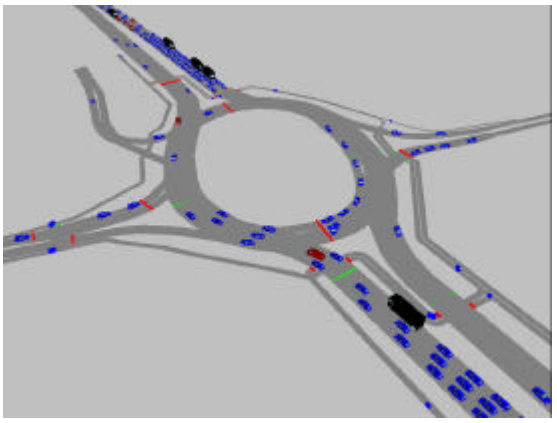

Transport for London

A1 Stirling Corner

Removal of HGV Traffic

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Transport for London

A1 Stirling Corner

Removal of HGV Traffic

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3	Revision 4
Remarks	100% HGV Removal	75% HGV Removal	50% HGV Removal	25% HGV Removal	25% HGV Removal revised
Date	29 March, 2004	2, April 2004	8, April 2004	27 April 2004	02 June 2004
Prepared by	**David Wildish**	**David Wildish**	**David Wildish**	**Clive Norfolk**	**Clive Norfolk**
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Signature					
Project number	10511093/016	10511093/016	10511093/016	10511093/016	10511093/016
File reference					

Removal of HGV Traffic

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A1 STIRLING CORNER

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1 INTRODUCTION

1.1 WSP has been commissioned by Transport for London to carry out a study to assess the impact that removal of Heavy Goods Vehicle (HGV) traffic might have on the performance of the Stirling Corner junction. The study brief requires an assessment of the morning and afternoon peak periods, through the use of a micro-simulation model to assess and quantify junction performance.

1.2 This study builds upon an earlier assessment, undertaken by WSP in 2003, to demonstrate the impact of improved pedestrian facilities at the junction. A VISSIM micro-simulation model was developed that was displayed at a public exhibition to demonstrate the impact of the proposals. To meet the requirements of the brief, and the agreed timescales for this study, use has been made of the public exhibition VISSIM model.

1.3 The removal of HGV traffic at this junction is being assessed in a sequential approach. Firstly revised base year models for the AM and PM peak periods have been developed for 2004 as an update to that presented in 2003. An assessment of the relative improvement in junction performance arising from the removal of HGVs is being carried out through the following:

- Removal of 100% HGVs from all approach links;
- Removal of 75% HGVs from all approach links (provisional);
- Removal of 50% HGVs from all approach links (provisional); and
- Removal of 25% HGVs from all approach links (provisional).

1.4 In this report the effect of removal of 100% of HGVs from all approach links is being assessed. Analysis of the impact of other scenarios is dependent on approval to carry out these assessments from TfL and will be detailed in a final report.

1.5 The structure of this report is as follows:

- Section 2 – Model Development
- Section 3 – Option Assessment, and
- Section 4 – Summary of Results

2 MODEL DEVELOPMENT

2.1 A VISSIM micro-simulation model for display at a public exhibition was developed to replicate the performance of the junction in the morning and afternoon peak periods for the following periods:

- Morning, 07:30 – 08:45
- Afternoon, 16:30 – 17:45

Model Period

2.2 The model was derived from junction turning counts for the periods 07:30 – 09:30 and 16:30 – 18:30 and validated against independently collected queue length data for the peak periods. To assess junction performance following the removal of HGV traffic the time periods have been extended to include the whole of the period for which data is available, resulting in the model periods being extended to include 07:30 - 09:30 and 16:30 - 18:30. This approach has been adopted as the model has already been developed to demonstrate a suitable level of performance for the shorter peak periods. Given that this model has already been accepted by TfL it is assumed that an extension to the model period will provide an accurate reflection of junction performance.

2.3 Evidence of model validation cannot be provided for the current version of the traffic model, which includes signalisation of four of the five junction approaches and incorporation of pedestrian phases, because queue length data has not been collected since their implementation.

