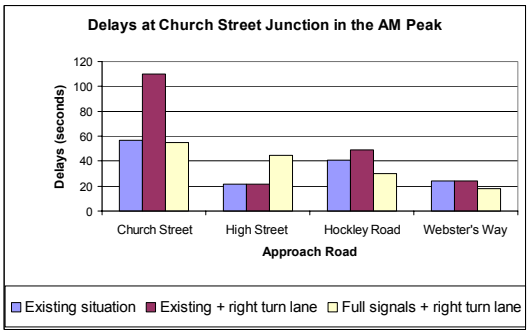


a) AM peak

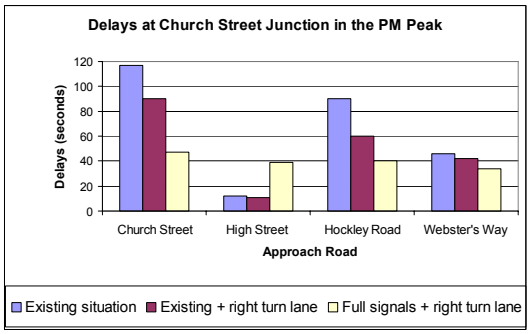


b) PM peak

Figure 12: delays at Church Street junction

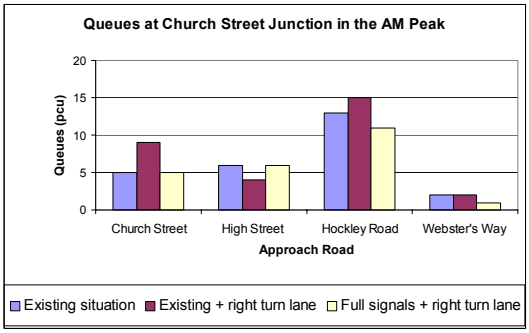


a) AM peak

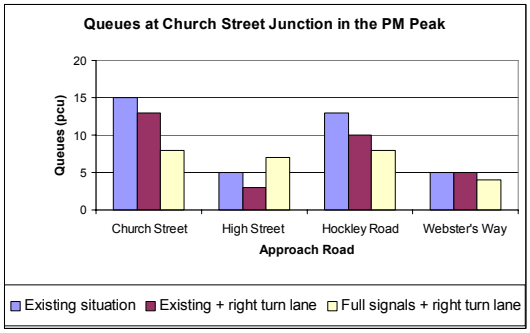


b) PM peak

Figure 13: queues at Church Street junction



a) AM peak



b) PM peak

Table 5: saturation (%) at Church Street Junction

	AM PEAK			**PM PEAK**		
Junction approach	Existing	Existing + extra-lane	Signals + extra-lane	Existing	Existing + extra-lane	Signals + extra-lane
Church Street	75	93	67	99	95	72
High Street right turn		13	34		12	30
High Street	41	24	64	37	27	66
Hockley Road	81	86	69	93	83	66
Webster's Way	16	17	13	59	53	42

Table 6: delays (sec/pcu) at Church Street Junction

	AM PEAK			**PM PEAK**		
Junction approach	Existing	Existing + extra-lane	Signals + extra-lane	Existing	Existing + extra-lane	Signals + extra-lane
Church Street	57	110	55	117	90	47
High Street right turn		17	41		11	35
High Street	22	24	47	12	11	41
Hockley Road	41	49	30	90	60	40
Webster's Way	24	24	18	46	42	34

Table 7: queues (pcu) at Church Street Junction

	AM PEAK			**PM PEAK**		
Junction approach	Existing	Existing + extra-lane	Signals + extra-lane	Existing	Existing + extra-lane	Signals + extra-lane
Church Street	5	9	5	15	13	8
High Street right turn		2	3		1	3
High Street	6	4	6	5	3	7
Hockley Road	13	15	11	13	10	8
Webster's Way	2	2	1	5	5	4