Traffic Growth

2.4 The previous VISSIM micro-simulation model was developed to demonstrate the performance of the junction in 2003. To ensure an accurate representation of current conditions an increase of 0.67% has been applied to both the AM and PM periods. This growth figure is derived from information provided in Section 3 of the TfL London Travel Report, 2003. This details that traffic growth since 1993 has been 7% across London, compared to a national average of 18%. Interpolation of this growth across a ten year period results in 0.67% annual increase in traffic. This figure has been applied to all traffic in the VISSIM model to generate a 2004 base model.

3 100% HGV REMOVAL - OPTION ASSESSMENT

3.1 The objective of the study has been to assess the impact that removal of HGVs has on the performance of the Stirling Corner junction. To provide background information on the number of vehicles travelling through the junction Table 3.1 summarises traffic volumes and the proportion of HGVs by each approach.

Table 3.1 – Summary of AM Peak Period Traffic Movements

AM	Barnet Bypass (North)			Barnet Road			Barnet Bypass (South)			Barnet Lane			Sterling Way		
time	Arm 1			Arm 2			Arm 3			Arm 4			Arm 5		
period	Total	HGV	% HGV	Total	HGV	% HGV	Total	HGV	% HGV	Total	HGV	% HGV	Total	HGV	% HGV
0730-0745	641	23	3.7%	170	3	1.9%	507	10	1.9%	229	3	1.4%	17	2	12.5%
0745-0800	618	32	5.2%	176	4	2.4%	555	18	3.3%	210	3	1.5%	28	2	7.7%
0800-0815	562	35	6.3%	173	5	3.1%	474	28	5.9%	229	10	4.2%	31	2	6.9%
0815-0830	576	32	5.6%	172	2	1.2%	528	16	3.0%	186	9	4.6%	31	2	6.9%
0830-0845	639	34	5.3%	171	0	0.0%	495	15	3.0%	200	6	3.2%	19	4	22.2%
0845-0900	563	37	6.6%	152	1	0.7%	530	22	4.2%	201	11	5.3%	11	0	0.0%
0900-0915	530	37	7.0%	156	1	0.7%	631	39	6.3%	161	4	2.6%	26	1	4.2%
0915-0930	551	35	6.4%	146	1	0.7%	452	27	5.9%	221	16	7.2%	26	6	25.0%
total	4681	267	5.7%	1315	18	1.4%	4172	175	4.2%	1637	62	3.8%	188	20	10.8%

Table 3.2 – Summary of PM Peak Period Traffic Movements

PM	Barnet Bypass (North)			Barnet Road			Barnet Bypass (South)			Barnet Lane			Sterling Way		
time	Arm 1			Arm 2			Arm 3			Arm 4			Arm 5		
period	Total	HGV	% HGV	Total	HGV	% HGV	Total	HGV	% HGV	Total	HGV	% HGV	Total	HGV	% HGV
1630-1645	402	2	0.5%	170	3	1.9%	654	32	4.9%	123	1	0.9%	31	0	0.0%
1645-1700	373	5	1.4%	176	4	2.4%	554	31	5.6%	186	2	1.1%	32	0	0.0%
1700-1715	425	4	1.0%	173	5	3.1%	571	25	4.3%	193	1	0.6%	76	2	2.8%
1715-1730	494	6	1.3%	172	2	1.2%	527	25	4.7%	181	1	0.6%	28	0	0.0%
1730-1745	474	4	0.9%	171	0	0.0%	614	21	3.5%	168	0	0.0%	49	0	0.0%
1745-1800	489	4	0.9%	152	1	0.7%	635	25	3.9%	170	1	0.6%	33	0	0.0%
1800-1815	407	4	1.0%	156	1	0.7%	630	17	2.7%	212	0	0.0%	42	1	2.6%
1815-1830	424	7	1.8%	146	1	0.7%	550	15	2.7%	203	1	0.5%	33	0	0.0%
total	3487	38	1.1%	1315	18	1.4%	4733	190	4.0%	1435	7	0.5%	323	3	1.0%

3.2 From the above summaries it can be seen that the maximum number of vehicles that can be removed from the junction is 542 HGVs during the morning peak period and 256 during the afternoon peak period..

3.3 A series of key network performance indicators have been used to assess the performance of the base model and with the removal of HGVs from the junction. These are:

- Queue lengths,
- Traffic volume on each approach,
- Journey time comparison, and
- Network Performance Indicators
  - Total network travel time,
  - Average network speed, and
  - Total network delay

3.4 Information on the relative performance of the junction with 100% of HGVs removed is described below. Each assessment has been undertaken using the same signal timings for the with and without HGV assessments so that they are directly comparable. Further improvements to junction performance are possible through additional amendments to signal timings to account for a reduced traffic volume through the junction.

Queue Lengths

3.5 A summary of the impact of queue lengths through the removal of HGV traffic is shown in Table 3.2 and Table 3.3 for the AM and PM peaks respectively.

Table 3.3 – Summary of Queue Length Difference (AM Peak)

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Stirling Way	
	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change
07:30 - 07:45	-4	-7%	-7	-9%	-32	-21%	-1	0%	0	0%
07:45 - 08:00	-44	-32%	6	8%	-84	-44%	-66	-28%	-5	-22%
08:00 - 08:15	-43	-37%	6	10%	-93	-31%	-85	-19%	-1	-7%
08:15 - 08:30	-17	-18%	0	0%	-68	-41%	-33	-16%	-12	-48%
08:30 - 08:45	-157	-38%	-10	-18%	-37	-30%	-14	-4%	-9	-53%
08:45 - 09:00	-147	-29%	0	0%	-15	-13%	20	21%	-5	-45%
09:00 - 09:15	-329	-65%	-5	-10%	-278	-55%	9	18%	1	5%
09:15 - 09:30	-267	-80%	1	2%	-274	-54%	-26	-28%	-5	-45%

3.6 From the table above it can be seen that there is an operational improvement on the major northern and southern approaches to the junction, Barnet Bypass, particularly in the morning peak period when there is a 80% reduction in one of the modelled time periods. During the morning

peak period the remaining approaches to the junction also have a reduction in queue length, with this being more noticeable on Barnet Lane than Stirling Way and Barnet Road.

Table 3.4 – Summary of Queue Length Difference (PM Peak)

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Stirling Way	
	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change
16:30 - 16:45	-4	-7%	-11	-16%	-3	-2%	-14	-16%	-2	-5%
16:45 - 17:00	-8	-12%	-9	-13%	0	0%	-41	-41%	1	3%
17:00 - 17:15	-7	-10%	-17	-27%	-23	-23%	3	2%	-4	-4%
17:15 - 17:30	3	4%	13	20%	-15	-16%	5	2%	-1	-1%
17:30 - 17:45	-4	-4%	20	41%	-11	-10%	3	5%	-32	-49%
17:45 - 18:00	-23	-23%	6	16%	-31	-22%	-40	-40%	-8	-26%
18:00 - 18:15	-5	-8%	1	2%	-48	-31%	70	52%	-12	-32%
18:15 - 18:30	-7	-13%	3	5%	5	5%	-9	-6%	-30	-56%

3.7 During the afternoon peak period there is not such a large reduction in the number of vehicles queuing on each of the approaches. The most significant reductions of 41% and 49% occur on Barnet Lane and Sterling Way respectively. It should also be noted that there are increases in queue lengths on the Barnet Lane and Barnet Road approaches. Investigation of this demonstrates that the increase occurs at a time when HGVs are removed from the junction approach. This indicates that HGVs are affecting the queue length in the base situation, on these more lightly trafficked single lane approaches, by either slowing vehicles on the approach to the junction or their slower acceleration resulting in the queue being less continuous.

Traffic Volume

3.8 Tables 3.5 and 3.6 for the AM and PM peak period respectively show the impact of HGV removal on traffic volumes across the modelled periods by junction approach.

Table 3.5 – Summary of AM Peak Traffic Volumes

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change
07:30 - 07:45	-17	-3%	-3	-3%	8	2%	-3	-1%	-2	-13%
07:45 - 08:00	-27	-4%	-3	-3%	-14	-3%	-2	-1%	-1	-4%
08:00 - 08:15	-27	-5%	-3	-3%	-22	-5%	-9	-4%	-3	-10%
08:15 - 08:30	-41	-8%	-2	-2%	-33	-8%	-10	-6%	-2	-7%
08:30 - 08:45	5	1%	2	2%	-17	-3%	-4	-2%	-4	-21%
08:45 - 09:00	37	7%	-2	-2%	-10	-2%	-11	-6%	1	11%
09:00 - 09:15	-66	-11%	-1	-1%	29	6%	-2	-1%	-1	-4%
09:15 - 09:30	-112	-19%	0	0%	-16	-3%	-16	-8%	-7	-28%