3.2 Origin-destination survey

3.2.1 The approach to the analysis of survey data

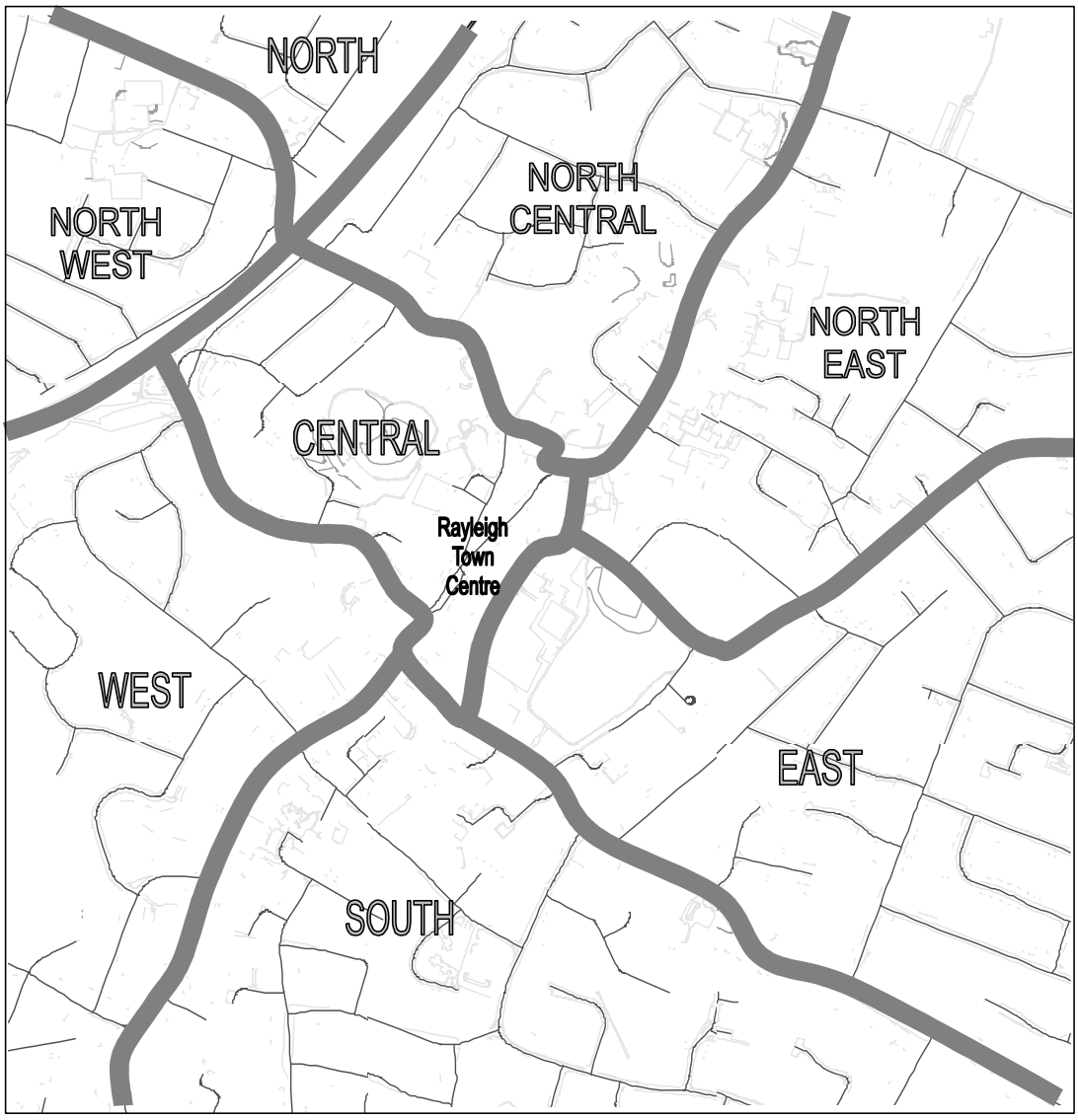
An origin-destination survey was conducted on Tuesday 16th September 2003 in the Webster's Way car park from 07:00 to 10:00 to cover the morning peak period, and from 16:00 to 19:00 to cover the evening peak period

Respondents were first divided into two groups according to whether they lived in Rayleigh or outside Rayleigh. Residents of Rayleigh were further grouped into eight arbitrary zones, as shown in Figure 14 below. Respondents from towns outside Rayleigh were grouped into five large zones according to the location of their home towns in relation to Rayleigh (see Table 8 below).

Table 8: External origin-destination zones

Zone	Towns in zone
East	Southend-on-Sea; Eastwood; Thorpe Bay; South Church; Westcliffe, Prittlewell, Shoeburyness, Little Wakering, Barling, Churchend, Foulness, Courtsend, etc
South	Dawsheath, Hadleigh, Leigh-on-Sea, Canvey Island, South Benfleet, Bowers Gifford, Thundersley, North Benfleet, Pitsea, Vange, Laindon, Basildon, Langdon Hills, Horndon on the Hill, Chadwell, West Tilbury, London, Stanford-le-Horpe, East Tilbury, Linford, Mucking, Corringham Fobbing, Coryton
West	Bilericay, South Green, Great Burstead, Crays Hill, Wickford, Shotgate, Nevendon, Ramsden Heath, Ramsden Bellhouse, Downham,
North west	Chelmsford, Witham, Braintree, West Hanningfield, South Hanningfield, Howe Green, Brock Hill, Runwell, Battlesbridge, Rawreth, East Hanningfield, Woodham Ferrers, South Woodham Ferrers, Danbury, Stow Maries, Maldon, Little Baddow, Heybridge, Cold Norton, Purleigh
North east	Hockley, Hawkwell, Hullbridge, South Fambridge, Ashingdon, Rochford, Southend Municipal Airport, Great Stambridge, Paglesham Eastend, Paglesham Churchend, Canewdon, Creeksea

Figure 14: Internal origin-destination zones for local residents of Rayleigh



3.2.2 O-D survey results in brief

The survey was undertaken using a questionnaire which contained a total of thirteen multiple-choice questions. The survey produced 315 responses from 100 men and 75 women from Rayleigh, and 52 men and 88 women from outside Rayleigh.

Analysis of survey data was processed using MS Access and MS Excel. The following patterns emerged from the analysis:

- The majority of people from within Rayleigh were on personal business and shopping trips and a small proportion (3%) were on work trips.

- The majority of people from outside Rayleigh were on personal business and shopping trips and a significant proportion (24%) were on work trips. If employer's business trips were added to work trips then almost a third of all the respondents would be on work related trips.