Table 3.6 – Summary of PM Peak Traffic Volumes

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change
16:30 - 16:45	-2	-1%	-2	-2%	-29	-5%	-2	-2%	0	0%
16:45 - 17:00	-5	-1%	-4	-3%	-24	-5%	0	0%	0	0%
17:00 - 17:15	-4	-1%	0	0%	-26	-5%	-7	-4%	4	8%
17:15 - 17:30	-4	-1%	-5	-4%	-21	-5%	5	3%	0	0%
17:30 - 17:45	-6	-1%	0	0%	-20	-4%	-2	-1%	-6	-12%
17:45 - 18:00	-4	-1%	0	0%	-33	-6%	0	0%	1	3%
18:00 - 18:15	-2	-1%	0	0%	-17	-3%	-3	-2%	1	3%
18:15 - 18:30	-8	-2%	-1	-1%	-16	-3%	5	3%	-3	-9%

3.9 From the assessments shown above it can be seen that the reduction in traffic volumes is in line with expectations as shown in Tables 3.1 and 3.2 above. In some circumstances there is an increase in traffic volume which occurs as a result of reduced queuing on that junction approach and because of the increased saturation flow achieved when HGVs are removed from the general traffic flow as a result of their slower acceleration rates and because in some circumstances vehicles are platooned behind HGVs on their approach to the junction. The 100% removal of HGVs from the junction results in a reduction of 542 vehicles through the junction in the morning

peak period, which amounts to a 4.5% decrease in traffic volume. This equates to approximately 5 years of traffic growth if historic trends are extrapolated into the future.

Journey Time Comparison

3.10 A comparison of journey times on each of the main routes through the modelled network has been carried out. For each route the journey time monitoring points have been selected so that they are unaffected by queues on junction approaches. A detailed summary of journey times, by route and 15 minute time segment, is provided in **Appendix A**. Table 3.7 provides a summary of the overall average journey time for each route.

Table 3.7 – Average Journey Time Comparison – AM Peak Period

	AM Base (sec)	100% HGV Removal (sec)	Difference (sec)	% Improvement
Barnet Bypass (n) to Barnet Bypass (s)	219	170	-49	22%
Barnet Bypass (s) to Barnet Bypass (n)	229	173	-56	24%
Barnet Lane to Barnet Road	108	107	-1	1%
Barnet Road to Barnet Lane	81	78	-3	4%

Table 3.8 – Average Journey Time Comparison – PM Peak Period

	PM Base (sec)	100% HGV Removal (sec)	Difference (sec)	% Improvement
Barnet Bypass (n) to Barnet Bypass (s)	150	147	-2	2%
Barnet Bypass (s) to Barnet Bypass (n)	156	150	-6	4%
Barnet Lane to Barnet Road	115	119	4	-3%
Barnet Road to Barnet Lane	82	79	-4	5%

3.11 It can be seen from the tables above that during the morning peak period there is a significant reduction in journey time on the two main routes (Barnet Bypass) through the junction. In real terms the journey has reduced by between 49 and 56 seconds which results in a 22% to 24% reduction in journey times. The less heavily trafficked routes through the junction experience only minor improvements in journey time during the morning peak period. In the afternoon peak period there the journey time reduction are minor on all routes, with a slight increase on the Barnet Road to Barnet Lane route.

Network Performance Indicators

3.12 The performance of the junction, throughout the whole of the modelled period, has been assessed through the use of three key performance indicators; total network travel time, average network speed and total delay. A summary of these is provided in Table 3.9 and Table 3.10 for the AM and PM peaks respectively.

Table 3.9 – AM Peak Network Performance Indicators

	AM Base	100% HGV Removal	Difference	% Improvement
Total Travel Time (h)	593	462	-131	22%
Average Network Speed (km/h)	37	46	9	24%
Total Network Delay (h)	292	172	-120	41%

3.13 From the table above it can be seen that there is a significant reduction in all of the indicators, with delay at the junction being substantially reduced with a 41% improvement compared with the base situation.

Table 3.10 – PM Peak Network Performance Indicators

	PM Base	100% HGV Removal	Difference	% Improvement
Total Travel Time (h)	421	401	-20	5%
Average Network Speed (km/h)	51	52	1	3%
Total Network Delay (h)	133	120	-13	10%

3.14 The table shown above illustrates that there is an improvement in junction performance during the afternoon peak period, although this is not as great as for the morning. Nevertheless there is a 10% reduction in total network delay, which would result in a noticeable improvement to junction performance.

Summary

3.15 The assessments described above demonstrate that the removal of HGVs from the Stirling Corner roundabout would result in an operational improvement to the junction as demonstrated through reductions in queue lengths on the major approaches to the junction. Data has also been extracted from the VISSIM micro-simulation model to assess the relative performance of the junction measured through total network travel time, average network speed and total delay. A

review of each of these criteria has demonstrated that there are improvements to the junction, particularly during the morning peak period. During the afternoon peak period the improvement to junction performance is not as noticeable although is because it is less heavily trafficked than during the morning peak period.

4 75% HGV REMOVAL - OPTION ASSESSMENT

4.1 Following completion of the initial option assessment for the removal of 100% of HGVs a further series of assessments were requested by TfL. The first of these, for the removal of 75% of HGVs from the junction is described in this section. To provide a comparative means of assessment the same criteria have been used to assess the performance of this option with the base model. The criteria that have been used are

- Queue lengths,
- Traffic volume on each approach,
- Journey time comparison, and
- Network Performance Indicators
  - Total network travel time,
  - Average network speed, and
  - Total network delay

4.2 Information on the relative performance of the junction with 75% of HGVs removed is described below. As with the previous option each assessment has been undertaken using the same signal timings for the with and without HGV assessments so that they are directly comparable. Further improvements to junction performance are possible through additional amendments to signal timings to account for a reduced traffic volume through the junction.

Queue Lengths

4.3 A summary of the impact on queue lengths through the removal of HGV traffic is shown in Table 4.1 for the morning peak period.

Table 4.1 – Summary of Queue Length Difference (AM Peak)

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change
07:30 - 07:45	40	66%	-7	-9%	-44	-29%	36	11%	0	0%
07:45 - 08:00	-33	-24%	6	8%	-63	-33%	12	5%	-5	-22%
08:00 - 08:15	-39	-34%	0	0%	-81	-27%	-51	-11%	-4	-27%
08:15 - 08:30	-13	-14%	11	15%	-68	-41%	0	0%	-7	-28%
08:30 - 08:45	-148	-36%	-4	-7%	-23	-18%	23	7%	-9	-53%
08:45 - 09:00	-131	-26%	0	0%	-4	-3%	26	28%	-5	-45%
09:00 - 09:15	-405	-79%	-9	-18%	-201	-40%	40	78%	-7	-37%
09:15 - 09:30	-255	-76%	-6	-10%	-193	-38%	2	2%	6	55%

4.4 As with preceding assessment for the 100% removal of HGVs during the AM Peak it can be seen that there is an operational improvement on the major northern and southern approaches to the junction, Barnet Bypass, particularly in the morning peak period when there is a large reduction in a majority of the modelled time periods. While there are improvements on the majority of the other junction approaches these are not as substantial as on the main movements.

Traffic Volumes

4.5 Table 4.2 shows the impact of HGV removal on traffic volumes across the modelled period by junction approach for the 75% removal of HGVs.

Table 4.2 – Summary of AM Peak Traffic Volumes

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change
07:30 - 07:45	-8	-2%	-3	-3%	7	2%	-4	-2%	-2	-13%
07:45 - 08:00	-23	-4%	-3	-3%	-15	-3%	2	1%	-1	-4%
08:00 - 08:15	-23	-4%	-2	-2%	-6	-1%	-6	-3%	-3	-10%
08:15 - 08:30	-33	-6%	-1	-1%	-8	-2%	-8	-4%	-2	-7%
08:30 - 08:45	13	3%	0	0%	-16	-3%	-1	-1%	-4	-21%
08:45 - 09:00	37	7%	0	0%	-3	-1%	-10	-5%	0	0%
09:00 - 09:15	-38	-7%	-1	-1%	17	4%	1	1%	0	0%
09:15 - 09:30	-108	-19%	0	0%	11	2%	-14	-7%	-5	-20%

4.6 From the assessments shown above it can be seen that there is an overall reduction in traffic volumes on all approaches. In some circumstances there is an increase in traffic volume which occurs as a result of reduced queuing on that junction approach and because of the increased saturation flow achieved when HGVs are removed from the general traffic flow. An assessment of the amount of traffic removed from the junction indicates that there are 406 vehicles removed from the junction, which equates to a 3.4% reduction in traffic. This equates to approximately 5 years of traffic growth if historic trends are extrapolated into the future.