- In the morning, over half of the respondents arrived between 09:00 and 10:00 and just over a third arrived between 08:00 and 09:00. In the evening/late afternoon, almost two-thirds arrived between 16:00 and 17:00 and a third arrived between 17:00 and 18:00. This bias towards personal business and shopping trips is reflected in Table 11, Table 12 and Table 13 which give the number of arrivals by time segment and trip purpose. The majority of work trips were recorded between 08:00 and 09:00.

- The majority of local residents of Rayleigh (30%) lived to the east of the town centre. The rest were almost evenly distributed in the remaining zones, the exceptions being the central (with 0%) and west zones (with 1%).

- The majority of people from outside Rayleigh (42%) came from the north-east; about a third came from the east of Rayleigh.

- The most common routes taken by local residents of Rayleigh were Bull Lane followed by Eastwood Road, Crown Hill and Hockley Road. Most common routes used by people from outside Rayleigh were Hockley Road, followed by Eastwood Road and High Road.

- Of all roads avoided by local residents of Rayleigh, Crown Hill (17%) was the most commonly avoided, followed by High Street (15%), Webster's Way (7%), Hockley Road (4%) and others. 39% of local residents did not specify a road they would avoid. A very small proportion (2%) of the respondents would avoid London Hill; no mention was made of Church Street.

- Respondents from outside Rayleigh would mostly avoid High Street (13%, Crown Hill (8%), Eastwood Road (5%), Webster's Way (4%) and others; 63% of the respondents did not specify the roads they would avoid. A small proportion of the respondents would avoid Church Street and/or London Hill.

- The two main reasons given by both residents of Rayleigh and those from outside Rayleigh were a) congested junctions and b) giving way to continuous streams of traffic, mainly at Crown Hill and High Street.

- The majority of people interviewed in the survey (69%) made the trip occasionally, that is, less than once a fortnight. About a quarter of the respondents made the trip everyday or every weekday.

3.2.3 Responses by home and main trip purpose

Details of the distribution of trips according to home location, main purpose and time of arrival are presented in Table 9 to Table 14 below.

Table 9: Number of responses by home and main trip purpose

	Responses from people with homes …			
Main Purpose	**In Rayleigh**	**%**	**Outside Rayleigh**	**%**
Employer's Business	4	2%	9	6%
Escort - Education	1	1%	-	-
Escort - Other	1	1%	3	2%
Personal Business	95	54%	51	37%
Shopping	65	37%	43	31%
Sports/Social	3	2%	-	-
Work	6	3%	34	24%
TOTALS	175	100%	140	100%

Table 10: temporal distribution of arrivals from within and outside Rayleigh

Arrival time	Total arrivals	Proportion	Arrivals from Rayleigh	Arrivals from outside Rayleigh
AM				
07:01 to 08:00	23	11%	11	12
08:01 to 09:00	80	38%	47	33
09:01 to 10:00	107	51%	56	51
TOTALS	210	100%	114	96
PM				
16:01 to 17:00	63	63%	32	31
17:01 to 18:00	30	30%	21	9
18:01 to 19:00	7	7%	5	2
TOTALS	100	100%	58	42

Table 11: temporal distribution of ALL responses according to trip purpose

Arrival Time	Total	Proportion	Employer's Business	Escort - Education	Escort - Other	Personal Business	Shopping	Sports/Social	Work
AM									
07:00 to 07:59	22	10%	7	0	0	8	0	1	6
08:00 to 08:59	76	36%	5	1	1	36	13	2	18
09:00 to 09:59	116	54%	1	0	0	44	59	0	12
TOTALS	214	100%	13	1	1	88	72	3	36
PROPORTION		100%	6%	0%	0%	41%	34%	2%	17%
PM									
16:00 to 16:59	61	60%	0	0	2	27	29	0	3
17:00 to 17:59	31	31%	0	0	1	22	7	0	1
18:00 to 18:59	9	9%	0	0	0	9	0	0	0
TOTALS	101	100%	0	0	3	58	36	0	4
PROPORTION		100%	0%	0%	3%	57%	36%	0%	4%

Table 12: temporal distribution of responses from Rayleigh residents

Arrival time	TOTAL	Proportion	Employer's Business	Escort - Education	Escort - Other	Personal Business	Shopping	Sports/Social	Work
AM									
07:01 to 07:59	10	9%	1	0	0	8	0	1	0
08:00 to 08:59	47	40%	3	1	0	29	8	2	4
09:00 to 09:59	59	51%	0	0	0	21	37	0	1
TOTALS	116	100%	4	1	0	58	45	3	5
PROPORTION		100%	3%	1%	0%	50%	39%	3%	4%
PM									
16:00 to 16:59	31	52%	0	0	0	16	15	0	0
17:00 to 17:59	21	36%	0	0	1	14	5	0	1
18:00 to 18:59	7	12%	0	0	0	7	0	0	0
TOTALS	59	100%	0	0	1	37	20	0	1
PROPORTION		100%	0%	0%	1%	63%	34%	0%	2%

Table 13: temporal distribution of responses from people living outside Rayleigh

Arrive time	Responses	Proportion	Employer's Business	Escort - Other	Personal Business	Shopping	Work
AM							
07:00 to 07:59	12	12%	6	0	0	0	6
08:00 to 08:59	29	30%	2	1	7	5	14
09:00 to 09:59	57	58%	1	0	23	22	11
TOTALS	98	100%	9	1	30	27	31
PROPORTION		100%	9%	1%	31%	27%	32%
PM							
16:00 to 16:59	30	71%	0	2	11	14	3
17:00 to 17:59	10	24%	0	0	8	2	0
18:00 to 18:59	2	5%	0	0	2	0	0
TOTALS	42	100%	0	2	21	16	3
PROPORTION		100%	0%	5%	50%	38%	7%