Journey Time Comparison

4.7 Table 4.3 illustrates that there is a large improvement for journeys that travel along the Barnet Bypass in both directions. However, for journeys that travel on Barnet Road and Barnet Lane there is a minimal improvement during the AM peak.

Table 4.3 - Journey Time Comparison

	AM Base (sec)	75% HGV Removal (sec)	Difference (sec)	% Improvement
Barnet Bypass (n) to Barnet Bypass (s)	219	169	-50	23%
Barnet Bypass (s) to Barnet Bypass (n)	229	184	-45	20%
Barnet Lane to Barnet Road	108	107	-1	1%
Barnet Road to Barnet Lane	81	79	-2	3%

Network Performance Indicators

4.8 Table 4.4 summarises the performance of the network once 75% of HGVs have been removed from the junction for the morning peak period.

Table 4.4 – AM Peak Network Performance Indicators

	AM Base	75% HGV Removal	Difference	% Improvement
Total Travel Time:	593	477	-116	20%
Average Network Speed:	37	45	8	21%
Total Network Delay:	292	184	-109	37%

4.9 From the assessments shown above it can be seen that there is a large improvement in junction performance during the morning peak period. There is a 37% reduction in total network delay, which would result in a noticeable improvement to junction performance.

Summary

4.10 The assessments described above demonstrate that the reduction of 75% HGVs from the Stirling Corner roundabout would result in an operational improvement to the junction as demonstrated through reductions in queue lengths on the major approaches to the junction. Data has also been extracted from the VISSIM micro-simulation model to assess the relative performance of the junction measured through total network travel time, average network speed and total delay. A review of each of these criteria has demonstrated that there are improvements to the junction, particularly during the morning peak period.

5 50% HGV REMOVAL - OPTION ASSESSMENT

5.1 In line with the requirements of the workbrief, following completion and acceptance of the assessment undertaken to assess the impact of 75% of HGVs being removed from the junction, approval was given for an assessment of 50% removal of HGVs form the Stirling Corner junction.

5.2 This assessment has been undertaken using the same criteria as the earlier appraisals and has been completed using the same signal timings for the with and without HGV assessments so that they are directly comparable. Further improvements to junction performance are possible through additional amendments to signal timings to account for a reduced traffic volume through the junction. Nevertheless this approach provides directly comparable results. Detail on the relative performance of the junction with the 50% removal of HGVs is described below.

Queue Lengths

5.3 A summary of the impact on queue lengths through the removal of 50% of HGV traffic is shown in Table 5.1 for the morning peak period.

Table 5.1 – Summary of Queue Length Difference (AM Peak)

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change	Difference in queue (m)	% Change
07:30 - 07:45	54	89%	-7	-9%	-10	-7%	36	11%	0	0%
07:45 - 08:00	-27	-20%	0	0%	-61	-32%	41	17%	-4	-17%
08:00 - 08:15	-24	-21%	-7	-11%	-78	-26%	-96	-21%	6	40%
08:15 - 08:30	-9	-9%	11	15%	-65	-39%	20	10%	0	0%
08:30 - 08:45	-90	-22%	-4	-7%	-15	-12%	76	23%	0	0%
08:45 - 09:00	-130	-25%	0	0%	21	18%	1	1%	1	9%
09:00 - 09:15	-399	-78%	-6	-12%	-109	-22%	23	45%	-7	-37%
09:15 - 09:30	-261	-78%	-2	-3%	-97	-19%	33	36%	7	64%

5.4 As with earlier assessments for % removal of HGVs during the AM Peak it can be seen that there is an operational improvement on the major northern and southern approaches to the junction, Barnet Bypass. However compared to these earlier assessments there is a reduced impact during the middle of the peak period. There continue to be improvements on the Barnet Lane approach but there is little, if any benefit, on the remaining two junction approaches as determined by this assessment. Subsequent criteria, such as journey time comparison and key network performance indicators will identify the extent of benefit to the junction as a whole.

Traffic Volumes

5.5 Table 5.2 shows the impact of HGV removal on traffic volumes across the modelled period by junction approach for the 50% removal of HGVs.