Table 14: Origin zones of people living IN Rayleigh and OUTSIDE Rayleigh

Origin	Within Rayleigh	Outside Rayleigh
North east	15%	42%
North	15%	
North central	11%	
East	30%	23%
South	12%	22%
North west	17%	9%
West	1%	4%
TOTAL	100%	100%

3.2.4 Routes either taken or avoided by respondents and reasons

Figure 15 and Figure 16 below show routes that would normally be used by local residents and people from outside Rayleigh respectively. Figure 17 and Figure 18 show roads that would be avoided by local residents of Rayleigh and those living outside Rayleigh, respectively. Reasons for avoiding the roads are given in Table 15 and Table 16.

Figure 15: normal routes taken by local residents of Rayleigh

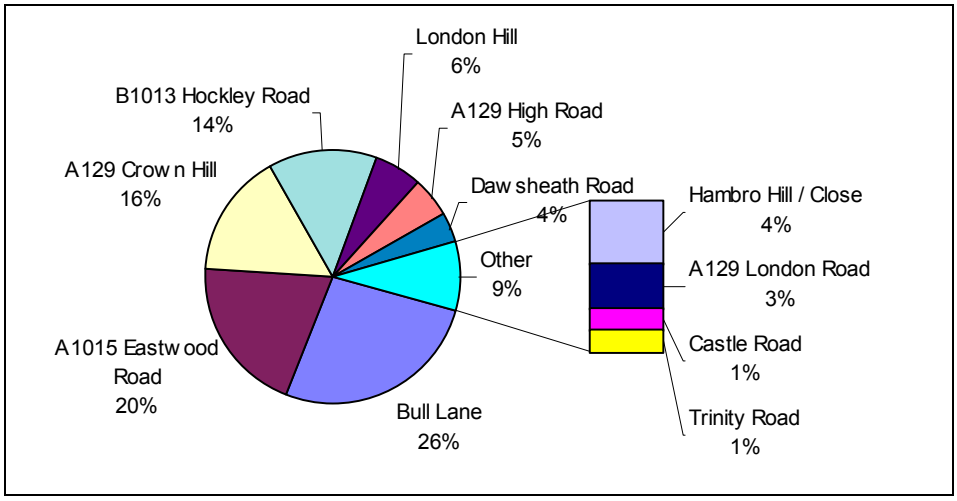


Figure 16: Normal routes in Rayleigh taken by people from outside Rayleigh

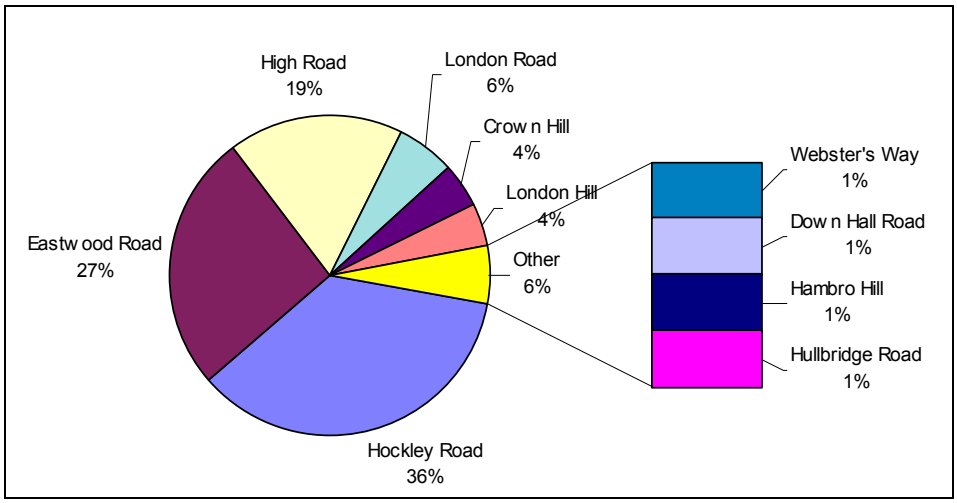


Figure 17: Roads avoided by local residents of Rayleigh

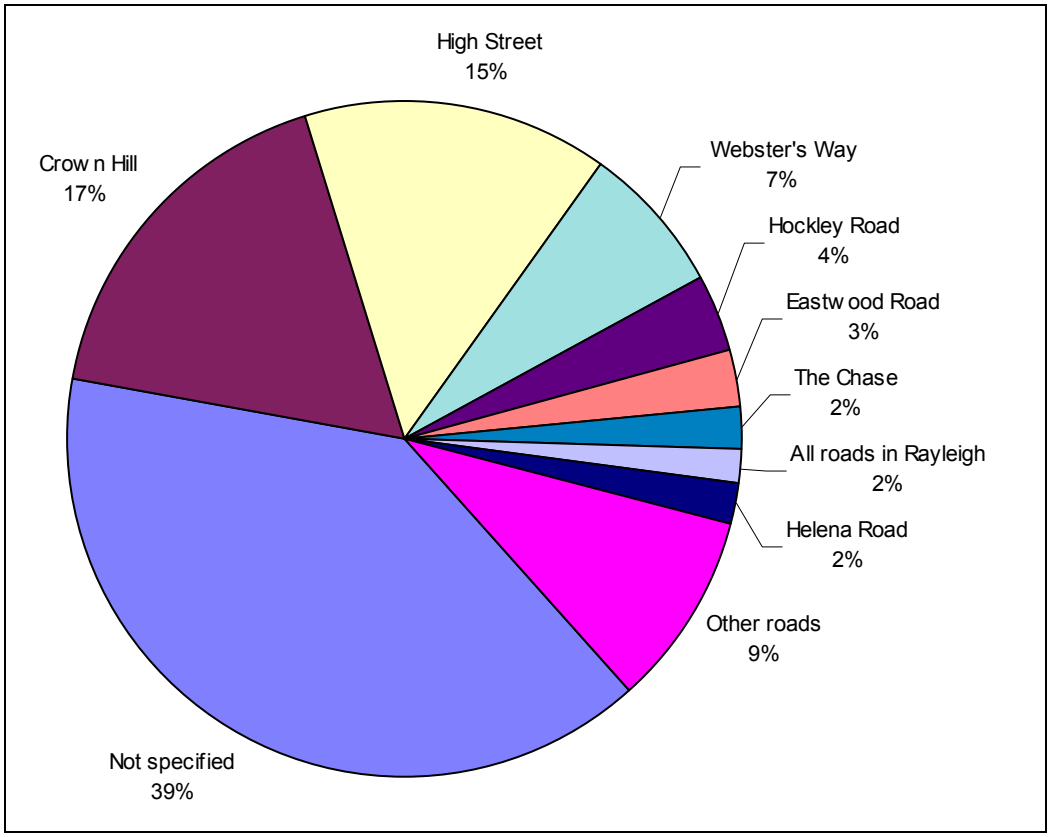


Figure 18: Roads avoided by people living outside Rayleigh

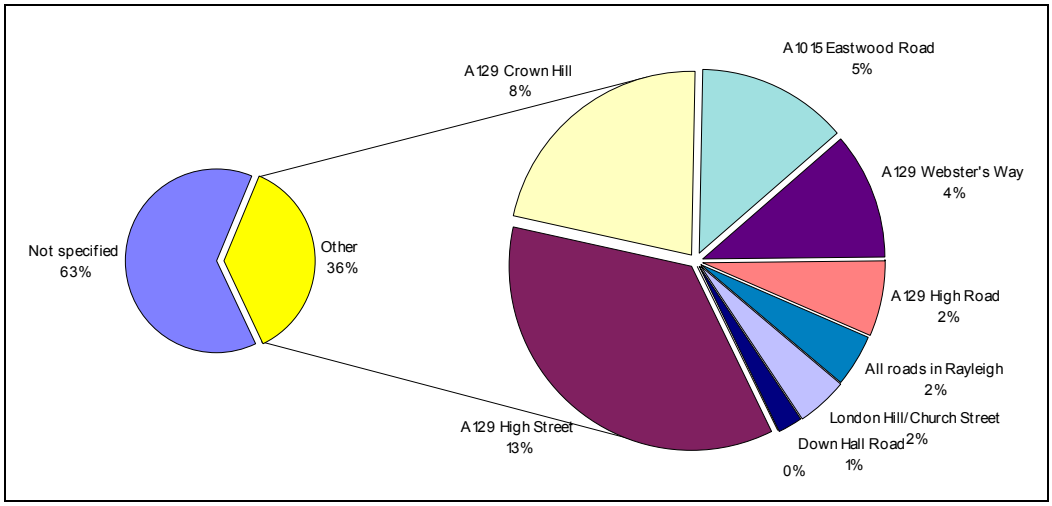


Table 15: Reasons given by local residents of Rayleigh for avoiding some roads in Rayleigh

Avoided route	Total responses	Proportion	Reason not specified	Accidents	Humps	Too busy	Congested junctions	Continuous give-way	Give way to pedestrians	Heavy Traffic	Lay out	Long queues	No traffic lights	Parked cars	slow traffic
Road not specified	73	42%	73												
Crown Hill	25	14%	3			1	7	6	2			4	1		1
High Street	18	10%				1	6	9					2		
Webster's Way	10	6%				2	4	1	1		1		1		
All roads in Rayleigh	10	6%					9	1							
Eastwood Road	9	5%					2	6	1						
High Road	4	2%					3	1							
Hockley Road	4	2%	1				2			1					
London Hill	4	2%					1	3							
Helena Road	2	1%			2										
The Chase	2	1%				1	1								
Trinity Road	2	1%						1						1	
Ashingdon	1	1%						1							
Bellingham Lane	1	1%					1								
Bull Lane	1	1%					1								
Castle Road	1	1%					1								
Down Hall Road	1	1%				1									
Hilary Cres	1	1%												1	
Louise Road	1	1%			1										
Rayleigh Weir	1	1%		1											
Station hill	1	1%						1							
Uplands Park Road	1	1%						1							
Victoria Road	1	1%			1										
Weir Gardens	1	1%										1			
TOTALS	175	100%	77	1	4	6	38	31	4	1	1	5	4	2	1

Table 16: Reasons given by people living outside Rayleigh for avoiding some roads

Main reason	Total	Proportion	Eastwood Road	Crown Hill	High Road	High Street	Webster's Way	All roads in Rayleigh	Church Street	Down Hall Road	London Hill
Congested junctions	23	48%	3	3	2	7	3	2	1	1	1
Give way to a continuous stream of cars	14	29%	2	4		6	1	1			
Busy	3	6%			1	1	1				
Long queues	2	4%		1		1					
Give way to pedestrians	1	2%				1					
Heavy Traffic	1	2%		1							
No traffic lights	1	2%	1								
One way street	1	2%				1					
Road works	1	2%		1							
Too many roundabouts	1	2%				1					
TOTALS	48	100%	6	10	3	18	5	3	1	1	1

Note: 92 respondents from outside Rayleigh did not specify a road they would avoid.