Table 5.2 – Summary of AM Peak Traffic Volumes

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change
07:30 - 07:45	-8	-2%	-2	-2%	5	1%	-18	-9%	-1	-6%
07:45 - 08:00	-19	-3%	-2	-2%	-8	-2%	17	9%	-2	-8%
08:00 - 08:15	-7	-1%	-2	-2%	-8	-2%	-9	-4%	-1	-3%
08:15 - 08:30	-26	-5%	-2	-2%	-9	-2%	-2	-1%	0	0%
08:30 - 08:45	13	3%	0	0%	-7	-1%	-1	-1%	-3	-16%
08:45 - 09:00	43	9%	0	0%	-19	-4%	-11	-6%	0	0%
09:00 - 09:15	-18	-3%	0	0%	22	5%	3	2%	0	0%
09:15 - 09:30	-102	-18%	0	0%	25	5%	-9	-4%	-5	-20%

5.6 From the assessments shown above it can be seen that there is an overall reduction in traffic volumes on all approaches. In some circumstances there is an increase in traffic volume which occurs as a result of reduced queuing on that junction approach and because of the increased saturation flow achieved when HGVs are removed from the general traffic flow. An assessment of the amount of traffic removed from the junction indicates that there are 271 vehicles removed from the junction, which equates to a 2.2% reduction in traffic. This equates to approximately 3 years of traffic growth if historic trends are extrapolated into the future.

Journey Time Comparison

5.7 Table 5.3 illustrates that there is a large improvement for journeys that travel along the Barnet Bypass in both directions. However, whilst there is a marginal improvement on the Barnet

Lane to Barnet Road journey time there is a negative impact on the journey in the opposite direction.

Table 5.3 - Journey Time Comparison

	AM Base (sec)	50% HGV Removal (sec)	Difference (sec)	% Improvement
Barnet Bypass (n) to Barnet Bypass (s)	219	176	-43	20%
Barnet Bypass (s) to Barnet Bypass (n)	229	198	-31	14%
Barnet Lane to Barnet Road	108	117	+9	-8%
Barnet Road to Barnet Lane	81	80	-1	1%

Network Performance Indicators

5.8 Table 5.4 summarises the performance of the network once 75% of HGVs have been removed from the junction for the morning peak period.

Table 5.4 – AM Peak Network Performance Indicators

	AM Base	75% HGV Removal	Difference	% Improvement
Total Travel Time:	593	508	-85	14%
Average Network Speed:	37	43	6	15%
Total Network Delay:	292	212	-81	28%

5.9 From the assessments shown above it can be seen that there is a significant overall improvement in junction performance during the morning peak period. There is a 28% reduction in total network delay, which would result in a noticeable improvement to junction performance.

Summary

5.10 The assessments described above demonstrate that removal of 50% HGVs from the Stirling Corner roundabout would result in an improvement to the junction on its major routes. On the minor arms of the junction there are some improvements, with the exception of the Barnet Lane approach. The overall impact on network performance is still positive as demonstrated by the network performance indicators.

6 25% HGV REMOVAL – OPTION ASSESSMENT

6.1 Following on from the assessment of 100% and 75% HGV removal from Sterling Corner junction, a test of 25% HGV removal was carried out.

6.2 The same criteria as previous tests were used in this assessment in order to ensure that the only variable in the test was the HGV element of the model. Information regarding the network performance with a 25% HGV removal is detailed below.

Queue Lengths

6.3 A summary of the impact a 25% reduction in HGV traffic has on queue lengths in the AM peak is shown in Table 5.1.

Table 6.1 – Summary of Queue Length Difference (AM Peak)

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in queue	% Change	Difference in queue	% Change	Difference in queue	% Change	Difference in queue	% Change	Difference in queue	% Change
07:30 - 07:45	33	54%	-7	-9%	-8	-5%	116	34%	0	0%
07:45 - 08:00	-22	-16%	0	0%	-45	-24%	47	20%	-5	-22%
08:00 - 08:15	-12	-10%	-13	-21%	-63	-21%	-1	0%	6	40%
08:15 - 08:30	-14	-15%	-1	-1%	-48	-29%	58	28%	0	0%
08:30 - 08:45	-62	-15%	-4	-7%	-3	-2%	37	11%	1	6%
08:45 - 09:00	0	0%	0	0%	32	27%	7	7%	-5	-45%
09:00 - 09:15	-394	-77%	-6	-12%	-39	-8%	18	35%	-7	-37%
09:15 - 09:30	-261	-78%	8	13%	-6	-1%	13	14%	6	55%