3.2.5 Trip frquency

Table 17 below shows trip frequencies by local residents of Rayleigh and by people from outside Rayleigh.

Table 17: trip frequencies

Trip freq	Total Responses	Proportion	In Rayleigh	Outside Rayleigh
Occasionally	216	69%	114	102
Every weekday	41	13%	23	18
Everyday	30	10%	22	8
Not specified	*8*	*3%*	*5*	*3*
Every morning	7	2%	2	5
Saturdays	6	2%	6	
Fortnightly	4	1%		4
Every weekend	2	1%	2	
Once a week	1	0%	1	
TOTALS	315	100%	175	140

3.3 Check traffic counts at Bull Lane junction

Check traffic counts at Bull Lane junction were carried out on Tuesday 16th September 2003 from 17:30 to 18:30.

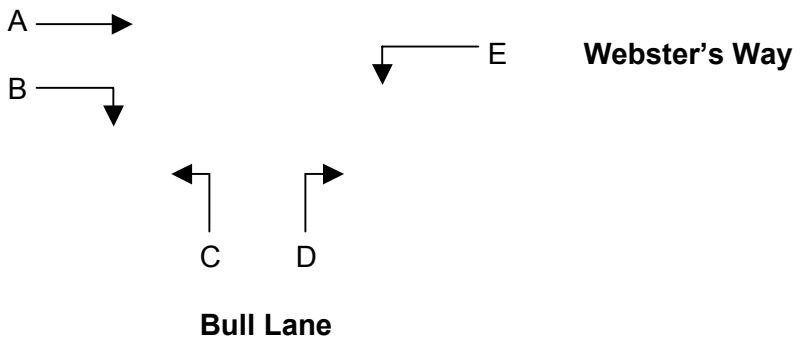


Table 18: traffic turning movements at Bull Lane junction

Start Time	Movement					
	A	**B**	**C**	**D**	**E**	Total
17:30	40	25	16	5	63	**149**
17:45	30	14	21	3	58	**126**
18:00	35	13	18	2	53	**121**
18:15	37	3	17	4	49	**110**
Total	**142**	**55**	**72**	**14**	**223**	**506**

The highest recorded flow was movement E, that is, traffic coming from the Church Street junction and turning left into Bull Lane. A small proportion of traffic turned right from Webster's Way into Bull Lane.

4 Conclusions

The proposed alterations at Church Street junction would result in some changes at the altered junction but would have limited effect on the operation of the rest of the town centre network, particularly at the mini-roundabouts. However, there would be slightly less overall network delays than under the existing situation.

Alterations to Church Street junction would result in some improvement at the junction, particularly during the PM peak. The introduction of a right turn lane on High Street effectively creates two streams of traffic to which Church Street would have to give way, leading to longer delays on Church Street. Full signals would provide an opportunity for Church Street traffic to proceed unhindered, as they would have their own separate green phase. However, this would result in increased saturation and/or delays for the other approaches.

A possible benefit of signalising Church Street and the addition of a right turn lane would improved conditions for emergency vehicles, in terms of reduced delays.

The addition of a right turn lane would introduce a longer walking for pedestrians distance across High Street. However, as both High Street and Church Street would be stopped when Webster's Way and Hockley Road are on the green, there would be ample time to cross.

The majority of respondents interviewed were either doing personal business or shopping. This observation could be explained by the fact that a lot of commuter traffic (people going to or coming from work) would not normally deviate from their routes, particularly in the morning, and hence would not be captured in the survey. Also, it could be assumed that a lot of the local residents of Rayleigh would walk to work (or to town centre for any other purpose), thus explaining the small proportion of work trips captured in the survey.

The majority of respondents came from the eastern part of Rayleigh or from the north-east outside Rayleigh. This would probably explain why the most common routes used were Bull Lane, Eastwood Road and Hockley Road.

Roads that would normally be avoided were mainly Crown Hill and High Street as well as Webster's Way, Eastwood Road and Hockley Road to a lesser extent.

The main reasons for avoiding these roads were congested junctions and giving way to continuous streams of traffic, a common characteristic of mini-roundabouts with imbalances in inflows of traffic.

The majority of respondents indicated that they made the trip occasionally. This would seem to reinforce the argument that most of the commuters (who would make frequent trips into and through Rayleigh) would not normally park their cars within the survey site.

Very little mention of either London Hill or Church Street was made by respondents. This could probably suggest that these two roads were not perceived as constituting a major problem when compared to roads like Crown Hill and High Street. Although alterations to Church Street junction would improve operating conditions for Church Street, the benefits would probably not be large enough to affect current traffic flows in the town centre.

Turning movements obtained during the check traffic counts show that a large proportion (over 40%) of the southbound traffic from Church Street junction would turn off into Bull Lane and would therefore not go as far as Eastwood Road. This would mean that a significant amount of traffic found at Eastwood Road junction would have come from Webster's Way car park. If the turning movements were to be input into the TRANSYT model, the effect would be that any improvements obtained from altering Church Street junction would have very little or no effect to the operation of Eastwood junction, particularly in the PM peak.

5 Cost of junction alteration

The cost of junction alterations, namely a right turn lane on High Street and full signalisation of Church Street junction, is shown in the summary bill of quantities below.

BILL SECTION	DESCRIPTION	AMOUNT	
		£	p
S100	Preliminaries (including traffic management)	11,095	70
S200	Site Clearance	1,069	50
S500	Drainage and Service Ducts	1,776	00
S600	Earthworks	7,281	90
S700	Pavements	7,281	90
S1100	Kerbs footways and paved areas	1,250	00
S1200	Traffic Signs and Road Markings	60,300	00
S1300	Lighting Including cabling etc	2,000	00
	SUB-TOTAL	**92,055**	**00**
	Add Contingencies (10%)	9,205	50
	TOTAL	**101,261**	**50**

6 Appendices

AM PEAK DEGREE OF SATURATION (%)

Link number and description		EXISTING SITUATION	EXISTING WITH EXTRA LANE	FULL SIGNALS + EXTRA LANE
10	Crown Hill	98	98	98
13	High Street at Crown Hill	63	63	63
14	High Street at Crown Hill	57	57	57
30	High Street at Eastwwod	51	75	75
31	High Street at Eastwwod	77	77	77
32	Eastwod at High Street	71	71	71
34	Eastwod at High Street	71	71	71
35	High Road	63	64	64
36	High Road	97	97	97
50	Eastwod at Webster's Way	50	50	50
51	Eastwod at Webster's Way	25	25	25
52	Webster's Way at Eastwood	100	84	84
53	Webster's Way at Eastwood	91	91	91
54	Eastwood	84	106	108
55	Eastwood	100	100	100
60	Church Street	75	93	67
61	High Street at Church Street		13	34
62	High Street at Church Street	41	24	64
70	Hockley Road	81	86	69
72	Webster's Way at Church St	16	17	13

AM PEAK Queues (pcu)

Link number and description		EXISTING SITUATION	EXISTING WITH EXTRA LANE	FULL SIGNALS + EXTRA LANE
10	Crown Hill	17	17	16
13	High Street at Crown Hill	4	8	5
14	High Street at Crown Hill	2	3	2
30	High Street at Eastwwod	3	5	6
31	High Street at Eastwwod	6	6	6
32	Eastwod at High Street	9	6	8
34	Eastwod at High Street	9	6	7
35	High Road	1	1	1
36	High Road	16	17	17
50	Eastwod at Webster's Way	1	3	0
51	Eastwod at Webster's Way	0	0	0
52	Webster's Way at Eastwood	26	17	17
53	Webster's Way at Eastwood	6	6	5
54	Eastwood	2	8	10
55	Eastwood	15	22	22
60	Church Street	5	9	5
61	High Street at Church Street		2	3
62	High Street at Church Street	6	4	6
70	Hockley Road	13	15	11
72	Webster's Way at Church St	2	2	1

AM PEAK DELAYS (seconds/pcu)

Link number and description		EXISTING SITUATION	EXISTING WITH EXTRA LANE	FULL SIGNALS + EXTRA LANE
10	Crown Hill	51	52	51
13	High Street at Crown Hill	5	6	5
14	High Street at Crown Hill	9	9	9
30	High Street at Eastwwod	7	21	21
31	High Street at Eastwwod	23	23	23
32	Eastwod at High Street	11	9	10
34	Eastwod at High Street	11	9	10
35	High Road	36	36	36
36	High Road	69	69	69
50	Eastwod at Webster's Way	6	7	6
51	Eastwod at Webster's Way	13	13	13
52	Webster's Way at Eastwood	102	38	37
53	Webster's Way at Eastwood	103	106	106
54	Eastwood	95	277	299
55	Eastwood	86	88	88
60	Church Street	57	110	55
61	High Street at Church Street		17	41
62	High Street at Church Street	22	24	47
70	Hockley Road	41	49	30
72	Webster's Way at Church St	24	24	18
OVERALL DELAY (pcu-h/h)		75.6	74.7	70.8

PM PEAK DEGREE OF SATURATION (%)

Link number and description		EXISTING SITUATION	EXISTING WITH EXTRA LANE	FULL SIGNALS + EXTRA LANE
10	Crown Hill	96	96	96
13	High Street at Crown Hill	61	61	61
14	High Street at Crown Hill	54	54	54
30	High Street at Eastwwod	76	76	76
31	High Street at Eastwwod	66	66	66
32	Eastwod at High Street	62	62	62
34	Eastwod at High Street	41	41	41
35	High Road	98	99	99
36	High Road	95	95	95
50	Eastwod at Webster's Way	76	76	76
51	Eastwod at Webster's Way	26	26	26
52	Webster's Way at Eastwood	92	92	92
53	Webster's Way at Eastwood	92	92	92
54	Eastwood	58	58	58
55	Eastwood	99	99	99
60	Church Street	99	95	72
61	High Street at Church Street		12	30
62	High Street at Church Street	37	27	66
70	Hockley Road	93	83	66
72	Webster's Way at Church St	59	53	42