The queue length results for the AM peak are in line with the earlier assessments carried out. There is an improvement in the operation of the Barnett Bypass, the major arms of the junction. As seen in the 50% HGV reduction test, the impact is further reduced during the middle of the peak period but overall there is a net benefit. On the other arms of the junction less benefit is seen in terms of queue length but other criteria will be used to examine the overall benefit to the junction as a whole.

Traffic Volumes

6.4 Table 6.2 shows the impact of the removal of 25% of HGV's on traffic volumes on each arm of the junction during the time period modelled.

Table 6.2 – Summary of AM Peak Traffic Volumes

	Barnet Bypass (North)		Barnet Road		Barnet Bypass (South)		Barnet Lane		Sterling Way	
	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change	Difference in Volume	% Change
07:30 - 07:45	-6	-1%	-1	-1%	3	1%	-16	-8%	-1	-6%
07:45 - 08:00	-1	0%	-1	-1%	-3	-1%	16	8%	-2	-8%
08:00 - 08:15	-6	-1%	0	0%	6	1%	-15	-7%	0	0%
08:15 - 08:30	-20	-4%	-2	-2%	-24	-6%	8	4%	0	0%
08:30 - 08:45	10	2%	1	1%	8	2%	-1	-1%	0	0%
08:45 - 09:00	6	1%	0	0%	-17	-4%	-1	-1%	0	0%
09:00 - 09:15	-13	-2%	0	0%	9	2%	0	0%	0	0%
09:15 - 09:30	-29	-5%	0	0%	7	1%	-6	-3%	-4	-16%

6.5 From the data above it is clear that there is an overall traffic reduction on all arms of the junction in the AM peak period. Any increases in traffic flow can frequently be linked to reductions in queue on that junction approach. This is due to an increased saturation flow brought about by a reduction in HGV traffic from the general flow on that arm. Overall there is a total reduction in traffic of 95 vehicles on all arms of the roundabout. This equates to a 0.89% reduction in traffic levels though the junction.

Journey Time Comparison

6.6 Table 6.3 shows the effect a removal of 25% of HGV traffic has on journey times through the Sterling corner junction.

Table 6.3 – Journey Time Comparison

	AM Base (sec)	25% HGV Removal (sec)	Difference (sec)	% Improvement
Barnet Bypass (n) to Barnet Bypass (s)	219	207	-12	6%
Barnet Bypass (s) to Barnet Bypass (n)	229	208	-20	9%
Barnet Lane to Barnet Road	108	118	11	-10%
Barnet Road to Barnet Lane	81	80	-1	2%

6.7 The jouney time comparison information clearly show an improvement along the Barnett Bypass both Northbound and Southbound. This improvement on the main route through the junction is tempered by the fact that there is a slight increase in journey time from Barnet Lane to Barnet Road.

Network Performance Indicators

6.8 Table 6.4 indicates some key network summary statistics.

Table 5.4 – AM Peak Network Performance Indicators

	AM Base	25% HGV Removal	Difference	% Improvement
Total Travel Time:	593	573	-20	3%
Average Network Speed:	37	38	1	3%
Total Network Delay:	292	274	-18	6%

6.9 The table above shows that a reduction of 25% of total HGV traffic through the junction has a positive impact on all aspects of network performance. Speeds through the junction are improved and total network travel time decreases; both of these by 3%. The most significant improvement can be seen in a 6% decrease in delay. All three of these factors will contribute to an increase in the operational performance of the junction.

Summary

6.10 All of the outputs from the VISSIM model shown above indicate that by removing 25% of HGV traffic, overall the operation of the junction will improve. Overall, queue's will reduce, particularly on the major arms of the junction and delays through the junction are reduced. The key links i.e. Barnett Bypass North and South experience the main benefits from the removal of HGV traffic. It is also clear that these benefits outweigh the small disbenefit indicated on the minor arms. Overall the impact on network performance is positive if 25% of HGV's are removed from the junction.

APPENDIX A

Detailed Summary of Journey Time Comparisons