PM PEAK DELAYS (seconds/pcu)

Link number and description		EXISTING SITUATION	EXISTING WITH EXTRA LANE	FULL SIGNALS + EXTRA LANE
10	Crown Hill	39	39	39
13	High Street at Crown Hill	6	6	6
14	High Street at Crown Hill	6	6	6
30	High Street at Eastwwod	27	26	26
31	High Street at Eastwwod	11	11	11
32	Eastwod at High Street	7	7	7
34	Eastwod at High Street	4	5	4
35	High Road	158	168	168
36	High Road	54	54	54
50	Eastwod at Webster's Way	13	14	14
51	Eastwod at Webster's Way	14	14	14
52	Webster's Way at Eastwood	76	76	74
53	Webster's Way at Eastwood	66	67	78
54	Eastwood	19	19	19
55	Eastwood	80	80	80
60	Church Street	117	90	47
61	High Street at Church Street		11	35
62	High Street at Church Street	12	11	41
70	Hockley Road	90	60	40
72	Webster's Way at Church St	46	42	34
OVERALL DELAY (pcu-h/h)		75.2	70.3	68.3

PM PEAK Queues (pcu)

Link number and description		EXISTING SITUATION	EXISTING WITH EXTRA LANE	FULL SIGNALS + EXTRA LANE
10	Crown Hill	12	12	12
13	High Street at Crown Hill	6	5	4
14	High Street at Crown Hill	3	3	2
30	High Street at Eastwwod	5	4	4
31	High Street at Eastwwod	5	5	5
32	Eastwod at High Street	5	5	5
34	Eastwod at High Street	2	2	2
35	High Road	7	8	8
36	High Road	12	12	12
50	Eastwod at Webster's Way	4	8	8
51	Eastwod at Webster's Way	0	0	0
52	Webster's Way at Eastwood	13	13	13
53	Webster's Way at Eastwood	11	11	11
54	Eastwood	1	1	1
55	Eastwood	9	9	12
60	Church Street	15	13	8
61	High Street at Church Street		1	3
62	High Street at Church Street	5	3	7
70	Hockley Road	13	10	8
72	Webster's Way at Church St	5	5	4

Essex County Council (Rayleigh) – Highways Department
ORIGIN-DESTINATION SURVEY **QUESTIONNAIRE**

Date: _____ Location: **WEBSTER'S WAY CAR PARK**

Weather: _____ Enumerator's Name: _____

1. Do you live in Rayleigh or outside Rayleigh?

☐ IN RAYLEIGH
What is your home Post Code/Street Name?
Post Code: _____
Street: _____

☐ OUTSIDE RAYLEIGH
From which town did you start your trip?
Town: _____

2. What is the main purpose of your trip?

☐ Shopping ☐ Work ☐ Employer's Business ☐ Personal Business
Other: _____

3. For what other purpose are you visiting?

☐ Shopping ☐ Work ☐ Employer's Business ☐ Personal Business
Other: _____

4. Which route did you take to get here?

1) _____ 2) _____

5. How often do you visit Rayleigh town centre?

☐ Every morning ☐ Every evening ☐ Every weekday ☐ Everyday
☐ Weekdays fortnightly ☐ Saturdays ☐ Sundays ☐ Occasionally

6. Which route do you normally take in Rayleigh?

Road/street1: _____ *Road/Street2:* _____

7. Which road/street or junctions do you normally avoid in Rayleigh?

1: _____ *2:* _____

☐ NONE *(Go to Question 9.)*

8 Why do you avoid it/them?

☐ Having to give way to a continuous stream of cars.
☐ No traffic signals.
☐ Have to give way to pedestrians.
☐ No facility for right turns.
☐ No facility for left turns.
Other: _____

9 Which route will you take to your next destination?

1) _____ 2) _____

10. Vehicle arrival time (24hr clock): _____:_____

11. Sex of driver

☐ Male ☐ Female

12. Approximate age

☐ 17-25 ☐ 26-35 ☐ 36-65 ☐ 65+

13. How many people were in the car?:

☐ 1 ☐ 2 ☐ 3 or more

Queues observed on Church Street on 30th October 2002

AM:	NO. OF VEHICLES	
TIME	**NEARSIDE**	**OFFSIDE**
0730	2	
0735	3	
0740	1	
0745	3	
0750	10	1
0755	5	
0800	3	
0805	9	
0810	11	
0815	5	
0820	8	
0825	3	
0830	8	
0835	5	
0840	5	
0845	10	
0850	7	
0855	4	
0900	8	
0905	7	
0910	3	
0915	5	
0920	12	
0925	5	
0930	3	
935	7	
940	5	
945	7	
950	16	
955	13	2
1000	12	
1005	7	
1010	14	
1015	8	
1020	3	
1025	7	
1030	5	

PM:	NO. OF VEHICLES	
TIME	**NEARSIDE**	**OFFSIDE**
1630	8	
1635	5	
1640	7	
1645	5	
1650	3	
1655	6	
1700	4	
1705	9	
1710	23	2
1715	19	1
1720	11	
1725	8	
1730	14	1
1735	7	
1740	4	
1745	14	
1750	5	1
1755	11	
1800	6	
1805	9	
1810	2	
1815	4	
1820	9	
1825	16	
1830	8	